Exhibit P1
Fish and Wildlife Habitat and Species

Boardman to Hemingway Transmission Line Project

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Amended Preliminary Application for Site Certificate

June 2017

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ACRONYMS AND ABBREVIATIONS

°C	degree Celsius
Amended Project Order	First Amended Project Order, Regarding Statutes, Administrative Rules and Other Requirements Applicable to the Proposed Boardman to Hemingway Transmission Line (December 22, 2014)
APLIC	Avian Power Line Interaction Committee
BLM	Bureau of Land Management
BMP	best management practice
CAP	Community Advisory Process
EFSC or Council	Energy Facility Siting Council
ESCP	Erosion and Sediment Control Plan
FWS	U.S. Fish and Wildlife Service
GAP	Gap Analysis Project
GeoBOB	Geographic Biotic Observation
GIS	geographic information system
HMP	Habitat Mitigation Plan
IDFG	Idaho Department of Fish and Game
IPC	Idaho Power Company
km	kilometer
kV	kilovolt
LWD	large woody debris
MP	milepost
NOAA Fisheries	National Oceanic and Atmospheric Administration Fisheries Division
NWSTF Boardman	Naval Weapons Systems Training Facility Boardman
OAR	Oregon Administrative Rules
ODF	Oregon Department of Forestry
ODFW	Oregon Department of Fish and Wildlife
ODOE	Oregon Department of Energy
ORBIC	Oregon Biodiversity Information Center
OSDAM	Oregon Streamflow Duration Assessment Methodology
Project	Boardman to Hemingway Transmission Line Project
ROE	right of entry
ROW	right-of-way
SPCC	Spill Prevention, Containment, and Countermeasures
T&E	threatened and endangered (species)
TVES	Terrestrial Visual Encounter Surveys
USFS	United States Forest Service
WAGS	Washington ground squirrel

Exhibit P
Fish and Wildlife Habitat and Species

1.0 INTRODUCTION

Exhibit P1 describes the potential impacts of the Boardman to Hemingway Transmission Line Project (Project) on fish and wildlife species (other than the endangered and threatened species addressed in Exhibit Q, Greater sage-grouse addressed in Exhibit P2, and elk addressed in Exhibit P3) and their habitats, as well as the steps Idaho Power Company (IPC) will take to avoid, minimize, and mitigate those impacts. Further, Exhibit P1 shows the Project will be consistent with the Oregon Department of Fish and Wildlife's (ODFW) fish and wildlife habitat mitigation goals and standards.

2.0 APPLICABLE RULES AND AMENDED PROJECT ORDER PROVISIONS

2.1 General Standards for Siting Facilities

The Fish and Wildlife Habitat Standard at Oregon Administrative Rule (OAR) 345-022-0060 states:

> *To issue a site certificate, the Council must find that the design, construction and operation of the facility, taking into account mitigation, are consistent with:*
>
> *(1) The general fish and wildlife habitat mitigation goals and standards of OAR 635-415-0025(1) through (6) in effect as of February 24, 2017, and*
>
> *(2) For energy facilities that impact sage-grouse habitat, the sage-grouse specific habitat mitigation requirements of the Greater Sage-Grouse Conservation Strategy for Oregon at OAR 635-415-0025(7) and OAR 635-140-0000 through -0025 in effect as of February 24, 2017.*

2.2 Fish and Wildlife Habitat Mitigation Goals and Standards

ODFW's Habitat Mitigation Goals and Standards of OAR 635-415-0025 provide:

> *(1) "Habitat Category 1" is irreplaceable, essential habitat for a fish or wildlife species, population, or a unique assemblage of species and is limited on either a physiographic province or site-specific basis, depending on the individual species, population or unique assemblage.*
>
> > *(a) The mitigation goal for Category 1 habitat is no loss of either habitat quantity or quality.*
> >
> > *(b) The Department shall act to protect Category 1 habitats described in this subsection by recommending or requiring:*
> >
> > > *(A) Avoidance of impacts through alternatives to the proposed development action; or*
> > >
> > > *(B) No authorization of the proposed development action if impacts cannot be avoided.*

(2) "Habitat Category 2" is essential habitat for a fish or wildlife species, population, or unique assemblage of species and is limited either on a physiographic province or site-specific basis depending on the individual species, population or unique assemblage.

(a) The mitigation goal if impacts are unavoidable, is no net loss of either habitat quantity or quality and to provide a net benefit of habitat quantity or quality.

(b) The Department shall act to achieve the mitigation goal for Category 2 habitat by recommending or requiring:

(A) Avoidance of impacts through alternatives to the proposed development action; or

(B) Mitigation of impacts, if unavoidable, through reliable in-kind, in-proximity habitat mitigation to achieve no net loss of either pre-development habitat quantity or quality. In addition, a net benefit of habitat quantity or quality must be provided. Progress towards achieving the mitigation goals and standards shall be reported on a schedule agreed to in the mitigation plan performance measures. The fish and wildlife mitigation measures shall be implemented and completed either prior to or concurrent with the development action.

(c) If neither 635-415-0025(2)(b)(A) or (B) can be achieved, the Department shall recommend against or shall not authorize the proposed development action.

(3) "Habitat Category 3" is essential habitat for fish and wildlife, or important habitat for fish and wildlife that is limited either on a physiographic province or site-specific basis, depending on the individual species or population.

(a) The mitigation goal is no net loss of either habitat quantity or quality.

(b) The Department shall act to achieve the mitigation goal for Category 3 habitat by recommending or requiring:

(A) Avoidance of impacts through alternatives to the proposed development action; or

(B) Mitigation of impacts, if unavoidable, through reliable in-kind, in-proximity habitat mitigation to achieve no net loss in either pre-development habitat quantity or quality. Progress towards achieving the mitigation goals and standards shall be reported on a schedule agreed to in the mitigation plan performance measures. The fish and wildlife mitigation measures shall be implemented and completed either prior to or concurrent with the development action.

c) If neither 635-415-0025(3)(b)(A) or (B) can be achieved, the Department shall recommend against or shall not authorize the proposed development action.

(4) "Habitat Category 4" is important habitat for fish and wildlife species.

(a) The mitigation goal is no net loss in either existing habitat quantity or quality.

(b) The Department shall act to achieve the mitigation goal for Category 4 habitat by recommending or requiring:

(A) Avoidance of impacts through alternatives to the proposed development action; or

(B) Mitigation of impacts, if unavoidable, through reliable in-kind or out-of-kind, in-proximity or off-proximity habitat mitigation to achieve no net loss in either pre-development habitat quantity or quality. Progress towards achieving the mitigation goals and standards shall be reported on a schedule agreed to in the mitigation plan performance measures. The fish and wildlife mitigation measures shall be implemented and completed either prior to or concurrent with the development action.

(c) If neither 635-415-0025(4)(b)(A) or (B) can be achieved, the Department shall recommend against or shall not authorize the proposed development action.

(5) "Habitat Category 5" is habitat for fish and wildlife having high potential to become either essential or important habitat.

(a) The mitigation goal, if impacts are unavoidable, is to provide a net benefit in habitat quantity or quality.

(b) The Department shall act to achieve the mitigation goal for Category 5 habitat by recommending or requiring:

(A) Avoidance of impacts through alternatives to the proposed development action; or

(B) Mitigation of impacts, if unavoidable, through actions that contribute to essential or important habitat.

(c) If neither 635-415-0025(5)(b)(A) or (B) can be achieved, the Department shall recommend against or shall not authorize the proposed development action.

(6) "Habitat Category 6" is habitat that has low potential to become essential or important habitat for fish and wildlife.

(a) The mitigation goal is to minimize impacts.

(b) The Department shall act to achieve the mitigation goal for Category 6 habitat by recommending or requiring actions that minimize direct habitat loss and avoid impacts to off-site habitat.

2.3 Site Certificate Application Requirements

OAR 345-021-0010(1)(p) requires that Exhibit P include the following information about the fish and wildlife habitat and species, other than the species addressed in Exhibit Q, that could be affected by the Project:

(A) A description of biological and botanical surveys performed that support the information in this exhibit, including a discussion of the timing and scope of each survey.

(B) Identification of all fish and wildlife habitat in the analysis area, classified by the habitat categories as set forth in OAR 635-415-0025 and a description of the characteristics and condition of that habitat in the analysis area, including a table of the areas of permanent disturbance and temporary disturbance (in acres) in each habitat category and subtype.

(C) A map showing the locations of the habitat identified in (B).

(D) Based on consultation with the Oregon Department of Fish and Wildlife (ODFW) and appropriate field study and literature review, identification of all State Sensitive Species that might be present in the analysis area and a discussion of any site-specific issues of concern to ODFW.

(E) A baseline survey of the use of habitat in the analysis area by species identified in (D) performed according to a protocol approved by the Department and ODFW.

(F) A description of the nature, extent and duration of potential adverse impacts on the habitat identified in (B) and species identified in (D) that could result from construction, operation and retirement of the proposed facility.

(G) A description of any measures proposed by the applicant to avoid, reduce or mitigate the potential adverse impacts described in (F) in accordance with the ODFW mitigation goals described in OAR 635-415-0025 and a discussion of how the proposed measures would achieve those goals.

(H) A description of the applicant's proposed monitoring plans to evaluate the success of the measures described in (G).

2.4 Amended Project Order Provisions

The Amended Project Order requires Exhibit P to include the following specific information:

The applicant has proposed a "phased survey" approach for data collection during the site certificate review process. The Department understands that the entirety of the site boundary for the proposed facility may not yet have been surveyed, mapped for vegetation types, and categorized under ODFW's habitat categorization guidance. Nevertheless, Exhibit P shall include as much information as possible about the results of the field surveys conducted to date for biological resources and the schedule for future surveys.

Exhibit P shall include analysis of how the evidence provided supports a finding by the Council that the proposed facility meets the Council's fish and wildlife habitat standard. Exhibit P must include the results of all surveys for fish and wildlife habitat in the analysis area. Exhibit P must also identify all state sensitive species that may be present in the analysis area and include the results of surveys for state sensitive species. Please also include the survey methodology, including scope and timing of each survey. Surveys must be performed by qualified survey personnel during the season or seasons appropriate to the detection of the species in question. The applicant must also include in Exhibit P its habitat categorization and tables depicting the estimated temporary and permanent impacts, broken down by habitat categories.

If particular fish and/or wildlife habitat or state sensitive species are identified within the analysis area that could be adversely affected as a result of the proposed facility, the applicant shall include description of the nature, extent and duration of potential adverse impacts and a description of any proposed mitigation measures. Fish and Wildlife Habitat Mitigation Policy (OAR Chapter 635, Division 415) classifies six habitat categories and establishes a mitigation goal for each category. The applicant for a site certificate must identify the appropriate habitat category for all areas affected by the proposed facility and provide the basis for each category designation, subject to ODFW

> *review. The applicant must show how it would comply with the habitat mitigation goals and standards by appropriate monitoring and mitigation.*
>
> *As a result of the access timing issues for this proposed facility, please also provide proposed site certificate conditions for the Council's consideration related to requirements for the applicant to complete all unfinished surveys within the project's site boundary prior to construction. The proposed site certificate conditions should also address submittal requirements for reporting future survey results, adjustment of previously calculated impact areas (if necessary), and the applicant's proposed approach to document approval of final results by agencies or the Council prior to commencing construction activities.*

(Amended Project Order, Section III(p)).

3.0 ANALYSIS

3.1 Analysis Area

The analysis area for Exhibit P1 includes all areas within the Site Boundary, which is defined as "the perimeter of the site of a proposed energy facility, its related or supporting facilities, all temporary laydown and staging areas, and all corridors and micrositing corridors proposed by the applicant" (OAR 345-001-0010(55)). The Site Boundary encompasses the following facilities in Oregon:

- The Proposed Route, consisting of 270.8 miles of new 500-kilovolt (kV) electric transmission line, removal of 12 miles of existing 69-kV transmission line, rebuilding of 0.9 mile of a 230-kV transmission line, and rebuilding of 1.1 miles of an existing 138-kV transmission line;
- Four alternatives that each could replace a portion of the Proposed Route, including the West of Bombing Range Road Alternative 1 (3.7 miles), West of Bombing Range Road Alternative 2 (3.7 miles), Morgan Lake Alternative (18.5 miles), and Double Mountain Alternative (7.4 miles);
- One proposed 20-acre station (Longhorn Station);
- Ten communication station sites of less than ¼-acre each and two alternative communication station sites;
- Permanent access roads for the Proposed Route, including 206.3 miles of new roads and 223.2 miles of existing roads requiring substantial modification, and for the alternative routes including 30.2 miles of new roads and 22.7 miles of existing roads requiring substantial modification; and
- Thirty-one temporary multi-use areas and 299 pulling and tensioning sites of which four will have light-duty fly yards within the pulling and tensioning sites.

The Project features are fully described in Exhibit B and the Site Boundary for each Project feature is described in Exhibit C, Section 3.5, Table C-24. The location of the Project features and the Site Boundary is outlined in Exhibit C. Additionally, within the analysis area, IPC has identified existing roads requiring no substantial modification (not a related or supporting facility), including 38 miles for the Proposed Route and 5 miles for the alternative routes.

3.2 Surveys

OAR 345-021-0010(1)(p)(A): A description of biological and botanical surveys performed that support the information in this exhibit, including a discussion of the timing and scope of each survey.

This section discusses the biological field surveys performed for the Project. The Revised Final Biological Survey Work Plan (Attachment P1-2) contains the agency comments regarding the plan and survey protocols, as well as IPC's responses to these comments (i.e., describing how any concerns by the agencies were addressed).

After consultation with applicable federal and state agencies, IPC determined that field surveys and data collection for the Project would be conducted via a phased study approach, which utilized three phases (see Attachment P1-2).[1] During Phase 1 (i.e., the initial desktop review), IPC compiled existing biological information relevant to the analysis area. In Phase 2, IPC undertook comprehensive field survey efforts specific to the analysis area for the Project. Phase 3 surveys include preconstruction surveys and surveys of previously unsurveyed areas.

The term "special status species" used in this exhibit includes federally-listed and state-listed threatened and endangered (T&E) species as well as those species designated as sensitive by the Bureau of Land Management (BLM) and United States Forest Service (USFS), as well as the USFS Management Indicator Species, as defined in the Revised Final Biological Survey Work Plan (see Attachment P1-2). Although the focus of this Exhibit is State Sensitive Species and fish and wildlife habitats, special status species as defined above are occasionally referenced in this Exhibit as they relate to Project siting, biological surveys, and avoidance and minimization measures that also apply to State Sensitive Species and fish and wildlife habitats. State-listed T&E species are addressed in Exhibit Q.

A detailed description of the biological field surveys performed for the Project is provided in Section 3.2.4 below.

3.2.1 Initial Desktop Review

Existing data were initially researched to determine the preliminary list of species that could potentially occur within the analysis area. Databases and literature from the Oregon Biodiversity Information Center[2] (ORBIC; 2016), StreamNet (2016), ODFW (2005, 2012, 2015a, 2016), Oregon Department of Agriculture (2016), Oregon Department of Forestry (ODF; 2013), USFS (2015), BLM (2015 and 2016), watershed basin plans, the Geographic Biotic Observation (GeoBOB) database (2016), the Natural Resource Information System database (USFS 2016), Federal Register notifications, Bonneville Power Administration and Northwest Power and Conservation Council reports, and the National Oceanic and Atmospheric Administration Fisheries Division (NOAA Fisheries; 2009) were reviewed for information on the species that could occur within the analysis area. Moreover, in recognition of the fact that species might occur in an area even in the absence of documented occurrence, local agency experts were consulted and field surveys were conducted, to better identify the list of species that could potentially occur within the analysis area. Consultation with the applicable agencies is described

[1] The original dates of the phased survey effort proposed in the Revised Final Biological Survey Work Plan (i.e., Attachment P1-2) do not always directly correspond to the dates in which these surveys were actually conducted; many of the surveys outlined in the Revised Final Biological Survey Work Plan were conducted earlier (i.e., in an earlier year) than proposed in Attachment P1-2. See Table P1-1 for a list of dates in which surveys were completed.
[2] ORBIC requested that rare species occurrence locations be kept confidential; upon request, they may be available from the Oregon Department of Energy with approval from ORBIC.

in the following paragraph, while the field surveys conducted to determine baseline conditions are described in Section 3.2.4.

3.2.2 Development of Field Survey Protocols and Agency Consultation

As required by OAR 345-021-0010(1)(p)(E) and consistent with direction provided to IPC in the Project Order, IPC consulted with state and federal agencies in developing its field survey protocols for the Project. An initial meeting was held on August 22, 2008, in Baker City, Oregon, with land managers and biologists from the ODFW, Idaho Department of Fish and Game (IDFG), USFS, U.S. Fish and Wildlife Service (FWS), NOAA Fisheries, and the BLM. The purpose of this meeting was to establish an interagency / intergovernmental working group that would determine the list of species that could potentially occur near the Project, as well as to identify the surveys and protocols that would be required to identify wildlife species, special status plant species, wetlands, vegetation, and general habitats in the analysis area. Subsequent meetings with ODFW biologists were held in Baker City on September 30, 2008, and in Pendleton, Oregon, on October 17, 2008. A meeting with the IDFG was held in Boise, Idaho, on February 9, 2009. As a result of these meetings, IPC prepared a draft of the Biological Survey Work Plan, which contained the proposed biological surveys and their protocols. This plan was submitted to agency specialists on February 10, 2009, and on February 17, 2009, IPC met to discuss the plan with the Oregon Department of Energy (ODOE), ODFW, USFS, FWS, NOAA Fisheries, and BLM.

Shortly after meeting with the agencies to discuss the Biological Survey Work Plan, IPC initiated the Community Advisory Process (CAP) to develop a broader range of possible routes for the Project. Following completion of the CAP, a second interagency meeting was held on October 26, 2010, with representatives of the ODFW, BLM, USFS, ODOE, NOAA Fisheries, and FWS, to obtain additional input on species and habitats within the Project's analysis area. Input from agency specialists was used to identify the special status species that could occur within the area, those that would require field surveys, and the species targeted during concurrent field surveys. The Revised Final Biological Survey Work Plan contains a list of all agency-required biological surveys, as well as a detailed description of the final protocols used (Attachment P1-2). Following approval of the Revised Final Biological Survey Work Plan, IPC continued to coordinate with agencies regarding continued field efforts. Coordination is ongoing as needed, and has included requesting comments on survey areas and protocols prior to conducting additional field surveys. IPC will develop a Pre-Construction Biological Survey Work Plan after issuance of a site certificate to replace the Revised Final Biological Survey Work Plan Phase 3 surveys.

Concurrent with agency coordination regarding field survey protocols, IPC coordinated with ODFW, ODOE, BLM, USFS, and FWS to develop methods for habitat categorization. The Habitat Categorization Matrix (Attachment P1-1) was developed during the same time frame as the Revised Final Biological Survey Work Plan, and was reviewed by these agencies. The Habitat Categorization Matrix has been modified by IPC to more accurately reflect the habitat types crossed by the Project and to incorporate wetland delineation data.

In the spring of 2013, IPC conducted geographic information system (GIS) mapping of fish-bearing streams along the Project routes. This mapping incorporated data from the existing GIS data layers and sources listed above (e.g., StreamNet, ODFW, and ODF) into one GIS layer. Using this layer, IPC created maps of fish-bearing streams along the Project routes, and these maps were distributed to local biologists at ODFW, USFS, and BLM for review and comment. Based on comments received from agency review and from other local biologists, as well as Tetra Tech fish biologists' evaluation of likely channel characteristics (derived from GIS) possibly suitable for fish habitat, updates were made to the GIS layer that resulted in the most conservative upstream extent of potential fish distribution related to the proposed Project. This revised GIS layer identified the extent of fish distribution and locations for which ODFW had already made a fish presence determination, and additional upstream extents identified as potentially fish-bearing that require an IPC fish presence determination and ODFW concurrence (for Oregon streams). Surveys to assess fish presence occurred first in 2014 (Tetra Tech 2014a) and again in 2016 following Project route modifications (see Attachment P1-7B). These surveys combined identified a total of 76 potentially fish-bearing streams, including 73 road and 55 transmission line crossing sites (128 total crossings) associated with the Project in both Idaho and Oregon.

3.2.3 Survey Access

IPC attempted to gain right-of-entry (ROE) to all areas that require surveys. On federally managed and state-managed lands, this was accomplished through coordination with the respective agencies. On privately owned lands, individual permission from each landowner was required prior to accessing the land. In some cases, private landowners did not allow ROE to their lands; therefore, IPC has not completed surveys for the areas to which ROE was not granted by the landowner. In addition, some areas where ROE has been granted have not been surveyed because of timing conflicts (ROE granted outside of the recommended timeframe for survey) or because access to those areas require crossing parcels that have not approved ROE. However, after issuance of the site certificate and prior to construction, IPC will obtain ROE to the remaining parcels and complete the surveys.

3.2.4 Biological Survey Descriptions

Table P1-1 lists the various biological surveys that were conducted (relative to Exhibit P1), the survey protocols that were used, the dates of these surveys, the approximate acreage or number of calling stations requiring surveys, the total acreage or number of calling stations that have been surveyed to date, and future survey efforts. These areas are shown in Figures P1-1 through P1-5.

Field surveys for fish presence and fish habitat at road and transmission line crossings were also conducted using methods provided in the Fish Presence Determination Survey Plan and Fisheries Habitat and Crossing Assessment Plan (Tetra Tech 2014b and 2014c). The protocols used in these plans were reviewed by ODFW and federal agencies prior to their implementation. The Fish Habitat and Stream Crossing Assessment Summary Report (Fish Habitat Report, hereafter; Attachment P1-7B) supplies the results of these fish-related field studies.

Table P1-1. Biological Surveys Related to Exhibit P1

Survey Name	Protocol Used	Total Area Requiring Surveys (acres or calling stations)	Surveys Completed to Date (acres or calling stations/date)	Future Survey Efforts
Northern Goshawk and American Three-toed Woodpecker	A Field Protocol to Monitor Cavity-Nesting Birds (Dudley and Saab 2003), and the Northern Goshawk Inventory and Monitoring Technical Guide (Woodbridge and Hargis 2006); see Attachment P1-7	853 calling stations; see Figure P1-1	566 calling stations / July 2016	None.
Great Gray Owl and Flammulated Owl	Survey Protocol for the Great Gray Owl Within the Range of the Northwest Forest Plan (Quintana-Coyer et al. 2004), and Flammulated Owl Surveys Final Report (Smucker et al. 2008); see Attachment P1-7	412 calling stations; see Figure P1-2	353 calling stations / June 2012	Surveys will occur on all previously unsurveyed parcels following issuance of a site certificate and prior to construction. Survey results will be provided to ODOE.
Washington Ground Squirrel	Status and Habitat Use of the Washington Ground Squirrel on State of Oregon Lands (Morgan and Nugent 1999); see Attachment P1-7	18,263 acres; see Figure P1-3	1,757 acres/ May 2014	IPC will perform pre-construction WAGS surveys of all previously surveyed and unsurveyed areas of ground squirrel habitat within the three years prior to scheduled construction. Survey results will be provided to ODOE.
Raptor Nest	Post-Construction 2008 Aerial Raptor Nest and Greater Sage-Grouse Lek Surveys for the Wild Horse Wind Facility (Jeffrey et al. 2008), and Inventory Methods for Raptors (MSRM 2001); also see Attachment P1-7	458,136 acres; see Figure P1-4	425,734 acres/ June 2016	IPC will perform pre-construction raptor nest surveys of all previously surveyed and unsurveyed areas during the breeding season prior to scheduled construction. Survey results will be provided to ODOE.
Terrestrial Visual Encounter Survey (TVES)	USFS Multiple Species Inventory and Monitoring Technical Guide (Manley et al. 2006); see Attachment P1-7	22,904 acres; see Figure P1-5	15,331 acres/ June 2016	Surveys will occur on all previously unsurveyed parcels following issuance of a site certificate and prior to construction. Survey results will be provided to ODOE.

Survey Name	Protocol Used	Total Area Requiring Surveys (acres or calling stations)	Surveys Completed to Date (acres or calling stations/date)	Future Survey Efforts
Wetland	U.S. Army Corp of Engineers Arid West and Western Mountains Delineation Supplements, while waters of the U.S. were recorded via the Oregon Streamflow Duration Assessment Method (OSDAM); see Exhibit J	NA; see Exhibit J	NA; August 2016	Surveys will occur on all previously unsurveyed parcels following issuance of a site certificate and prior to construction. Survey results will be provided to ODOE.
Fish Presence and Crossing Assessment Surveys	Tetra Tech (2014b, 2014c); agencies reviewed protocols	NA; see Attachment P1-7B	NA / August 2016	Surveys will occur on all previously unsurveyed parcels following issuance of a site certificate and prior to construction. Survey results will be provided to ODOE.

ODOE = Oregon Department of Energy; ROE = right of entry; WAGS = Washington ground squirrel

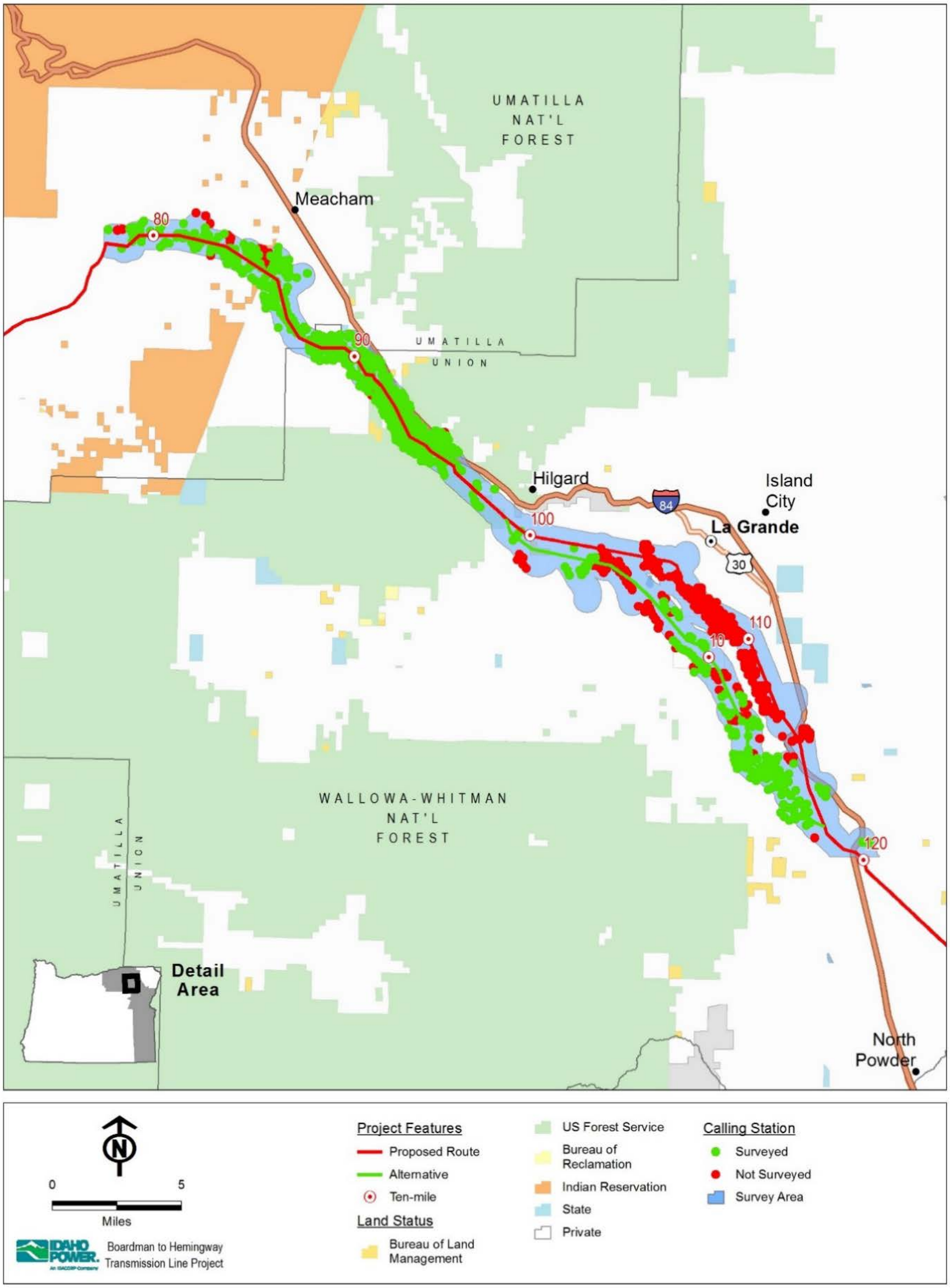

Figure P1-1. Northern Goshawk and American Three-toed Woodpecker Calling Stations and Survey Area

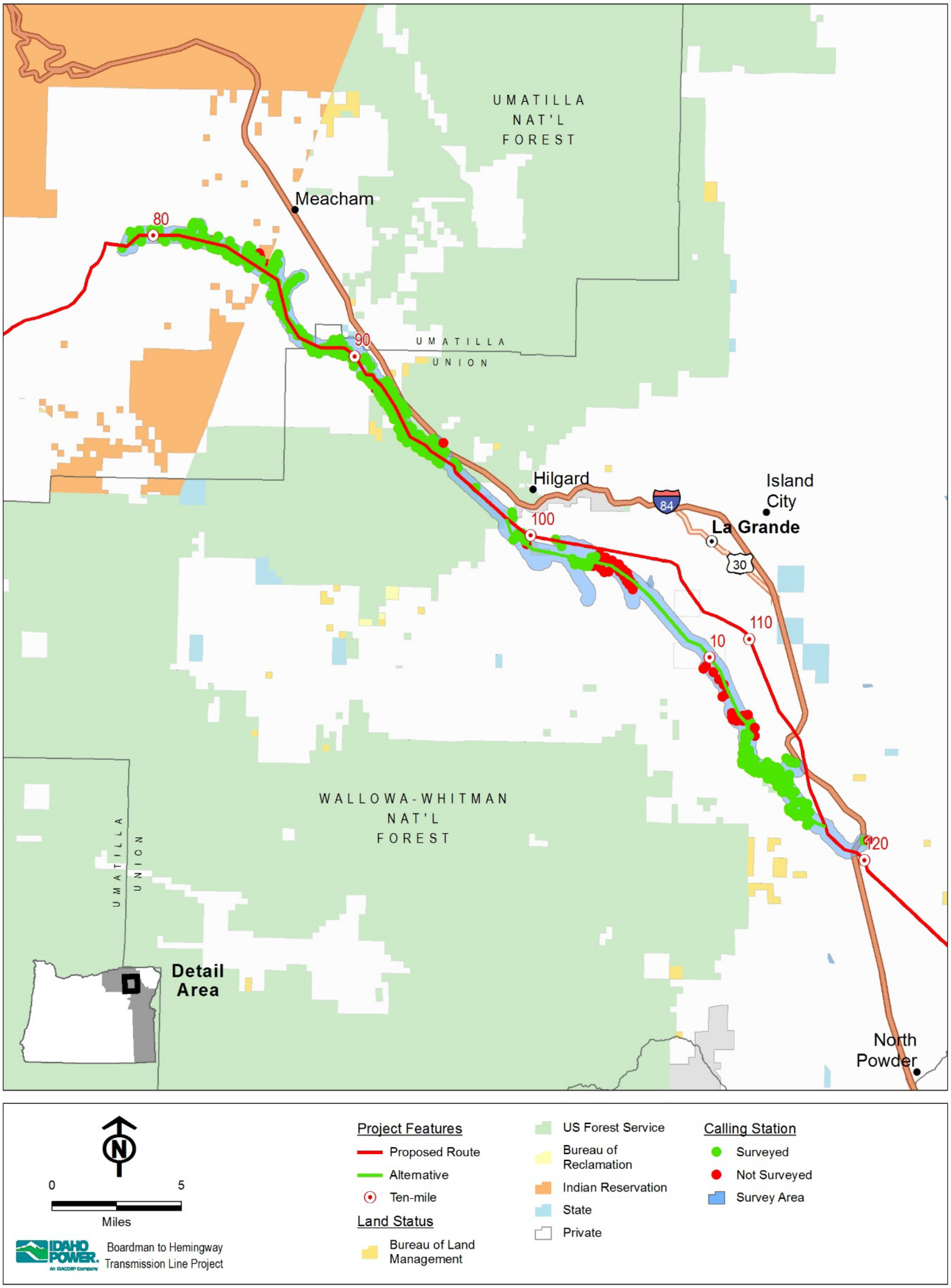

Figure P1-2. Great Gray and Flammulated Owl Calling Stations and Survey Area

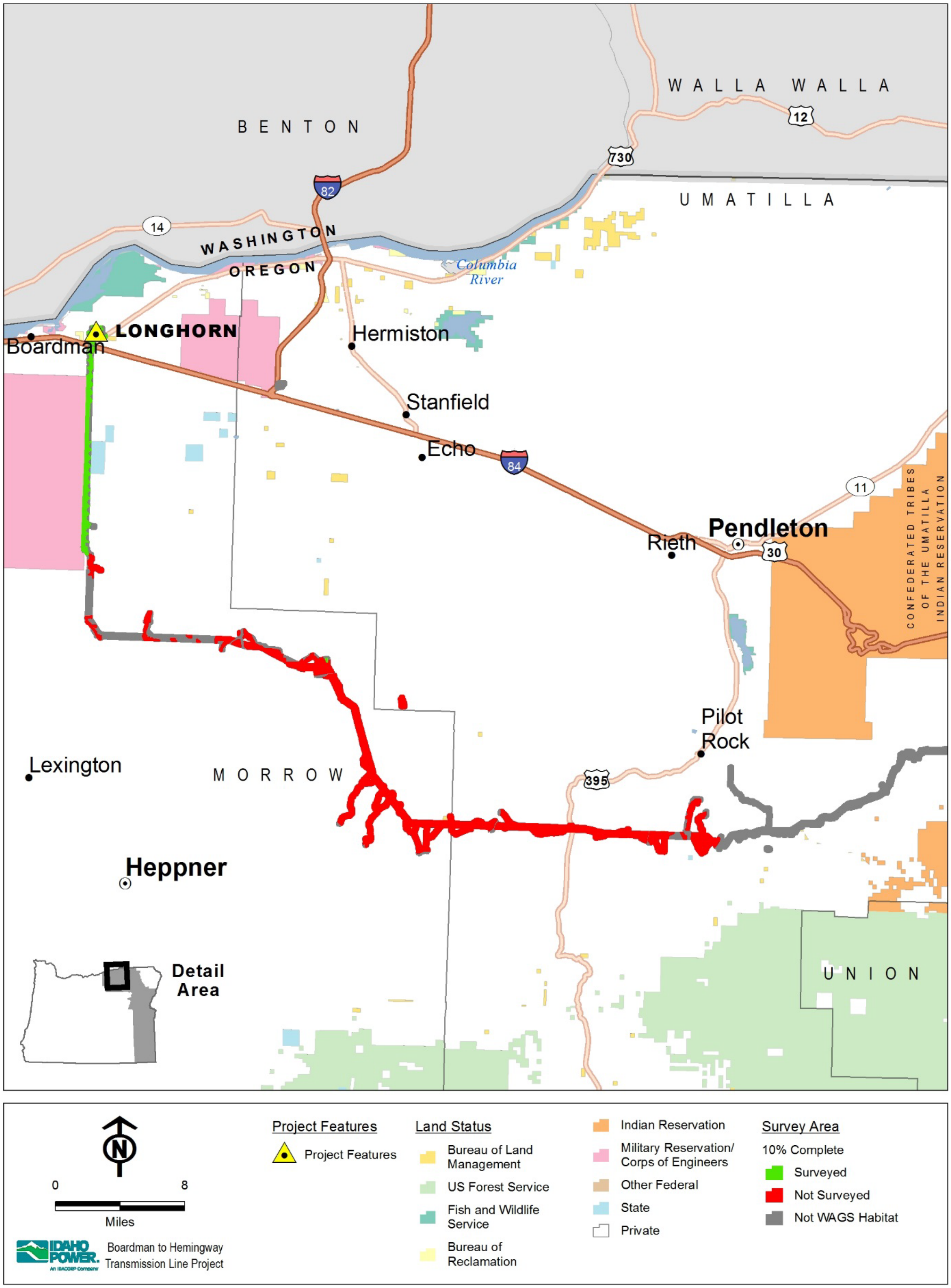

Figure P1-3. Washington Ground Squirrel Survey Area

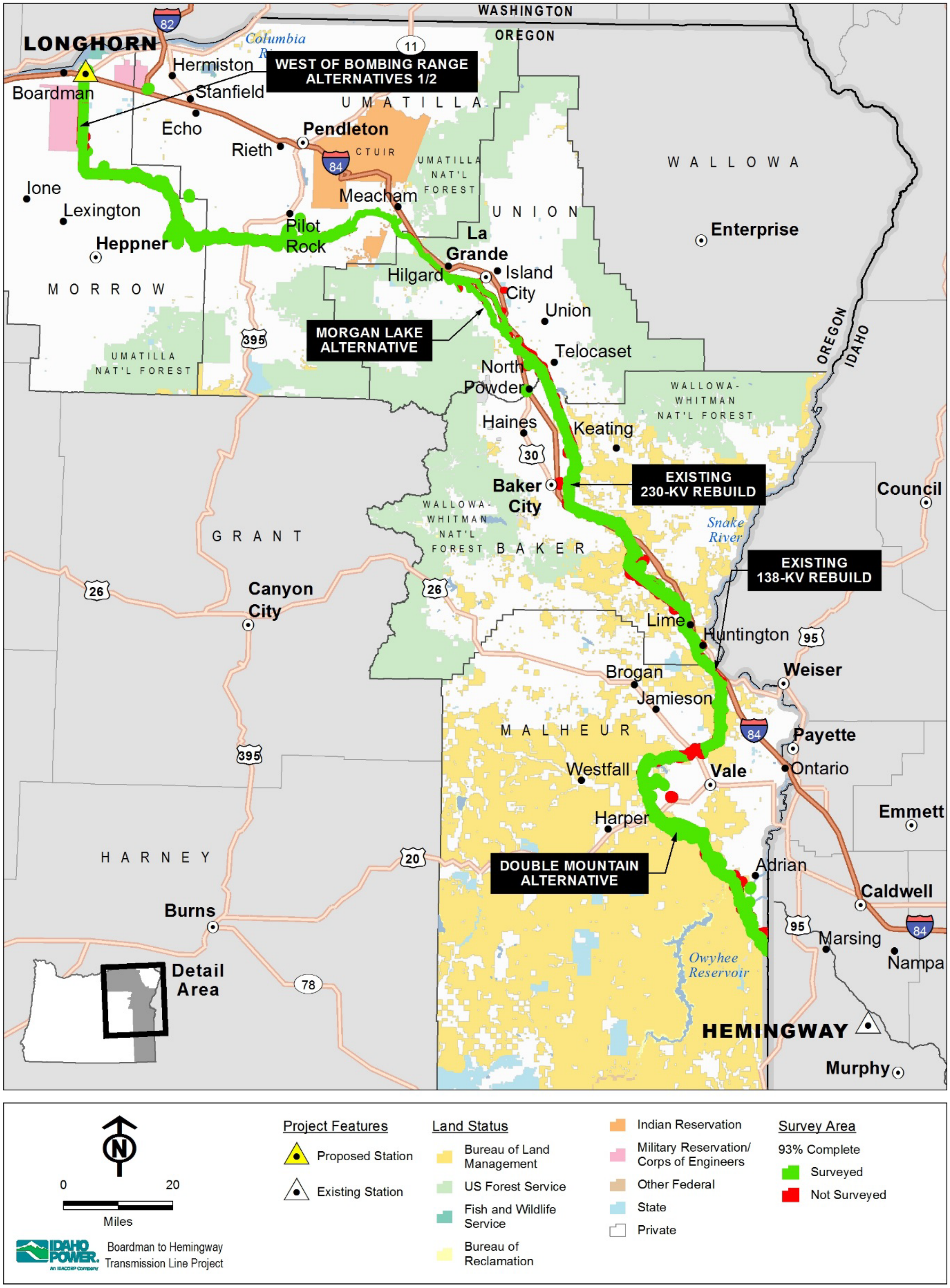

Figure P1-4. Raptor Nest Survey Area

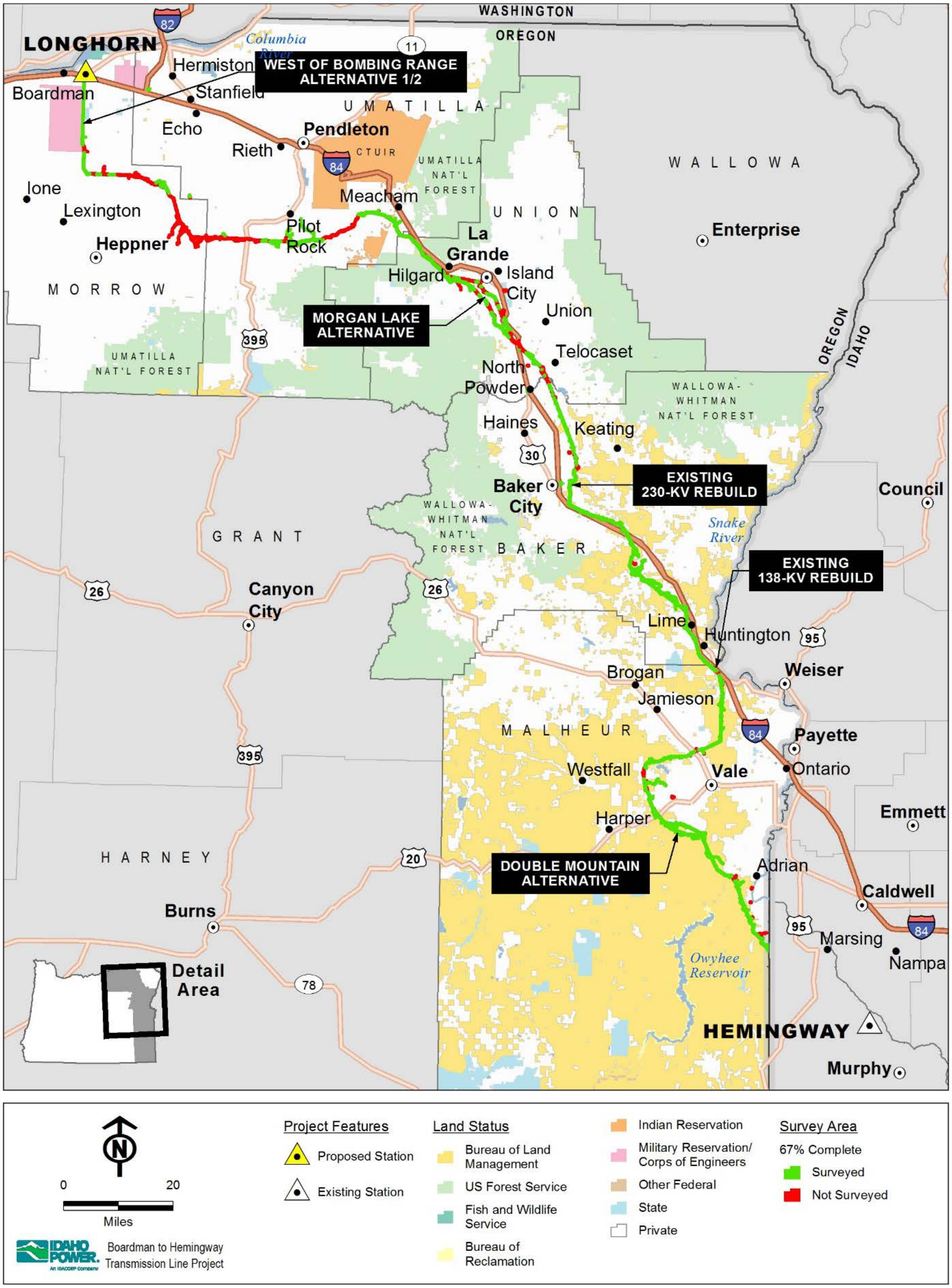

Figure P1-5. Terrestrial Visual Encounter Survey Area

3.2.4.1 Northern Goshawk and American Three-toed Woodpecker Surveys

The objective of these surveys was to identify the presence of northern goshawk (*Accipiter gentilis atricapillus*) and American three-toed woodpecker (*Picoides dorsalis*) in the vicinity of the Project so that impacts to these species can be avoided and/or minimized. The American three-toed woodpecker is listed as Sensitive within the analysis area while the northern goshawk is no longer considered Sensitive within the analysis area (ODFW 2016). The protocols used during the northern goshawk and American three-toed woodpecker surveys were based on the survey methods described in Dudley and Saab (2003) and Woodbridge and Hargis (2006). The details and justifications for these methods are provided in the Revised Final Biological Survey Work Plan (Attachment P1-2).

Northern goshawks and American three-toed woodpeckers use similar habitat types (mature conifer and mixed-conifer forests), and protocol surveys for these two species are carried out at approximately the same time of year. Therefore, surveys for northern goshawk and three-toed woodpecker were carried out concurrently. The survey area for both birds included the analysis area as well as a 0.5-mile buffer on either side of the analysis area within suitable habitat. As habitat requirements for the goshawk and three-toed woodpecker consist of high elevation forest, habitat was restricted to the Blue Mountains, from approximately mileposts 78 to 120.

Pre-field activities included establishing the survey area and identifying calling stations. Calling stations were placed approximately 650 feet apart (200 meters), and took advantage of topography to maximize calling efficacy when possible, for example by placing stations along a ridgetop. The survey area encompasses approximately 46,077 acres and includes 853 calling stations.

Surveys were performed for both species in 2011 and 2012. Changes to the Project location since 2012 moved the Project into previously unsurveyed potential habitat. In 2016, only northern goshawk surveys were performed in these areas. Of the 853 calling stations established for this survey, 566 were completed. American three-toed woodpeckers were recorded at four calling stations, and a single northern goshawk was detected during this survey. Two additional northern goshawk detections were recorded during other Project surveys. No nests for either species were identified. For more information regarding this survey, see Attachment P1-7A. Future survey efforts are identified in Table P1-1.

3.2.4.2 Great Gray and Flammulated Owl Surveys

The objective of this survey was to identify the presence of great gray owl (*Strix nebulosa*) and flammulated owl (*Psiloscops flammeolus*) in the vicinity of the Project so that impacts to these species can be avoided and/or minimized. Both species are classified Sensitive within the analysis area (ODFW 2016). The protocols used during the great gray owl and flammulated owl surveys were based on the survey methods described in Quintana-Coyer et al. (2004) and Smucker et al. (2008). The details and justifications for these methods are provided in the Revised Final Biological Survey Work Plan (Attachment P1-2).

Because both great gray owls and flammulated owls are nocturnal and use higher-elevation forested habitat, surveys for these two species were carried out concurrently. As habitat requirements for the gray owl and flammulated owl consist of high elevation forest, habitat was restricted to the Blue Mountains from approximately milepost (MP) 78.5 to MP 101 of the Proposed Route and all of the Morgan Lake Alternative. The survey area was a 0.25-mile buffer around the analysis area within suitable habitat.

Pre-field activities included establishing the survey area and identifying calling stations. Calling stations were placed approximately 528 feet apart (0.1 mile), and took advantage of topography to maximize calling efficacy when possible, for example by placing stations along a ridgetop. The survey area encompasses approximately 19,716 acres and includes 412 calling stations.

Surveys for these two owl species took place over three survey periods in each of 2011 and 2012, with each species being surveyed for twice. Of the 412 calling stations established for this survey, 353 were completed. Both target species were identified during the survey. Three great gray owl observations were recorded and seven flammulated owl observations were recorded. No nests for either species were identified. For more information regarding this survey, see Attachment P1-7A. Future survey efforts are identified in Table P1-1.

3.2.4.3 Washington Ground Squirrel Surveys

Washington ground squirrels (*Urocitellus washingtoni*; WAGS) are a state-listed species, and are therefore addressed in Exhibit Q. However, the surveys for this species informed the Habitat Categorization process (see Section 3.3.2) and are therefore discussed in Exhibit P1 as well.

The objective of these surveys was to identify the presence of WAGS colonies in the vicinity of the Project so that impacts to WAGS can be avoided and/or minimized. The protocols used during the WAGS surveys were based on the survey methods described in Morgan and Nugent (1999). The details and justifications for these methods are provided in the Revised Final Biological Survey Work Plan (Attachment P1-2).

The survey area extends from Bombing Range Road in Morrow County east to East Birch Creek Road south of Pilot Rock, Oregon, in Umatilla County (MP 0 to MP 64 of the Proposed Route). ODFW considers a 785-foot buffer in continuous suitable habitat around WAGS colonies as Category 1 habitat. As a result, the survey area consisted of the analysis area plus a 785-foot buffer in suitable habitat. Suitable habitat for WAGS includes native grasslands and shrub-steppe; however, the species is also known to use lesser quality habitat such as non-native annual grasslands. IPC has identified a total of 18,263 acres of survey area.

During surveys, a crew of two to eight biologists walked meandering line transects, each spaced 165 feet (50 meters) apart, to provide survey coverage of the habitat within the analysis area as well as a 785-foot buffer around the analysis area. The survey area was surveyed twice, once in April and once in May, to correspond with the highest WAGS activity period when juveniles have emerged and alarm calls are most frequent. During the second survey, transects were walked perpendicularly to the first survey transects in order to maximize coverage of the habitat. Surveys were initially conducted in 2011; additional surveys were conducted in 2012, 2013, and 2014 in order to capture modifications to the Project location.

Colonies were designated active when WAGS activity was confirmed through visual detection of a squirrel, audio confirmations (hearing alarm or social calls), and/or fresh WAGS scat near burrows. Three active colonies were identified within the survey area, none of which occur within the analysis area.

Of the 18,263 acres of WAGS survey area, 1,757 acres have been surveyed including all of the survey area along the Naval Weapons Systems Training Facility Boardman (NWSTF Boardman). Three active colonies were recorded within the survey area, but are outside of the analysis area for Exhibit P1. The vast majority of unsurveyed WAGS habitat is attributed to the recent modification of the location of the Proposed Route in Morrow and Umatilla counties. ODFW has provided guidance on WAGS pre-construction surveys, and has indicated that surveys for this species are good for 3 years (i.e., the year of survey and 2 years after). With this in mind, IPC in consultation with ODOE has decided to delay additional WAGS surveys until later in the Project schedule so that survey results will be valid for Project construction. For more information regarding this survey, see Attachment P1-7A. Future survey efforts are identified in Table P1-1.

3.2.4.4 Raptor Nest Surveys

The objective of this survey was to identify nesting raptor species in the vicinity of the Project so that impacts to these species can be avoided and/or minimized. The protocols used during the raptor nest surveys, as well as the details and justifications of these protocols, are detailed in the Revised Final Biological Survey Work Plan (Attachment P1-2).

The raptor nest survey area included the analysis area and all habitat within 1 mile of the analysis area; within forested habitat, the survey area was reduced to the analysis area and all habitat within 0.5 mile of the analysis area. The survey area covered 458,136 acres.

Transects were spaced approximately 0.5 mile apart and the survey area was traversed by a helicopter carrying two observers and the pilot. Due to the low visibility within forested habitats, transects were flown at closer intervals (typically 0.25-mile transect spacing) within these areas. Surveys were performed twice during the breeding season. The first survey corresponds with late courtship and incubation or hatchling/nestling stages of most raptors expected within the analysis area. The second survey corresponds with the late nesting and early fledgling period for many raptors, and allowed the survey crew to identify nests of later breeding species such as Swainson’s hawks. Raptors and their nests were also documented if observed during other surveys (e.g., the Terrestrial Visual Encounter Surveys [TVES] and sage-grouse surveys, as well as the northern goshawk and owl surveys).

Surveys were performed in 2011, 2012, 2013, and 2016 over 425,734 acres of the survey area. Approximately 1,100 observations were recorded within the survey area and 17 raptor species were identified. More than 120 active raptor nests were identified within the survey area. For more information regarding this survey, see Attachment P1-7A. Future survey efforts are identified in Table P1-1.

3.2.4.5 Terrestrial Visual Encounter Survey

The TVES is a general wildlife and vegetation survey adapted from methods described in the USFS Multiple Species Inventory and Monitoring Technical Guide (Manley et al. 2006). The TVES was designed to gather baseline data for both wildlife and vegetation, with some of these data being utilized for further data analysis, specifically the habitat categorization process. The details and justifications for these methods are provided in the Revised Final Biological Survey Work Plan (Attachment P1-2).

The TVES are walking surveys that identify species presence through evidence of use. TVES include visual and auditory confirmation of a species, and observation of sign such as burrows, nests, feathers, fecal material, and tracks. The focus of the TVES was on special status species and State Sensitive Species as well as their habitat; however, all species encountered during TVES were identified to the extent practical In addition to functioning as a general wildlife survey, TVES also recorded ecological systems, noxious weed populations, and special status plants. TVES documentation of the ecological systems within the analysis area serves as the basis for identifying habitat types and habitat categories discussed in Section 3.3.

Additional survey efforts were implemented for some State Sensitive Species including pygmy rabbits (*Brachylagus idahoensis*), burrowing owls (*Athene cunicularia hypogea*), and Columbia spotted frogs (*Rana luteiventris*)where appropriate during TVES. The Visual Encounter Survey method was used to identify any amphibians in riparian areas within the survey area, and were conducted concurrently with the TVES when ponds, streams, or other water bodies intersected with the survey area.

The survey area for the TVES is the analysis area and covers 20,904 acres. To conduct the TVES, three observers systematically surveyed the analysis area for wildlife and their sign, and documented vegetation communities by traversing the analysis area along evenly spaced meandering transects. This methodology allowed the observers to cover the entire analysis area in one pass. Three observers were used to reduce observer fatigue, improve consistency in identifications by comparing observations, and provide a second opinion for difficult identifications.

TVES surveys were conducted in 2011, 2012, 2013, 2014, and 2016 across 15,330 acres of the survey area. The TVES recorded 174 wildlife species within the analysis area (136 birds, 23 mammals, 13 reptiles, and 2 amphibians). The TVES identified 22 habitat types consisting of 49 ecological systems within the analysis area. For more information regarding this survey, see Attachment P1-7A. Future survey efforts are identified in Table P1-1.

3.2.4.6 Wetland Surveys

The following is a brief summary of the timing and scope of wetland surveys; however, see Exhibit J as well as the Revised Final Biological Survey Work Plan (Attachment P1-2) for more details.

Wetlands were delineated using the U.S. Army Corp of Engineers Arid West and Mountains Delineation Supplement, while waters of the U.S. were determined based on the Oregon Streamflow Duration Assessment Method (OSDAM). The OSDAM is used to determine and document stream flow duration (i.e., if the stream is classified as perennial, intermittent, or ephemeral). This determination is largely based on the presence or absence of macroinvertebrates and wetland plant species, as well as the slope of the waterbody bed if macroinvertebrates are not present. The OSDAM forms for each of the waters of the U.S. can be found in the various wetland survey technical reports referenced in Exhibit J.

The survey area used for wetland and waters was the analysis area. In 2011, surveys occurred from June 24 to October 7. Surveys in Oregon started in Morrow County then moved to Umatilla, Malheur, Baker, and finally Union counties. This order was used to capture the lower elevation areas in Oregon first, where wetlands would be harder to identify as the season progressed, before moving to higher elevations where wetlands would be easier to identify later in the season. Additional surveys were conducted in 2012, 2013, and 2016 in order to capture changes that were made to the Site Boundary, including the addition of alternative routes. Future survey efforts are identified in Table P1-1.

3.2.4.7 Fish Surveys

Fish Presence and Assessment Surveys

Fisheries presence, habitat, and crossing assessment surveys were intended to achieve several objectives. First, for streams not already designated as fish-bearing streams by ODFW, the data collected were intended to adequately determine if streams did, or likely could, support fish use. Second, the habitat data collected were intended to help describe riparian and in-stream conditions, both of which are important components of fish habitat quality. Lastly, habitat data were collected to provide additional information about Project-related risks to assist with the crossing assessments.

Fish Presence Determination

Fish presence was assumed for streams designated by ODFW as fish-bearing streams. For those streams not already designated as fish-bearing by ODFW, field data were used as the primary factor to determine potential fish presence. The presence or absence of fish habitat, or potential need for fish sampling, was typically based on channel gradient and bankfull width with considerations of available habitat. Characteristics used to evaluate available fish habitat are described below, with additional details and specific criteria related to fish presence determination, including fish sampling, provided in the Fish Habitat Report (Attachment P1-7B). Fish sampling was conducted only in the rare case where potential fish presence could not be reasonably determined from habitat surveys.

Fish Habitat Characteristics

Surveys were conducted to determine the general habitat condition of streams at locations where the Project construction footprint proposes a direct impact to the resource. Data were collected at each road and transmission line crossing area (where landowner access permission was obtained) using the Stream Habitat Survey Datasheet (Appendix A of the Fish Habitat Report [Attachment P1-7B]). Fish habitat surveys included characterizing conditions upstream and downstream of the location over a reach length typically 100 to 500 feet, extending farther when necessary to accurately assess available fish habitat.

Three general types of fish habitat data were collected within distinct geomorphic stream segments: riparian vegetation characteristics, stream morphology, and stream substrate characteristics. Data were collected using the Stream Habitat Survey Datasheet as noted above, and data collected within each segment focused on common habitat measures including:

- Riparian classes present (within 100 feet from channel);
- Shade;
- Riparian tree characteristics;
- Overhanging vegetation;
- Channel gradient;
- Active and bankfull channel widths;
- Floodplain width;
- Bank stability;
- Undercut banks;
- Pool and large woody debris (LWD) frequency;
- Presence of beaver activity;
- Substrate characteristics and size; and
- Percent embeddedness and fines (Bain and Stevenson 1999; ODFW 2010; USFS 2001, 2010).

Other parameters, including road and transmission line crossing risk assessments, fish passage conditions at road crossings, and transmission line crossing characteristics, were also measured. These were recorded and reported following the protocols described in the Fish Habitat Report (Attachment P1-7B).

3.2.4.8 Proposed Conditions to Address Future Surveys

IPC proposes the following site certificate conditions, providing schedules for the forthcoming biological surveys. Whether one or more surveys is applicable in a particular area will depend on the relevant protocol (see Exhibit P1, Table P1-1).

> ***Fish and Wildlife Condition 1****: Prior to construction, the site certificate holder shall conduct, as applicable, the following biological surveys on those portions of the site boundary that have not been surveyed at the time of issuance of the site certificate:*
> *a. Great Gray Owl;*
> *b. Flammulated Owl;*
> *c. Terrestrial Visual Encounter Surveys;*
> *d. Wetlands; and*
> *e. Fish Presence and Crossing Assessment Surveys.*

> ***Fish and Wildlife Condition 2****: Prior to construction, the site certificate holder shall conduct, as applicable, the following biological surveys on all portions of the site boundary, regardless of whether those portions have been surveyed at the time of issuance of the site certificate:*
> *a. Washington ground squirrels;*
> *b. Raptor Nests; and*
> *c. State-Listed Threatened and Endangered Plants.*

> ***Fish and Wildlife Condition 13****: During construction, if the site certificate holder will be conducting ground-disturbing activities during the migratory bird nesting season between April 1 and July 15, the site certificate holder shall conduct, as applicable, biological surveys for native, non-raptor bird species nests on all portions of the site boundary a maximum of 7 days prior to ground-disturbing activities, regardless of whether those portions have been previously surveyed. If the site certificate holder identifies a native, non-raptor bird species nest, the site certificate holder shall submit to the department for its approval a notification addressing the following:*
> *a. Identification of the native, non-raptor species observed;*
> *b. Location of the nest; and*
> *c. Any actions the site certificate holder will take to avoid, minimize, or mitigate impacts to the nest.*

3.3 Identification of Fish and Wildlife Habitats

OAR 345-021-0010(1)(p)(B): Identification of all fish and wildlife habitat in the analysis area, classified by the habitat categories as set forth in OAR 635-415-0025 and a description of the characteristics and condition of that habitat in the analysis area.

3.3.1 Fish and Wildlife Habitat Types

The analysis area encompasses multiple general vegetation types that serve as fish and wildlife habitats. The seven general vegetation types present are (1) agriculture/developed, (2) bare ground, (3) open water/unvegetated wetland, (4) riparian vegetation, (5) forest/woodland, (6) shrub/grass, and (7) wetland.

Agricultural/developed lands are common in Morrow and Umatilla counties, and are less common in the other three Oregon counties crossed by the Project (i.e., Union, Baker, and Malheur counties). Bare ground, cliffs, and talus cover only small areas of land at each occurrence, and are rare in the analysis area. Open water/unvegetated wetland, including streams and ponds, is also limited in the analysis area, which encompasses mostly arid and semiarid lands with low precipitation. Most streams in the analysis area are intermittent, and are fed by stormwater. Riparian vegetation is associated with open water/unvegetated wetlands and wetlands. Riparian vegetation occurs between upland habitat and the edge of delineated wetlands or delineated non-wetland waters.

The vast majority of the analysis area consists of shrub/grass. Shrublands and grasslands in the analysis area differ in structure and species composition depending on the ecoregion, elevation, soil conditions, moisture regimes, and fire history present in the area. However, these communities typically occur on dry flats and plains, rolling hills, saddles, and ridges where precipitation is low. They are dominated by forbs, grasses, and shrub species. Fire has historically played an important role in maintaining grassland and shrubland communities, and served as a cyclical disturbance regime (ODFW 2006).

Forests are rare within the analysis area and occur primarily in the Blue Mountains region. Wetlands are areas where water saturation is the dominant factor that determines the soil type/development, as well as the types of plants and animals that can inhabit these areas (Cowardin et al. 1979). Wetlands are sparsely distributed in the analysis area, but are found in all counties crossed by the Project in Oregon (see Exhibit J).

Each of the general vegetation types, discussed above, are further defined into habitat types based on the dominant plant species found within a vegetation community, or the hydraulic regime that controls the waterbody. Refining these general vegetation types into habitat types is important when discussing fish and wildlife use because species composition can differ according to the specific conditions found within each habitat type. For example, the wildlife species composition found in a forested wetland would likely be different from what would be found in an emergent wetland. Table P1-2 describes the general vegetation types as well as the habitat types found within the analysis area based on field survey data and Gap Analysis Project (GAP) data (USGS 2011).

Table P1-2. Description and Definition of General Vegetation Types and Habitat Types within the Analysis Area

General Vegetation Type	Habitat Type	Description
Agriculture / Developed	Agriculture	Agricultural areas vary in composition on an annual basis. Cultivated croplands and modified grasslands are plowed and harvested seasonally, while pastures are mowed, hayed, or grazed one or more times a year. Conservation Reserve Program (CRP) land is included in the Agriculture habitat type. CRP lands were identified by vegetation composition and do not represent lands actually enrolled in the program.
	Developed	Developed areas typically contain non-native vegetation, in the form of landscaping around buildings and homes, as well as invasive-plants that have become established in disturbed landscapes. Much of the developed habitat type crossed by the Project includes dirt, gravel, and paved roads.
Bare Ground	Bare Ground, Cliffs, Talus	Bare ground or areas with limited vegetation consist of lands where the endemic site conditions are unsuitable for consistent vegetative communities to develop, and where the predominant habitat features are related to geological structures as opposed to vegetative components. These areas include cliffs, rock, and talus habitats, as well as areas where soil conditions prohibit the growth of most plant species.
Open Water / Unvegetated Wetland	Ponds and Lakes	Ponds and lakes are permanently flooded, intermittently exposed, or semi-permanently flooded areas which do not fall into the river and stream classifications.
	Perennial Streams	Perennial streams consist of flowing waterbodies that have a year-round flow of water, except for infrequent periods of severe drought.
	Intermittent Streams	Intermittent streams contain water for only part of the year, but more than just in response to precipitation. Canals and ditches are included in this habitat type.
	Ephemeral Streams	Ephemeral streams contain water only in direct response to precipitation. They receive little or no water from springs and no long-continued supply from melting snow or other sources. The stream channel is at all times above the water table.
Riparian	Herbaceous Riparian	Grasses, sedges, rushes, ferns, legumes, and forbs tolerant of intermittent flooding located in the transitional zone between upland and aquatic habitats. Located outside delineated wetlands and delineated non-wetland waters.
	Introduced Riparian	Areas where non-native vegetation dominates lands immediately adjacent to streams and wetlands. Within the analysis area, typically includes Russian olive (*Elaeagnus angustifolia*). Located outside delineated wetlands and delineated non-wetland waters.
	Riparian Woodland and Shrubland	Typically found within the flood zone of rivers and immediate streambanks. This habitat type is associated with perennial, intermittent, and ephemeral streams with woody vegetation. Located outside delineated wetlands and delineated non-wetland waters.

General Vegetation Type	Habitat Type	Description
Forest / Woodland	Douglas Fir / Mixed Grand Fir	The Douglas-fir / mixed grand fir habitat type is the most common forest community found within the analysis area. Douglas-fir (*Pseudotsuga menziesii*) is typically more dominant than grand fir (*Abies grandis*), but begins to decrease in abundance as elevations increase; ultimately being replaced by *Abies* and *Pinus* species at higher elevations (Franklin and Dyrness 1988).
	Ponderosa Pine	The ponderosa pine (*Pinus ponderosa*) community is typically an open woodland, and contains a variety of common tree species that vary based on elevation and moisture regime. This community is common in much of the Blue Mountains, and is the second most common forest type crossed by the Project. Ponderosa pine forests are found in the arid transition zone between shrub steppe and higher elevation forests. The ponderosa pine zone in the analysis area is typically dominated by ponderosa pine, Douglas-fir, grand fir, lodgepole pine (*Pinus contorta*), western larch (*Larix occidentalis*), western juniper (*Juniperus occidentalis*), and quaking aspen (*Populus tremuloides*) (Franklin and Dyrness 1988).
	Western Juniper / Mountain Mahogany Woodland	This community could be described as a transition zone between shrubland and woodland/forest communities, as it is often found within the ecotone between the lower edge of the ponderosa pine forest community and the shrub-steppe community, often in very dry areas. The structure of this woodland type is widely spaced trees, a discontinuous shrub layer, and an herbaceous layer dominated by grasses. The overstory is dominated by western juniper and mahogany species (*Cercocarpus* spp.) with scattered ponderosa pine as well (Franklin and Dyrness 1988). Dominant shrubs may include big sage (*Artemisia tridentate*), antelope bitterbrush (*Purshia tridentata*), rabbitbrush (*Chrysothamnus nauseosus*), and wax currant (*Ribes cereum*). The herbaceous layer is dominated by wheatgrass (*Agropyron spicatum*) and Idaho fescue (*Festuca idahoensis*) (Franklin and Dyrness 1988).
	Forested-Other	This broadly defined vegetation type includes a variety of plant communities present in the analysis area that either represents a small percentage of the total geographic area studied, or have been disturbed and do not fit into other vegetation classifications. It includes recently burned forests (stand replacing burns), as well as recently harvested areas.
Shrub / Grass	Native Grasslands	Grassland communities (or steppe communities lacking a major shrub component) within the analysis area are dominated by various species of *Poa*, *Festuca*, and *Agropyron*. Poor soil conditions, as well as a short fire return interval, often prevent these grassland communities from transitioning into a shrub dominated community (Franklin and Dyrness 1988).

General Vegetation Type	Habitat Type	Description
	Desert Shrub	Desert shrub communities contain saline and very alkaline soils that support various saltbrush species (*Atriplex* spp.), as well as grasses such as Sandberg bluegrass (*Poa secunda*) and basin wildrye (*Elymus cinereus*; Franklin and Dyrness 1988).
Shrub / Grass (continued)	Shrub-Steppe with Big Sage	Shrub-steppe communities are widespread in the analysis area. These communities are dominated by bunchgrasses such as wheatgrass, Idaho fescue, and Sandberg bluegrass, as well as shrub species. Within this particular shrub-steppe community, the dominant shrub species is big sage (Franklin and Dyrness 1988).
	Shrub-Steppe without Big Sage	This shrub-steppe community is similar to the community described previously, except that it is typically dominated by shrub species such as curl-leaf mountain-mahogany (*Cercocarpus ledifolius*) or antelope bitterbrush instead of big sage (Franklin and Dyrness 1988).
	Introduced Upland Vegetation	This broadly defined shrubland type includes a variety of plant communities present in the analysis area that either represents a small percentage of the total geographic area studied, or have been disturbed and do not fit into other vegetation classifications.
Wetland	Emergent Wetland	Emergent wetlands are defined by a lack of significant shrub or tree cover (Cowardin et al. 1979). This wetland type is variable and can occur over a variety of locales, including arid-climate ephemeral depressions, wet alpine meadows, and bogs. Vegetation is also variable based on the locale, but includes species adapted to prolonged inundation or soil saturation. Vegetation found in emergent wetlands may include grasses, sedges, rushes, and other forbs adapted to wet conditions.
	Scrub-Shrub Wetland	Scrub-shrub wetlands are identified by the dominance of woody vegetation less than 20 feet in height, which may include both shrubs and sapling trees (Cowardin et al. 1979). This wetland type can also occur over a wide range of elevations. Willows (*Salix* spp.) often dominate scrub-shrub wetlands.
	Forested Wetland	Forested wetlands are identified by the dominance of woody vegetation more than 20 feet in height (Cowardin et al. 1979). Common species found in forested wetlands include black cottonwood (*Populus trichocarpa*), quaking aspen, and hawthorn (*Crataegus douglasii*).
	Aquatic Bed Wetland	Includes wetlands with plants that grow on or below the surface of the water.

3.3.2 ODFW Habitat Categorization

The ODFW Fish and Wildlife Habitat Mitigation Policy provides a framework for assigning one of six category types to habitats based on the relative importance of these habitats to fish and wildlife species. The definition of each category type, as well as the mitigation goals for these category types, is listed in Table P1-3. Habitats located within the analysis area were classified into these six category types in accordance with OAR 635-415-0025 and following the methods in Attachment P1-1. IPC used data from the TVES surveys that identified the ecological systems and assigned an initial habitat category based on vegetation characteristics. Following this categorization, IPC overlaid WAGS, raptor nest, and fish presence data collected during surveys, as well as existing mapped big game ranges, onto the initial habitat categorization using ArcGIS. The wildlife habitat overlays modify the habitat category “up” to a Category 1, Category 2, or Category 3 as follows[3]:

Category 1 habitat:

- Trees or structures that contain a special status raptor nest;[4] and
- Occupied WAGS colonies, defined as a single or cluster of holes as well as the required habitat for squirrel survival (the required habitat for squirrel survival is a 785-foot buffer around the holes in suitable habitat).

Category 2 habitat:

- ODFW elk (*Cervus canadensis nelsoni*) winter range (ODFW 2013a);[5]
- ODFW mule deer (*Odocoileus hemionus*) winter range (ODFW 2013a);
- Bighorn sheep (*Ovis canadensis*) herd ranges (ODFW 2013b);
- Areas of potential ground squirrel use, defined as areas adjacent to and within 4,921 feet (1.5 kilometers [km]) of WAGS Category 1 habitat, but not occupied by any squirrels either for burrowing or foraging, which is of similar habitat type and quality to the adjacent WAGS Category 1 habitat; and
- Fish-bearing streams.

Category 3 habitat:

- Elk summer range as defined by the M.A.P. (Measure and Prioritize) Elk Habitat Project (RMEF 1999);
- Mule deer summer range as defined in the Mule Deer Habitat of the Western United States (WAFWA 2002); and
- Non-fish-bearing streams.

[3] For instance, if TVES identified an area as a Category 5 habitat based on vegetation characteristics and it is within mule deer winter range, then the category is modified “up” to a Category 2 habitat. If TVES identified an area as a Category 2 habitat based on vegetation characteristics and it is within mule deer summer range, the habitat category is not modified “down” to a Category 3. There are not any wildlife habitat overlays identified as Category 4, 5, or 6.
[4] Although trees or structures with raptor nests are managed as Category 1 habitat, they are not included in the habitat categorization calculations due to their relatively small size on the landscape.

[5] See Exhibit P3 for a complete discussion of elk habitat categorization.

Detailed descriptions of the methods used to categorize habitats within the analysis area are included in Attachment P1-1 (Habitat Categorization Matrix) and Appendix A to Attachment P1-1 (Methods and Models Used for Habitat Categorization).

Fish presence also played a role in the categorization of stream habitats (see Attachment P1-1). Fish were assumed present in all perennial streams and in intermittent streams if the OSDAM data indicated that the stream contained macro-invertebrates, or if ODFW biologists indicated that an intermittent stream contained fish when water is present. Following this initial incorporation of fish presence into the habitat categorization data, IPC refined their fish presence analysis through additional coordination with ODFW and field surveys (see the Fish Habitat Report in Attachment P1-7B). This refined fish presence information has been incorporated into the habitat categorization process.

Table P1-3. Habitat Categorization Types

Category Type	Definition[1]	Mitigation Goal
1	Irreplaceable, essential habitat for a fish or wildlife species, population, or a unique assemblage of species and is limited on either a physiographic province or site-specific basis, depending on the individual species, population or unique assemblage.	The mitigation goal for Category 1 habitat is no loss of either habitat quantity or quality.
2	Essential habitat for a fish or wildlife species, population, or unique assemblage of species and is limited either on a physiographic province or site-specific basis depending on the individual species, population or unique assemblage.	The mitigation goal if impacts are unavoidable is no net loss of either habitat quantity or quality and to provide a net benefit of habitat quantity or quality.
3	Essential habitat for fish and wildlife, or important habitat for fish and wildlife that is limited either on a physiographic province or site-specific basis, depending on the individual species or population.	The mitigation goal is no net loss of either habitat quantity or quality.
4	Important habitat for fish and wildlife species.	The mitigation goal is no net loss of either habitat quantity or quality.
5	Habitat for fish and wildlife having high potential to become either essential or important habitat.	The mitigation goal, if impacts are unavoidable, is to provide a net benefit in habitat quantity or quality.
6	Habitat that has low potential to become essential or important habitat for fish and wildlife.	The mitigation goal is to minimize impacts.

[1] Source: OAR 635-415-0025.

Attachment P1-1 contains the metrics and habitat components used to classify habitats into these six category types, based on the presence of habitat characteristics and species observations. These metrics and habitat components were first reviewed by land managers and biologists from ODFW, USFS, FWS, NOAA Fisheries, and BLM during the interagency meetings. Additional meetings to discuss these methods as well as the preliminary habitat categorization maps were held with the ODFW in September 2011 and with BLM, ODFW, USFS, FWS, and ODOE in November 2011 and September 2012. IPC has since revised Attachment P1-1 to reflect only those habitat types within the analysis area and to incorporate wetland delineation data and fish presence information. Major roads within the analysis area were identified as developed habitat types during survey efforts. In addition, Project access roads that are identified as existing roads have been included as a developed habitat type and given a width of 8 feet.

Because surveys have not been completed to date within the entire analysis area, there are areas where survey information is not currently available. In these areas, aerial photo interpretation was used in conjunction with GAP data and adjacent survey data to approximate the appropriate habitat type and category. For example, to estimate the current land conditions found in the areas that were not surveyed, aerial photo interpretation was used to compare unsurveyed areas to surveyed areas located directly adjacent to the unsurveyed area (e.g., if a survey conducted in a sagebrush habitat determines that it is of high quality with few invasive species, and an unsurveyed area directly adjacent is similar in appearance to the surveyed area based on aerial images, then the unsurveyed area would be classified in accordance with the conditions found in the surveyed area). The habitat categorization, as well as the associated impact values and mitigation requirements, will be recalculated once complete survey information is obtained.

Table P1-4 lists the acres of each habitat type, by ODFW habitat category, located within the analysis area; however, these numbers do not directly relate to impacts because portions of the analysis area will not be impacted (the acres of direct impact that will occur within the analysis area are quantified in Section 3.5.3).

Table P1-4. Acres of Habitat Types by ODFW Habitat Category within the Analysis Area[1]

General Vegetation Type	Habitat Type	ODFW Habitat Category (acres)						
		1	2	3	4	5	6	Total[4]
Agriculture/ Developed	Agriculture[3]	–	412.6	38.9	3.5	–	1,449.2	**1,904.1**
	Developed / Disturbed	–	–	–	–	–	458.9	**458.9**
Bare Ground	Bare Ground, Cliffs, Talus	–	40.7	17.8	–	–	–	**58.5**
Open Water/ Unvegetated Wetland[2]	Ponds and Lakes	–	1.6	0.6	–	–	–	**2.2**
	Perennial Streams	–	19.5	0.6	–	–	–	**20.1**
	Intermittent Streams	–	24.4	7.4	0.9	–	–	**32.7**
	Ephemeral Streams	–	3.5	1.5	–	–	–	**5.1**
Riparian Vegetation	Herbaceous Riparian	–	8.4	13.2	–	–	–	**21.6**
	Introduced Riparian	–	4.9	0.7	–	–	–	**5.5**
	Riparian Woodland and Shrubland	–	59.0	1.4	–	–	–	**60.4**
Forest/ Woodland	Douglas Fir / Mixed Grand Fir	–	481.5	922.4	–	–	–	**1,403.9**
	Ponderosa Pine	–	890.2	216.9	–	–	–	**1,107.1**
	Western Juniper / Mountain Mahogany Woodland	–	359.8	–	–	–	–	**359.8**
	Forested-Other	–	–	108.5	–	–	–	**108.5**

General Vegetation Type	Habitat Type	ODFW Habitat Category (acres)						
		1	**2**	**3**	**4**	**5**	**6**	**Total[3]**
Shrub/ Grass	Native Grasslands	–	3,827.2	223.3	37.7	–	–	**4,088.2**
	Desert Shrub	–	139.2	135.3	27.0	–	–	**301.6**
	Shrub-Steppe with Big Sage	–	4,958.0	1,217.4	885.0	89.0	–	**7,149.5**
	Shrub-Steppe without Big Sage	–	868.0	34.9	114.7	–	–	**1,017.5**
	Introduced Upland Vegetation	–	2,976.4	90.5	–	1,661.4	–	**4,728.3**
Wetland[2]	Emergent Wetland	–	35.2	–	–	–	–	**35.2**
	Scrub-Shrub Wetland	–	28.5	–	–	–	–	**28.5**
	Forested Wetland	–	6.4	–	–	–	–	**6.4**
	Aquatic Bed Wetland	–	0.2	–	–	–	–	**0.2**

[1] The analysis area is defined in Section 3.1 and consists of the Project's Site Boundary. Note the analysis area is greater than the total area disturbed by the Project.
[2] The acres of wetlands and waters within the analysis area listed here reflect the occurrence of wetlands and waters presented in Exhibit J. The acres of stream habitats (ephemeral, intermittent, and perennial) presented in this table was quantified using the stream data from Exhibit J; habitat categorization of streams is based on the fish presence determination as detailed in Attachment P1-7B. Please refer to the discussion on impacts to fish species in Exhibit P1 and Exhibit Q for more detail.
[3] Category 2 agriculture habitat type includes areas that appear to be in the Conservation Reserve Program within elk or mule deer winter range.
[4] Numbers may not sum exactly due to rounding.

3.3.3 Habitat Category Maps

OAR 345-021-0010(1)(p)(C): A map showing the locations of the habitat identified in (B).

Attachment P1-8 contains a mapbook that shows the habitat types by ODFW habitat category within the analysis area. The underlying vegetation/waterbody type determined during field surveys, the habitat categorization based on the vegetation/waterbody type alone, as well as the final categorization (once wildlife habitat data were considered; see Section 3.3.2) are shown in these maps for the analysis area.

3.4 Identification of State Sensitive Species

> OAR 345-021-0010(1)(p)(D): Based on consultation with the Oregon Department of Fish and Wildlife (ODFW) and appropriate field study and literature review, identification of all State Sensitive Species that might be present in the analysis area and a discussion of any site-specific issues of concern to ODFW.
>
> OAR 345-021-0010(1)(p)(E): A baseline survey of the use of habitat in the analysis area by species identified in (D) performed according to a protocol approved by the Department and ODFW.

This section addresses species that have been designated by Oregon as State Sensitive Species. State Sensitive Species are defined by ODFW as “naturally-reproducing fish and wildlife species, subspecies, or populations which are facing one or more threats to their populations and/or habitats” (OAR 635-100-0040). ODFW further defines State Sensitive Species as either Sensitive or Sensitive Critical. Sensitive species are defined as having small or declining populations, are at-risk, and/or are of management concern. Sensitive Critical means the species have current or legacy threats that are significantly impacting their abundance, distribution, diversity, and/or habitat; Sensitive Critical species may decline to the point of qualifying for threatened or endangered status if conservation actions are not taken (ODFW 2016).

IPC developed the list of State Sensitive Species that could potentially occur within the analysis area through a review of pertinent literature and databases (including 2016 ORBIC data), consultation with applicable land-management agencies, and the results of Project-specific field surveys. Baseline surveys were conducted to better determine habitats that could support State Sensitive Species within the analysis area (as discussed in Section 3.2; also see the Revised Final Biological Survey Work Plan in Attachment P1-2). Table P1-5 lists the State Sensitive Species that could occur within the analysis area, their designation as Sensitive or Sensitive Critical, as well as whether or not the species has been documented within the analysis area. This includes 11 mammals (2 of which have been documented in the analysis area), 23 birds (20 of which have been documented or potentially documented in the analysis area), 5 reptiles/amphibians (2 of which have been documented in the analysis area), and 6 fish (1 of which has been documented in the analysis area). Further details regarding the locations of State Sensitive Species detected during surveys can be found in the biological survey summary report (see Attachment P1-7A).

1 **Table P1-5. State Sensitive Species Likely Use of the Analysis Area (excluding state T&E species and sage grouse)**

Common Name *Scientific Name*	Oregon Status	Habitat Requirements	Found within the Analysis Area[1]	Likely Use of the Analysis Area / General Impacts
Mammals				
Fringed myotis *Myotis thysanodes*	S (BM)	Wide variety of habitats, especially dry oak, pinyon-juniper, and ponderosa pine woodlands, as well as desert scrub.	No database records or survey observations.	Could potentially breed and hibernate in analysis area. Disturbances at roosts and hibernacula sites. Reduction in foraging habitat as a result of vegetation removal.
Spotted bat *Euderma maculatum*	S (BM, CP, NBR)	Variety of habitat types, especially deserts, canyons, grasslands, riparian areas, shrub-steppe, and pinyon-juniper woodlands; requires large cliffs and water.	No database records or survey observations.	Could potentially breed and hibernate in analysis area. Disturbances at roosts and hibernacula sites. Reduction in foraging habitat as a result of vegetation removal.
Pallid bat *Antrozous pallidus*	S(BM, CP, NBR)	Variety of habitat types, including rocky, arid deserts and canyon lands, shrub-steppe, grasslands, karst formations, and coniferous forests under 2,000 feet.	No database records or survey observations.	Could potentially breed and hibernate in analysis area. Disturbances at roosts and hibernacula sites. Reduction in foraging habitat as a result of vegetation removal.
Townsend's big-eared bat *Corynorhinus townsendii*	SC (BM, CP, NBR)	Variety of habitat types, including coniferous forests, deserts, native prairies, riparian areas, agricultural fields, and coastal areas; requires caves, rock crevices, or other roosts.	No database records or survey observations.	Could potentially breed and hibernate in analysis area. Disturbances at roosts and hibernacula sites. Reduction in foraging habitat as a result of vegetation removal.
California myotis *Myotis californicus*	S (BM, NBR)	Variety of habitat types, including deserts and forested areas. Forages around trees and over open water. Roosts in cliffs, tree crevices, caves, and structures.	No database records or survey observations.	Could potentially breed and hibernate in analysis area. Disturbances at roosts and hibernacula sites. Reduction in foraging habitat as a result of vegetation removal.
Long-legged myotis *Myotis volans*	S (BM, NBR)	Coniferous forests as well as oak and mixed evergreen woodlands; in arid regions, frequents riparian forests. Roosts in cliffs, abandoned buildings, caves, and mines.	Two database records from Union County. No survey observations.	Confirmed presence within the analysis area. Likely to breed and hibernate in analysis area. Disturbances at roosts and hibernacula sites. Reduction in foraging habitat as a result of vegetation removal.
Hoary bat *Lasiurus cinereus*	S (BM, CP, NBR)	Coniferous and deciduous forests. Roosts in trees; forages along riparian corridors and brush areas in forests.	No database records or survey observations.	Could potentially breed and hibernate in analysis area, although little is known about the winter distribution for this migratory species. Disturbances at roosts and hibernacula sites. Reduction in foraging habitat as a result of vegetation removal.
Silver-haired Bat *Lasionycteris noctivagans*	S (BM, CP, NBR)	Forested areas, especially older Douglas-fir/western hemlock forests and occasionally ponderosa pine forests. Forages over ponds and streams and day-roosts under loose bark.	No database records or survey observations.	Could potentially breed and hibernate in analysis area. Disturbances at roosts and hibernacula sites. Reduction in foraging habitat as a result of vegetation removal.
Pygmy rabbit *Brachylagus idahoensis*	S (NBR)	High plains with large, dense stands of sagebrush in loose, deep soil.	No database records or survey observations.	Could potentially be present in the analysis area year-round. Habitat loss.
White-tailed jackrabbit *Lepus townsendii*	S (NBR)	Prairie, plains and montane pastures among scattered evergreens to 10,171 feet elevation. Requires grasses and forbs with shrubs for forage during the winter.	No database records. Three individuals observed during field surveys (two in Baker County and one in Malheur County).	Confirmed presence within the analysis area. Habitat loss.
Pacific Marten – Interior Population *Martes caurina*	S (BM)	Mature, unfragmented conifer or mixed-conifer forests with coarse woody debris and intermediate canopy closure.	No database records or survey observations.	Could potentially be present in the analysis area year-round. Forest removal and fragmentation.
Birds				
Swainson's hawk *Buteo swainsoni*	S (BM, CP, NBR)	Open, grass-dominated areas, sparse shrublands, open woodlands, agricultural fields, and pastureland.	Four observations in ORBIC database (1978 and 1986 in Union County and two in 1986 in Baker County). Twenty-five additional observations and one nest were recorded during surveys (nine in Malheur, three in Baker, five in Union, two and a nest in Umatilla, and six in Morrow counties).	Breeds in analysis area. Disturbances during nesting.

2

Common Name ***Scientific Name***	**Oregon Status**	**Habitat Requirements**	**Found within the Analysis Area[1]**	**Likely Use of the Analysis Area / General Impacts**
Ferruginous hawk *Buteo regalis*	SC (CP), S (BM, NBR)	High-desert sagebrush and bunchgrass prairies, canyon shrublands, desert playa, agricultural fields, and pastureland.	This species was identified during surveys in Morrow, Umatilla, Baker, and Malheur counties. Eleven historic records (1978-1986) within the analysis area in Malheur County. Five individuals were recorded within the analysis during surveys in Malheur County.	Confirmed presence within the analysis area. Disturbances during nesting.
American peregrine falcon *Falco peregrinus anatum*	S (NBR)	Various landscapes including mountains, river corridors, marshes, lakes, coastlines, and cities. In a natural setting, peregrines breed on cliffs, cut banks, and in trees.	No database records or survey observations.	Could potentially breed in analysis area. Disturbance during nesting.
Great gray owl *Strix nebulosa*	S (BM)	Deciduous or coniferous forests up to 9,000 feet elevation interspersed with bogs, muskets, or meadows that support rodent prey.	No database records. Three observations and no nests were observed during surveys in Union County.	Confirmed presence within the analysis area. Likely utilizes the analysis area year-round. Habitat loss through forest removal and fragmentation. Potential disturbances to nesting attempts in adjacent habitats.
Flammulated owl *Otus flammeolus*	S (BM)	Cool, dry, mid-elevation forests with limited understory and high densities of insect prey.	No database records. Seven observations and no nests were observed during surveys in Union County.	Confirmed presence within the analysis area. Likely utilizes the analysis area year-round. Habitat loss through forest removal and fragmentation. Potential disturbances to nesting attempts in adjacent habitats.
Western burrowing owl *Athene cunicularia hypugea*	S (NBR), SC (BM, CP)	Variety of arid and semiarid environments with well drained soils, level to gentle slopes, and short vegetation with a high percentage of bare ground.	Four ORBIC records from 1980-1992 (three in Malheur County and one in Morrow County). One GeoBOB record in Baker County. Nine individuals and two burrows recorded during surveys (four in Baker County and five in Malheur County).	Breeds in analysis area. Disturbances during nesting.
Common nighthawk *Chordeiles minor*	S (CP)	Habitat generalists; nest in open areas with little cover.	No database records. During field surveys, 47 individuals were recorded with observations in every county.	Confirmed presence within the analysis area. Disturbances during nesting.
Mountain quail *Oreortyx pictus*	S (NBR)	Shrublands 2,300–9,800 feet elevation, occasionally forests, woodlands, and riparian areas.	No database records or survey observations.	Could potentially be present in the analysis area year-round. Disturbances during nesting.
Long-billed curlew *Numenius americanus*	S (BM, NBR) SC (CP)	Short- and mixed-grass prairies with flat to rolling topography.	Two ORBIC records of individuals and nesting areas (Morrow and Union counties), including the Boardman Bombing Range where there were 300-400 nesting pairs estimated from 1995 to 1997. A total of 142 observations with one nest recorded during field surveys in Morrow, Umatilla and Malheur counties. Most of the survey records were within Malheur County (117 observations).	Breeds in analysis area. Disturbances during nesting.
Upland sandpiper *Bartramia longicauda*	SC (BM)	Obligate grassland species found in native prairies with little bare ground, 3,400–5,060 feet elevation.	No database records or survey observations.	Could potentially breed in analysis area. Disturbances during nesting.
American White Pelican *Pelecanus erythrorhynchos*	S (NBR)	Typically found near large bodies of water during the breeding season, such as the Columbia River and Malheur National Wildlife Refuge.	No database records. Eleven individuals observed during surveys in Malheur County.	Confirmed presence within the analysis area. The analysis area does not contain breeding habitat; however, this species may cross through the analysis area during long migratory flights.
Greater sandhill crane *Antigone Canadensis tabida*	S (NBR)	Open prairies, grasslands, and wetlands. Outside of the breeding season, they often roost in deeper water of ponds or lakes. Migrating and wintering individuals often forage in agricultural fields, especially stubble or disked fields where grain crops have been harvested.	No database records. Five individuals observed during surveys in Union County.	Confirmed presence within the analysis area. Could potentially breed in or travel through analysis area. Habitat loss and disturbances during nesting and migration could result in displacement and nest failure, and transmission lines could result in collisions.

Common Name *Scientific Name*	Oregon Status	Habitat Requirements	Found within the Analysis Area[1]	Likely Use of the Analysis Area / General Impacts
White-headed woodpecker *Picoides albolarvatus*	SC (BM)	Open ponderosa pine or mixed-conifer forests dominated by ponderosa pine and containing snags, sometimes in riparian wetlands.	No database records or survey observations.	Could potentially be present in the analysis area year-round. Removal of snags. Disturbances during nesting.
Lewis's woodpecker *Melanerpes lewis*	SC (BM, CP)	Open ponderosa pine woodlands, riparian areas dominated by cottonwood, or logged or burned pine forest.	Two ORBIC records within Baker and Union counties. Nine observations and one nest found during surveys (one in Union County and eight observations and a nest cavity in Baker County).	Breeds in analysis area. Disturbances during nesting.
American three-toed woodpecker *Picoides dorsalis*	S (BM)	Mature forests dominated by spruce (*Picea* spp.), fir, and lodgepole pine, often recently burned.	No database records. Four survey observations, but no nests found during surveys (Union County).	Found in the analysis area year-round. Removal of snags. Disturbances during nesting.
Black-backed woodpecker *Picoides arcticus*	S (BM)	Boreal and montane coniferous forests, recently burned and containing many dead trees.	No database records. Three observations, but no nests found during surveys in Union County.	Found in the analysis area year-round. Removal of snags. Disturbances during nesting.
Pileated woodpecker *Dryocopus pileatus*	S (BM)	Dense, mature mixed-conifer forests with large-diameter trees, snags, and logs for nesting and foraging.	No database records. 20 observations, but no nests found during surveys (2 in Umatilla County, 16 in Union County, and 1 in Baker County).	Found in the analysis area year-round. Removal of snags and downed wood. Disturbances during nesting.
Olive-sided flycatcher *Contopus cooperi*	S (BM)	Montane mixed-conifer forests interspersed with natural openings up to 7,000 feet elevation; require prominent perches for singing and flycatching.	No database records. 14 observations were recorded during surveys (three in Umatilla County and 11 in Union County).	Confirmed presence within the analysis area. Likely breeds in analysis area. Disturbances during nesting.
Willow flycatcher *Empidonax traillii*	S(NBR)	Moist, shrubby areas with standing or running water.	No database records. Five individuals were recorded during surveys (one in Umatilla, three in Union, and one in Baker counties).	Confirmed presence within the analysis area. Likely breeds in analysis area. Disturbances during nesting.
Loggerhead shrike *Lanius ludovicianus*	S (BM, CP)	Open areas with short vegetation and hunting perches, for example juniper-mountain mahogany woodlands, shrub-steppe, agricultural fields, and pastureland.	No database records. Twenty individuals were recorded during surveys (1 in Morrow County, 10 in Baker County, and 9 in Malheur County).	Confirmed presence within the analysis area. Likely breeds in analysis area. Disturbances during nesting.
Sagebrush sparrow *Artemisiospiza nevadensis*	SC (CP)	Big sagebrush and other shrub species 3–6 feet high with open areas in between.	No database records. Six individuals were recorded during surveys (one in Union, three in Baker, and two in Malheur counties).	Confirmed presence within the analysis area. Likely breeds in analysis area. Disturbances during nesting.
Grasshopper sparrow *Ammodramus savannarum perpallidus*	S (CP)	Moderately open, unfragmented grasslands with patches of bare ground, sometimes with light cover of shrubs.	One ORBIC record in Morrow County on the Boardman Bombing Range. A total of 159 individuals were recorded during surveys in Morrow, Umatilla, Union, Baker, and Malheur counties.	Confirmed presence within the analysis area. Likely breeds in analysis area. Disturbances during nesting.
Bobolink *Dolichonyx oryzivorus*	S (BM, NBR)	Historically tall- and mixed-grass prairie; today, also agricultural fields and pastureland.	1988 ORBIC record of a colony with 14 males in Union County. No observations during surveys.	Could potentially breed in analysis area. Disturbances during nesting.
Reptiles and Amphibians				
Northern sagebrush lizard *Sceloporus graciosus*	S (CP)	Big sagebrush and antelope bitterbrush with small perches such as rocks or logs, and burrows of other animals.	No database records. Nine individuals unidentifiable to subspecies were recorded during surveys (one in Baker County and eight in Malheur County).	Found in the analysis area year-round (hibernates during winter). Alterations to sagebrush habitats.
Western painted turtle *Chrysemys picta bellii*	SC (BM, CP)	Requires slow-moving and shallow water, including streams, canals, slough, small lakes, and ponds. Prefers water bodies with surface or emergent vegetation.	No database records or survey observations.	Could potentially be present in the analysis area year-round.
Western toad *Anaxyrus boreas*	S (BM, NBR)	Lakes, rivers, streams, and wetlands during breeding; variety of grassland, shrubland, woodland, and forests at other times of year.	No database records. Two individuals were recorded in Umatilla County during surveys.	Confirmed presence within the analysis area. Could potentially be present in the analysis area year-round (hibernates during winter). Alterations to wetland habitats or hydrology.
Rocky Mountain tailed frog *Ascaphus montanus*	S (BM)	Cold, rocky streams at 3,600–7,000 feet elevation.	No database records or survey observations.	Could potentially be present in the analysis area year-round.

Common Name *Scientific Name*	Oregon Status	Habitat Requirements	Found within the Analysis Area[1]	Likely Use of the Analysis Area / General Impacts
Columbia spotted frog *Rana luteiventris*	SC (BM, NBR)	Areas near bodies of slow-moving water including lakes, ponds, sluggish streams, and marshes.	No database records or survey observations.	Could potentially be present in the analysis area year-round. Alterations to wetland habitats or hydrology.
Fish				
Bull Trout *Salvelinus confluentus*	SC (BM)	During birth, rearing, and spawning: cold freshwater streams with abundant low silt pools and riffles, or lakes for rearing. Spawning migration: streams with free passage.	ORBIC record in the Grande Ronde River and its tributaries. Current literature states that this species does occur in streams or drainages within the analysis area.	Present in the analysis area year-round. Sedimentation, blockage of fish movement, and reduced riparian function.
Columbia Basin Rainbow Trout *Oncorhynchus mykiss / gairdneri* [3]	S (BM), SC (BM CP)	Cool streams with clean, well oxygenated water.	Species present in streams within the analysis area (based on existing databases).	Present in the analysis area year-round. Sedimentation, blockage of fish movement, and reduced riparian function.
Middle Columbia River Summer Steelhead *Oncorhynchus mykiss*	SC (BM, CP)	During birth, rearing, and spawning: cool to cold freshwater streams with abundant low silt pools and riffles. Migration: streams with free passage. Adulthood: ocean.	ORBIC record in Birch Creek and its tributary, Stewart Creek, and in Meacham Creek and its tributaries, all of which are tributaries to the Umatilla River. Current literature states that this species does occur in streams or drainages within the analysis area.	Present in the analysis area. Sedimentation, blockage of fish movement, and reduced riparian function.
Lower Snake River Basin Summer Steelhead *Oncorhynchus mykiss*	S (BM)	During birth, rearing, and spawning: cool to cold freshwater streams with abundant low silt pools and riffles. Migration: streams with free passage. Adulthood: ocean.	ORBIC record in Ladd Creek, Rock Creek and its tributaries, Dry Creek and its tributaries, and Whiskey Creek, all of which are tributaries to the Grande Ronde River. Current literature states that this species does occur in streams or drainages within the analysis area.	Present in the analysis area. Sedimentation, blockage of fish movement, and reduced riparian function.
Pacific Lamprey *Entosphenus tridentata*	S (CP)	During birth, rearing, and spawning: freshwater streams. Migration: streams with free passage. Adulthood: ocean.	No database records or survey observations.	Could potentially be present in the analysis area year-round. Sedimentation, blockage of fish movement, and reduced riparian function.
Western Brook Lamprey *Lampetra richardsoni*	S (BM, CP)	Riffles and side channels for spawning, silty backwater habitats for rearing.	No database records or survey observations.	Could potentially be present in the analysis area year-round (dormant in stream substrate during winter). Sedimentation, blockage of fish movement, and reduced riparian function.

SC = State Sensitive Critical; S = State Sensitive ; BM = Blue Mountains; CP = Columbia Plateau; NBR = Northern Basin and Range
[1] Oregon Status from ODFW (2016).
[2] Based on results of Project-specific surveys, as well as the databases discussed in Section 3.2.1 (e.g., ORBIC data).
[3] For clarity of distribution, the Columbia Basin rainbow trout and two summer steelhead Species Management Units were separated from the common name category of: “Steelhead – Summer/ Columbia Basin Rainbow Trout” from the designation in Oregon Status report (ODFW 2016).

3.5 Potential Impacts to Fish and Wildlife

> OAR 345-021-0010(1)(p)(F): A description of the nature, extent and duration of potential adverse impacts on the habitat identified in (B) and species identified in (D) that could result from construction, operation and retirement of the proposed facility.

3.5.1 Project Features within Fish and Wildlife Habitat

3.5.1.1 Category 1 Habitat

Raptor Nests

The Project will not destroy or remove any active raptor nests during the breeding season. If nest removal must occur for construction purposes, IPC will perform the removal outside of the breeding season. See Fish and Wildlife Condition 12 (Section 4.0) for species-specific raptor breeding seasons.

Washington Ground Squirrel Colonies

There is no Category 1 WAGS habitat within the analysis area based on the surveys performed to date. Final design of the Project will avoid all Category 1 WAGS habitat identified during pre-construction surveys. Exhibit Q contains Threatened and Endangered Species Condition 1, which ensures impacts to Category 1 WAGS habitat are avoided.

3.5.1.2 Category 2 Habitat

Table P1-6 identifies, for the Proposed Route and the alternative routes, the Project features that will occur in each of the Category 2 habitats with the exception of elk winter range, which is addressed in Exhibit P3.

Table P1-6. Project Features in Category 2 Habitat

Habitat	Trans-mission Line (miles)	New Access Roads (miles)	Existing Roads Requiring Substantial Modification (miles)	MUAs (list by name)	Comm. Stations (list by name)	LDFYs (list by name)
Proposed Route						
Mule deer winter range	178.7	153.5	156.7[1]	MUA BA-03 MUA BA-04 MUA BA-05 MUA BA-06 MUA MA-01 MUA MA-04 MUA MA-06 MUA MA-07 MUA MA-08 MUA MA-09 MUA MO-04 MUA MO-05 MUA UM-02 MUA UM-03	CS BA-01 CS BA-02 CS MA-03 CS UM-01 CS UN-01 CS UN-02	LDFY BA-01 LDFY MA-01 LDFY MA-02

Habitat	Trans-mission Line (miles)	New Access Roads (miles)	Existing Roads Requiring Substantial Modification (miles)	MUAs (list by name)	Comm. Stations (list by name)	LDFYs (list by name)
				MUA UM-04 MUA UM-05 MUA UM-06 MUA UN-02 MUA UN-03		
Bighorn sheep herd range	0.9	0.8	0	None	None	None
WAGS potential use areas	3.4	1.0	0.5	None	None	None
Fish-bearing streams	0.2	0	0	MUA UM-02	None	None
Other habitat based on vegetation type	3.0	2.0	0	MUA BA-01 MUA UM-02	None	None
Morgan Lake Alternative						
Mule deer winter range	15.3	13.8	11.1[1]	MUA UN-02	CS UN-02 ALT	None
Bighorn sheep herd range	0	0	0	None	None	None
WAGS potential use areas	0	0	0	None	None	None
Fish-bearing streams	0.03	0	0	None	None	None
Other habitat based on vegetation type	0.8	0.3	0	None	None	None
Double Mountain Alternative						
Mule deer winter range	0.2	0.8	0	MUA MA-06	None	None
Bighorn sheep herd range	0	0	0	None	None	None
WAGS potential use areas	0	0	0	None	None	None
Fish-bearing streams	0	0	0	None	None	None
Other habitat based on vegetation type	0	0	0	None	None	None

Habitat	Trans-mission Line (miles)	New Access Roads (miles)	Existing Roads Requiring Substantial Modification (miles)	MUAs (list by name)	Comm. Stations (list by name)	LDFYs (list by name)
West of Bombing Range Road Alternative 1						
Mule deer winter range	0	0	0	None	None	None
Bighorn sheep herd range	0	0	0	None	None	None
WAGS potential use areas	0.3	0.3	0	None	None	None
Fish-bearing streams	0	0	0	None	None	None
Other habitat based on vegetation type	0	0	0	None	None	None
West of Bombing Range Road Alternative 2						
Mule deer winter range	0	0	0	None	None	None
Bighorn sheep herd range	0	0	0	None	None	None
WAGS potential use areas	0.3	0.3	0	None	None	None
Fish-bearing streams	0	0	0	None	None	None
Other habitat based on vegetation type	0	0	0	None	None	None

[1] The current footprint of existing roads is considered a Category 6 habitat (see Table P1-7); the mileage represents the miles of Category 6 existing roads within each habitat.
Comm. Station = communication station; LDFY = light-duty fly yard; MUA = multi-use area

3.5.1.3 Category 3 Habitat

Table P1-7 identifies, for the Proposed Route, the Project features that will occur in each of the Category 3 habitats, except for elk summer range which is addressed in Exhibit P3.

1 **Table P1-7. Project Features in Category 3 Habitat**

Habitat	Trans-mission Line (miles)	New Access Roads (miles)	Existing Roads Requiring Substantial Modification (miles)	MUAs (list by name)	Comm. Stations (list by name)	LDFYs (list by name)
Proposed Route						
Mule deer summer range	36.8	20.4	44.2[1]	MUA UM-07 MUA UN-04	CS BA-02 CS MA-03 CS UM-02	LDFY UM-01
Non-fish-bearing streams	0.1	0.02	0	MUA MA-02	None	None
Other habitat based on vegetation type	30.5	15.5	0	MUA BA-01 MUA MA-02 MUA MA-05 MUA UM-03 MUA UM-04	None	None
Morgan Lake Alternative						
Mule deer summer range	7.8	4.5	9.3[1]	None	None	None
Non-fish-bearing streams	0	0	0	None	None	None
Other habitat based on vegetation type	1.9	0.5	0	None	None	None
Double Mountain Alternative						
Mule deer summer range	0	0	0	None	None	None
Non-fish-bearing streams	0.01	0	0	None	None	None
Other habitat based on vegetation type	1.5	1.2	0	MUA MA-05	None	None
Fish-bearing streams	0	0	0	None	None	None
Other habitat based on vegetation type	0	0	0	None	None	None
West of Bombing Range Road Alternative 1						
Mule deer summer range	0	0	0	None	None	None

Habitat	Trans-mission Line (miles)	New Access Roads (miles)	Existing Roads Requiring Substantial Modification (miles)	MUAs (list by name)	Comm. Stations (list by name)	LDFYs (list by name)
Non-fish-bearing streams	0	0	0	None	None	None
Other habitat based on vegetation type	0	0	0	None	None	None
West of Bombing Range Road Alternative 2						
Mule deer summer range	0	0	0	None	None	None
Non-fish-bearing streams	0	0	0	None	None	None
Other habitat based on vegetation type	0.4	0.01	0	None	None	None

[1] The current footprint of existing roads is considered a Category 6 habitat (see Table P1-7); the mileage represents the miles of Category 6 existing roads within each habitat.
Comm. Station = communication station; LDFY = light-duty fly yard; MUA = multi-use area

3.5.1.4 Category 4, Category 5, and Category 6 Habitat

Table P1-8 identifies, for the Proposed Route and the alternative routes, the Project features that will occur in each of the Category 4, Category 5, and Category 6 habitats. All Category 4 and Category 5 habitats are categorized as such based upon vegetation characteristics alone and are completely outside of the wildlife habitat overlays presented in Section 3.3.2. Category 6 habitat includes agricultural and developed areas that can be within one of the wildlife habitat overlays, but the category is not modified based on ODFW guidance (ODFW 2015b)

Table P1-8. Project Features in Category 4, 5, and 6 Habitats

Habitat	Trans-mission Line (miles)	New Access Roads (miles)	Existing Roads Requiring Substantial Modification (miles)	MUAs (list by name)	Comm. Stations (list by name)	LDFYs (list by name)
Category 4	14.1	9.8	0	MUA BA-02 MUA MA-02 MUA UM-04	None	None
Category 5[1]	21.3	15.5	0	MUA MA-02 MUA MA-03 MUA MA-07 MUA MO-01 MUA MO-02	CS-MA-02	None

Habitat	Trans-mission Line (miles)	New Access Roads (miles)	Existing Roads Requiring Substantial Modification (miles)	MUAs (list by name)	Comm. Stations (list by name)	LDFYs (list by name)
Category 6[1]	20.0	13.9	223.2	MUA BA-01 MUA BA-02 MUA BA-03 MUA BA-04 MUA BA-06 MUA MA-01 MUA MA-02 MUA MA-03 MUA MA-04 MUA MA-05 MUA MA-06 MUA MA-07 MUA MA-08 MUA MA-09 MUA MO-01 MUA MO-03 MUA MO-05 MUA UM-01 MUA UM-02 MUA UM-03 MUA UM-04 MUA UM-05 MUA UM-06 MUA UM-07 MUA UN-01 MUA UN-02 MUA UN-03 MUA UN-04	CS MA-01 CS MA-02	LDFY MA-02 LDFY UM-01
Morgan Lake Alternative						
Category 4	0	0	0	None	None	None
Category 5	0	0	0	None	None	None
Category 6	0.1	0	15.9	MUA UN-01 MUA UN-02	None	None
Double Mountain Alternative						
Category 4	1.3	1.1	0	None	CS MA-02 ALT	None
Category 5	4.3	8.1	0	None	None	None
Category 6	0	0	5.0	MUA MA-05 MUA MA-06	None	None
West of Bombing Range Road Alternative 1						
Category 4	0.6	0.5	0	None	None	None
Category 5	1.7	1.3	0	None	None	None
Category 6	1.2	0.3	1.1	None	None	None

Habitat	Trans-mission Line (miles)	New Access Roads (miles)	Existing Roads Requiring Substantial Modification (miles)	MUAs (list by name)	Comm. Stations (list by name)	LDFYs (list by name)
West of Bombing Range Road Alternative 2						
Category 4	1.1	0.3	0	None	None	None
Category 5	1.1	0.6	0	None	None	None
Category 6	0.8	0.4	0.8	None	None	None

[1] The Longhorn Station is not included in this table, but is sited within Category 5 and Category 6 habitat.
Comm. Station = communication station; LDFY = light-duty fly yard; MUA = multi-use area

3.5.2 Duration of Impacts

Impacts may be permanent or temporary. Permanent impacts are defined as those impacts that will exist for the entire life of the Project. Temporary impacts are those impacts that will last for a time less than the life of the Project. The duration of temporary impacts to habitat will vary by vegetation type. For example: the recovery period for agricultural areas that were directly disturbed could be as short as 1 to 3 years; grasslands and herbaceous wetlands generally recover within 3 to 7 years; shrublands may require 30 to 100 years to recover (with the longer recovery periods associated with disturbances in mature sage-brush habitats located in arid regions or for specific sage-brush species, e.g., *Artemisia tridentata* ssp. *wyomingensis*); and forested and woodland areas could take anywhere from 50 to many hundreds of years to reach preconstruction conditions (depending on the condition of the area prior to construction). Arid sites with naturally sparse vegetation, as well as those with saline or alkaline soils, shallow soils, compacted soils, or areas that have a high erosion potential may be difficult to restore and could require special techniques or repeated revegetation efforts by IPC. IPC will restore temporary impacts consistent with the Reclamation and Revegetation Plan (Exhibit P1, Attachment P1-3). IPC is proposing compensatory mitigation for temporary impacts to Category 2, 3, and 4 habitat to address the duration of the lost habitat functionality during reclamation. IPC is not proposing compensatory mitigation for temporary impacts to Category 5 and 6 habitat as set forth in the Fish and Wildlife Habitat Mitigation Plan (HMP; Exhibit P1, Attachment P1-6).

3.5.3 Direct Impacts

Direct impacts are defined as the impacts that will have an adverse effect upon species habitat or individuals, and that will occur at the same, or in close proximity to, time and place. Direct impacts may be permanent or temporary.

3.5.3.1 Permanent Direct Impacts

Table P1-9 summarizes the type, timing, duration, quantification metric, and mitigation measures related to the Project's potential permanent direct impacts to fish and wildlife and their habitat.

Table P1-9. Type, Timing, Duration, Quantification Metrics, and Mitigation Measures Related to Permanent Direct Impacts to Fish and Wildlife and Their Habitat

Type of Disturbance	Type of Impact	Timing of Impact	Duration of Impact	Metric to Quantify Effects on Habitat Functionality	Mitigation Measures
Permanent direct impacts from vegetation clearing (transmission line, communication stations, and access roads)	Permanent direct	Construction, Operation	Life of the Project	Quantified based on construction dimensions	Permanent direct impacts from vegetation clearing will be mitigated as set forth in the Fish and Wildlife Habitat Mitigation Plan (Attachment P1-6); permanent direct impacts from vegetation clearing in forest lands in particular will be minimized as set forth in the Vegetation Management Plan (Attachment P1-4).
Direct mortality	Permanent direct	Construction, Operation	Life of the Project	Not quantified – no or de minimis impacts expected; there is no reasonable and accepted methodology for quantifying these impacts	IPC will establish speed limits on Project roads, where possible; IPC will implement seasonal and spatial restrictions described in proposed conditions of site certificate subject to variance; IPC will construct the Project to APLIC standards; avian mortality related to the transmission line will be addressed through avian-safe design measures.

Permanent Direct Impacts from Vegetation Clearing

Vegetation clearing to accommodate Project features required for operation will result in permanent direct impacts to fish and wildlife habitat through habitat loss. Permanent loss of habitat will occur within the operations disturbance areas for transmission structures, the

Longhorn Station, communication stations, and access roads; the dimensions of these areas are summarized in Exhibit C, Section 3.4.

With respect to the permanent direct impacts from access road construction and modification, details on road construction activities and methods, including types of improvements to existing roads and projected traffic volumes, are provided in Exhibit B, Attachment B-5 (Road Classification Guide and Access Management Plan), Exhibit U, and Attachment U-2 (Traffic and Transportation Management Plan). Access to construction sites will require both improvements to existing unpaved roads, as well as construction of new access roads. For existing roads that require substantial modification, proposed repair and/or construction activities will increase the width of the existing road prism, change the existing road alignment, use materials inconsistent with the existing road surface, and/or change the existing road profile, as well as meet additional criteria detailed in Exhibit B, Attachment B-5. New roads proposed to be constructed include both primitive and bladed roads. Primitive roads, commonly called a “two-track” or “overland travel” roads, will be created by direct vehicle use with little or no grading. Bladed roads will be constructed using heavy equipment and designed to support vehicular traffic; bladed road features typically include cuts and/or fills to construct a smooth travel surface and manage surface water drainage.

IPC will provide mitigation for permanent direct impacts resulting from construction and installation of Project features as set forth in the draft HMP (Exhibit P1, Attachment P1-6). IPC proposes the following conditions in the site certificate providing that IPC will finalize the draft Fish and Wildlife HMP and provide mitigation commensurate with the same:

> ***Fish and Wildlife Condition 7****: Prior to construction, the site certificate holder shall finalize, and submit to the department for its approval, a final Fish and Wildlife Habitat Mitigation Plan (HMP).*
> *a. The final Fish and Wildlife HMP shall include the following, unless otherwise approved by the department:*
> > *i. The areas that were surveyed for biological resources;*
> > *ii. The location of all facility components and related and supporting facilities;*
> > *iii. The areas that will be permanently and temporarily disturbed during construction;*
> > *iv. The protective measures described in the draft Fish and Wildlife HMP in ASC Exhibit P, Attachment P-6; and*
> > *v. The results of the biological surveys referenced in Fish and Wildlife Condition 1 and Fish and Wildlife Condition 2.*
>
> *b. The final Fish and Wildlife HMP shall address the potential habitat impacts through mitigation banking, an in-lieu fee program, development of mitigation projects by the site certificate holder, or a combination of the same.*
> > *i. To the extent the site certificate holder shall develop its own mitigation projects, the final Habitat Mitigation Plan shall:*
> > > *1. Identify the location of each mitigation site, including a map of the same;*
> > > *2. Identify the number of credit-acres that each mitigation site will provide for the site certificate holder;*
> > > *3. Include a site-specific mitigation management plan for each mitigation site that provides for:*
> > > > *A. A baseline ecological assessment;*
> > > > *B. Conservation actions to be implemented at the site;*

C. An implementation schedule for the baseline ecological assessment and conservation actions;

D. Performance measures;

E. A reporting plan; and

F. A monitoring plan.

ii. To the extent the site certificate shall utilize a mitigation bank or in-lieu fee program, the final Habitat Mitigation Plan shall:

1. Describe the nature, extent, and history of the mitigation bank or in-lieu fee program; and

2. Identify the number of credit-acres that each mitigation site will provide for the site certificate holder.

c. Oregon's Elk Mitigation Framework shall be used to calculate the amount of elk habitat compensatory mitigation required for the facility.

d. The final Fish and Wildlife Habitat Mitigation Plan may be amended from time to time by agreement of the site certificate holder and the department. Such amendments may be made without amendment to the site certificate. The Council authorizes the department to agree to amendments of the plan and to mitigation actions that may be required under the plan; however, the Council retains the authority to approve, reject, or modify any amendment of the plan agreed to by the department.

***Fish and Wildlife Condition 20**: During construction, the site certificate holder shall commence implementation of the conservation actions set forth in the final Fish and Wildlife HMP referenced in Fish and Wildlife Condition 7.*

***Fish and Wildlife Condition 24**: During the third year of operation, the site certificate holder shall provide to the department a report demonstrating that fish and wildlife habitat mitigation shall be commensurate with the final compensatory mitigation calculations.*

a. The final calculations shall be based on the as-constructed footprint of the facility.

b. Oregon's Elk Mitigation Framework shall be used to calculate the amount of elk habitat compensatory mitigation required for the facility, and the information from the pre- and post-construction traffic studies shall be used in the calculation.

Regarding forest lands in particular, permanent clearing will occur along the transmission line right-of-way (ROW) where necessary to meet reliability standards to protect the line from vegetation encroachments and hazards. A wire-border zone method will be used during maintenance of the ROW to control vegetation and to ensure adequate ground-to-conductor clearances (see Attachment P1-4, Vegetation Management Plan). This method results in two zones of clearing and revegetation. The wire zone includes the linear area along the ROW located under the wires as well as the area extending 10 feet outside of the outermost phase-conductor. After initial clearing, vegetation in the wire zone would be managed to remain under 20 feet tall at maturity. The border zone is the linear area along each side of the ROW extending from the edge of the wire zone to the edge of the ROW. Vegetation in the border zone would be maintained to consist of tall shrubs or short trees (up to 34 feet high at maturity), grasses, and forbs. These cover plants along the border zone benefit the ROW by competing with and excluding undesirable plants. During operations, vegetation growth will be monitored and managed on a routine cyclical clearing schedule (i.e., every 3 to 6 years) to maintain the wire-border zone objectives. In addition, hazard trees (i.e., trees that pose a risk of falling onto conductors, structures, or Project personnel) would be removed as needed. Maintenance efforts will be conducted around project structures and communication sites.

To ensure the protective measures set forth in the draft Vegetation Management Plan in Attachment P1-4 are incorporated into the final plan (unless otherwise approved by ODOE) and to ensure compliance with the final Vegetation Management Plan, IPC proposes that the Energy Facility Siting Council (EFSC or Council) include the following conditions in the site certificate:

> ***Fish and Wildlife Condition 5:*** *Prior to construction, the site certificate holder shall finalize, and submit to the department for its approval, a final Vegetation Management Plan. The protective measures described in the draft Vegetation Management Plan in ASC Exhibit P1, Attachment P1-4, shall be included as part of the final Vegetation Management Plan, unless otherwise approved by the department.*

> Fish and Wildlife Condition 18: During construction, the site certificate holder shall conduct all work in compliance with the final Vegetation Management Plan referenced in Fish and Wildlife Condition 5.

> ***Fish and Wildlife Condition 28:*** *During operation, the site certificate holder shall conduct all work in compliance with the final Vegetation Management Plan referenced in Fish and Wildlife Condition 5.*

Direct Mortality

Traffic-Related Mortality

Direct mortality to fish and wildlife individuals may occur as a result of collisions with Project-related vehicles during construction or operation of the Project. IPC expects this risk to be very low, as most species will likely avoid the work sites. However, species or individuals that are less mobile or less sensitive to these disturbances could be directly threatened by construction activities. For example, species living underground, injured individuals, fish at stream crossings, and nesting birds may not be able to avoid construction equipment, and as a result, would be vulnerable to direct mortality. The risk of traffic-related direct mortality can be avoided or minimized by having Project vehicles reduce their speed to a level sufficient to anticipate and avoid striking fish and wildlife individuals. Accordingly, to avoid or minimize direct mortality to fish and wildlife, IPC proposes the following conditions in the site certificate establishing speed limits on access roads when applicable:

> ***Fish and Wildlife Condition 16****: During construction, the site certificate holder shall employ a speed limit of 25 miles per hour on facility access roads, unless the applicable land-management agency or landowner has designated an alternative speed limit.*

> ***Fish and Wildlife Condition 26****: During operation, the site certificate holder shall employ a speed limit of 25 miles per hour on facility access roads, unless the applicable land-management agency or landowner has designated an alternative speed limit.*

Additionally, vehicle-wildlife collisions on Project access roads can be substantially reduced through controlling use of such roads. IPC will implement access control as set forth in the draft Road Classification Guide and Access Control Plan (Exhibit B, Attachment B-5). Access control may involve fencing, gates, barriers, and/or signage as preferred by the landowner while maintaining effectiveness. To avoid or minimize indirect impacts related to access roads with respect to species that may be particularly sensitive to vehicle access (i.e., elk and sage-grouse), consistent with the Road Classification Guide and Access Control Plan, IPC proposes that the Council include the following conditions in the site certificate providing that access control will be pursued where possible:

> ***Fish and Wildlife Condition 27**: During operation, the site certificate holder shall employ access control on facility access roads within elk habitat (i.e., elk summer range and elk winter range) and sage-grouse habitat (i.e., areas of high population richness, core area habitat, low density habitat, or general habitat), subject to approval by the applicable land-management agency or landowner.*

Electrocution-Related Mortality

Concerns have been raised regarding the risk of bird electrocutions (especially raptors) along electrical lines. However, the risk of avian mortalities occurring as a result of electrocutions is negligible for extra high-voltage transmission lines. This is because a bird would need to contact two phases of the line simultaneously to be electrocuted and the spacing between phases of the Project's transmission lines is much larger than the wing span of any North American bird. Therefore, electrocution due to the transmission line is not considered likely. Even so, IPC is committed to designing and constructing the Project to avoid or minimize direct mortality to avian species by following practices set forth in IPC's Avian Protection Plan and certain other avian protection guidelines. IPC recommends that the Council adopt the following condition regarding the same:

> ***Fish and Wildlife Condition 22:** During construction, the site certificate holder shall construct the transmission line to avian-safe design standards consistent with the site certificate holder's Avian Protection Plan (Idaho Power 2015).*

3.5.3.2 Temporary Direct Impacts

Table P1-10 summarizes the type, timing, duration, quantification metric, and mitigation measures related to the Project's potential temporary direct impacts to fish and wildlife and their habitat.

Table P1-10. Type, Timing, Duration, Quantification Metrics, and Mitigation Measures Related to Temporary Direct Impacts to Fish and Wildlife and Their Habitat

Type of Disturbance	Type of Impact	Timing of Impact	Duration of Impact	Metric to Quantify Effects on Habitat Functionality	Mitigation Measures
Temporary direct impacts from vegetation clearing (construction areas)	Temporary direct	Construction	Construction through re-vegetation	Construction area dimensions	Temporary direct impacts from vegetation clearing will be mitigated as set forth in the Reclamation and Revegetation Plan (Attachment P1-3) and the Fish and Wildlife Habitat Mitigation Plan (Attachment P1-6).
Retirement	Temporary direct	Retirement	Retirement	Similar to construction related impacts	Similar to construction-related impacts

Temporary Direct Impacts from Vegetation Clearing

To provide for construction-related activities and installation of certain Project features, vegetation may be temporarily cleared within the Project's ROW. In most areas, IPC will have a 250-foot-wide ROW in which to construct the 500-kV portions of the transmission line and a 100-foot-wide ROW to construct the 138-kV portions of the line. Temporary vegetation clearing activities encompass the entire footprint of pulling and tensioning sites, multi-use areas, and light-duty fly yards. Temporary clearing activities will also occur around the perimeter of permanent Project features including transmission structures, the Longhorn station, communication stations, and access roads. Areas cleared for construction activities, and not encompassed by permanent Project features or not needed for normal transmission line operation and maintenance will be reclaimed though measures described in IPC's Reclamation and Revegetation Plan (Attachment P1-3). To ensure the protective measures set forth in the draft Reclamation and Revegetation Plan are incorporated into the final Reclamation and Revegetation Plan (unless otherwise approved by ODOE) and to ensure compliance with the final Reclamation and Revegetation Plan, IPC proposes that the Council include the following conditions in the site certificate providing for the same:

> ***Fish and Wildlife Condition 4:*** *Prior to construction, the site certificate holder shall finalize, and submit to the department for its approval, a final Reclamation and Revegetation Plan. The protective measures described in the draft Reclamation and Revegetation Plan in ASC Exhibit P1, Attachment P1-3, shall be included and implemented as part of the final Reclamation and Revegetation Plan, unless otherwise approved by the department.*

> ***Fish and Wildlife Condition 17:*** *During construction, the site certificate holder shall conduct all work in compliance with the final Reclamation and Revegetation Plan referenced in Fish and Wildlife Condition 4.*

Habitat that is cleared for construction will be restored and the duration of the impact will not exceed the life of the Project; thus, clearing vegetation followed by restoration constitutes a temporary impact to habitat. While restoration of certain habitat (e.g., forestlands) can take decades and restoration could span generations of wildlife, those impacts are considered temporary because they will last less than the life of the Project which is expected to be in place indefinitely. To the extent compensatory mitigation is required for temporary impacts, IPC will address the temporal loss of habitat functionality as set forth in the Fish and Wildlife HMP (Attachment P1-6).

Retirement

Retirement of the Project would involve activities and equipment similar to those that would be used during construction. Therefore, potential impacts on fish and wildlife habitat during retirement of the Project would be similar to the temporary impacts described for construction.

3.5.3.3 Quantifying Direct Impacts

Table P1-11 lists the acres of impact that will occur to fish and wildlife habitat as a result of the Proposed Route, including acres of impact to each ODFW habitat category and habitat type. Table P1-12 lists the same information for the Alternatives. The total acreage of impacts that will occur during construction, prior to restoration, is equal to the sum of the temporary and permanent impacts reported in this table. Note that the temporary impacts listed in Table P1-11 will vary in duration depending on vegetation type as described above; mitigation will be commensurate with impact duration as described in the Fish and Wildlife HMP (Attachment P1-6).

1 **Table P1-11. Direct Impacts to Fish and Wildlife Habitat from the Proposed Route**

ODFW Category	Habitat Type	Acres Disturbed[1]	
		Temp	Perm
2	Agriculture[2]	95.0	10.6
	Bare Ground Cliffs Talus	2.0	0.3
	Douglas Fir/ Mixed Grand Fir	5.9	159.6
	Ponderosa Pine	0.3	247.2
	Western Juniper / Mountain Mahogany Woodland	0.6	129.3
	Ephemeral Stream[3]	0.3	0.0
	Intermittent Stream[3]	0.6	0.3
	Perennial Stream[3]	0.1	0.1
	Ponds and Lakes[3]	0.0	0.0
	Herbaceous Riparian	0.0	0.1
	Introduced Riparian	0.0	–
	Riparian Woodland and Shrubland	0.5	0.4
	Desert Shrub	15.3	2.7
	Introduced Upland Vegetation	577.0	90.5
	Native Grasslands	475.3	87.8
	Shrub-steppe with Big Sage	801.3	133.2
	Shrub-steppe without Big Sage	121.9	19.9
	Aquatic Bed Wetland[3]	0.0	0.0
	Emergent Wetland[3]	1.7	0.4
	Forested Wetland[3]	0.0	0.0
	Scrub-Shrub Wetland[3]	25.2	–
	Category 2 Subtotal	***2,123.1***	***882.7***
3	Agriculture	10.1	0.8
	Bare Ground Cliffs Talus	0.3	0.1
	Douglas Fir/ Mixed Grand Fir	3.3	320.8
	Forested-Other	0.0	48.3
	Ponderosa Pine	12.6	88.9
	Ephemeral Stream[2]	0.0	0.0
	Intermittent Stream[2]	0.2	0.1
	Perennial Stream[2]	0.1	0.0
	Ponds and Lakes[2]	0.1	–
	Herbaceous Riparian	5.3	0.1
	Introduced Riparian	0.0	0.0
	Riparian Woodland and Shrubland	0.1	0.0
	Desert Shrub	18.1	0.8
	Introduced Upland Vegetation	63.6	0.6
	Native Grasslands	59.8	4.9
	Shrub-Steppe with Big Sage	167.6	22.5
	Shrub-Steppe without Big Sage	3.2	1.2
	Category 3 Subtotal	***312.4***	***29.9***
4	Intermittent Stream[2]	0.0	0.0
	Desert Shrub	20.9	0.2
	Native Grasslands	2.7	0.9
	Shrub-Steppe with Big Sage	129.1	21.5
	Shrub-Steppe without Big Sage	12.6	3.5
	Category 4 Subtotal	***165.3***	***26.1***

ODFW Category	Habitat Type	Acres Disturbed[1]	
		Temp	Perm
5	Introduced Upland Vegetation	323.0	40.8
	Shrub-Steppe with Big Sage	6.3	2.4
	Category 5 Subtotal	***329.3***	***43.3***
6	Agriculture	331.7	44.1
	Developed	57.3	215.7
	Category 6 Subtotal	***389.0***	***259.8***

Notes: "Temp" = temporary impacts. "Perm" = permanent impacts.
A "0.0" indicates a value less than 0.1, while a "–"indicates a null or zero value.
[1] Numbers may not sum exactly due to rounding.
[2] Category 2 agriculture habitat type includes areas that appear to be in CRP within elk or mule deer winter range.
[3] The acres of wetlands and waters reflect the occurrence of wetlands and waters presented in Exhibit J. The acres of stream habitats (ephemeral, intermittent, and perennial) presented in this table were quantified using the stream data from Exhibit J; habitat categorization of streams is based on the fish presence determination as detailed in Attachment P1-7B. This table is not intended to inform the analysis of impacts to fish because the methodologies differ; please refer to the discussion on impacts to fish species in Exhibit P1 and Exhibit Q for more detail.

Table P1-12. Direct Impacts to Fish and Wildlife Habitat from the Alternatives

ODFW Category	Habitat Type	Acres Disturbed[1]							
		West of Bombing Range Road Alternative 1		West of Bombing Range Road Alternative 2		Morgan Lake Alternative		Double Mountain Alternative	
		Temp	Perm	Temp	Perm	Temp	Perm	Temp	Perm
2	Bare Ground Cliffs Talus	–	–	–	–	–	–	2.0	0.5
	Douglas Fir/Mixed Grand Fir	–	–	–	–	12.8	2.8	–	–
	Ponderosa Pine	–	–	–	–	55.3	9.8	–	–
	Ephemeral Stream[2]	–	–	–	–	0.0	0.0	–	–
	Intermittent Stream[2]	–	–	–	–	–	–	0.0	0.0
	Perennial Stream[2]	–	–	–	–	0.0	0.0	–	–
	Herbaceous Riparian	–	–	–	–	0.0	0.0	–	–
	Introduced Upland Vegetation	5.3	0.3	5.3	0.3	3.7	1.0	17.8	0.6
	Native Grasslands	1.0	0.2	1.0	0.2	123.2	15.7	3.7	0.3
	Shrub-Steppe with Big Sage	–	–	–	–	0.2	0.5	0.4	0.2
	Shrub-Steppe without Big Sage	–	–	–	–	10.9	2.1	–	–
	Emergent Wetland[2]	–	–	–	–	0.0	0.0	–	–
	Category 2 Subtotal	**6.3**	**0.4**	**6.3**	**0.4**	**206.1**	**31.9**	**23.9**	**1.6**
3	Bare Ground Cliffs Talus	–	–	–	–	–	–	0.1	0.0
	Douglas Fir / Mixed Grand Fir	–	–	–	–	29.2	5.6	–	–
	Ponderosa Pine	–	–	–	–	2.2	0.2	–	–
	Ephemeral Stream[2]	–	–	–	–	–	–	0.0	0.0
	Intermittent Stream[2]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Desert Shrub	–	–	–	–	–	–	32.4	3.3
	Native Grasslands	0.0	0.0	0.8	0.8	–	–	–	–
	Shrub-Steppe with Big Sage	–	–	–	–	–	–	4.1	0.2
	Category 3 Subtotal	**0.0**	**0.0**	**0.8**	**0.8**	**31.4**	**5.8**	**36.6**	**3.5**

ODFW Category	Habitat Type	Acres Disturbed[1]							
		West of Bombing Range Road Alternative 1		West of Bombing Range Road Alternative 2		Morgan Lake Alternative		Double Mountain Alternative	
		Temp	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**
4	Native Grasslands	4.2	0.5	4.2	0.5	–	–	–	–
	Shrub-Steppe with Big Sage	–	–	–	–	–	–	15.8	2.5
	Shrub-Steppe without Big Sage	0.7	0.2	2.0	0.7	–	–	–	–
	Category 4 Subtotal	**4.9**	**0.7**	**6.2**	**1.2**	–	–	**15.8**	**2.5**
5	Douglas Fir / Mixed Grand Fir					0.0	0.0		
	Introduced Upland Vegetation	13.4	2.5	5.7	1.7	–	–	53.2	14.7
	Shrub-Steppe with Big Sage	-	-	-	-	–	–	4.1	1.6
	Category 5 Subtotal	**13.4**	**2.5**	**5.7**	**1.7**	0.0	0.0	**57.3**	**16.3**
6	Agriculture	2.3	0.5	1.5	0.4	78.5	–	–	–
	Developed	0.1	1.2	0.4	1.1	0.3	15.5	0.1	4.8
	Category 6 Subtotal	**2.3**	**1.6**	**1.9**	**1.5**	**78.8**	**15.5**	**0.1**	**4.8**

Notes: "Temp" = temporary impacts. "Perm" = permanent impacts.
A "0.0" indicates a value less than 0.1, while a "–"indicates a null or zero value.
[1] Numbers may not sum exactly due to rounding.
[2] Category 2 agriculture habitat type includes areas that appear to be in CRP within elk or mule deer winter range.
[3] The acres of wetlands and waters reflect the occurrence of wetlands and waters presented in Exhibit J. The acres of stream habitats (ephemeral, intermittent, and perennial) presented in this table were quantified using the stream data from Exhibit J; habitat categorization of streams is based on the fish presence determination as detailed in Attachment P1-7B. This table is not intended to inform the analysis of impacts to fish because the methodologies differ; please refer to the discussion on impacts to fish species in Exhibit P1 and Exhibit Q for more detail.

Category 1 Habitat

Raptor nests are within the analysis area and are considered a Category 1 habitat. Although trees or structures with raptor nests are managed as Category 1 habitat, they are not included in the habitat categorization analysis for acres of Category 1 habitat because of their relatively small size on the landscape. To ensure that Category 1 raptor nests and raptor breeding activities are not disturbed by Project activities, the seasonal and spatial restrictions identified in Fish and Wildlife Condition 12 will be applied.

There is potential for Category 1 WAGS habitat to be identified within the analysis area during future surveys. Category 1 WAGS habitat consists of the 785-foot buffer around the outside of the cluster of holes where WAGS are residing and corresponds to a known maximum travel distance of 239 meters as described in Carlson et al. (1980). This distance has been included in other projects, such as the Leaning Juniper II Wind Power Facility (EFSC 2009), as Category 1 habitat because the area within 785 feet of WAGS holes is defined by ODFW as required area for squirrel survival.

IPC has modified the Project location to avoid Category 1 WAGS habitat in the past and will perform WAGS surveys in previously unsurveyed areas to identify Category 1 WAGS habitat for avoidance. WAGS surveys shall be used to complete final design, facility layout, and micrositing of facility components and IPC shall not construct any facility components within areas of Category 1 habitat and shall avoid temporary disturbance of Category 1 habitat. To ensure that

Category 1 WAGS habitat is avoided, IPC recommends Threatened and Endangered Species Condition 1 (see Exhibit Q, Section 3.5.2).

Category 2 Habitat

Category 2 habitats are the most abundant category type impacted by the Project. The majority of these areas were categorized as Category 2 habitats due to overlap with wildlife habitat layers (Attachment P1-1). Approximately 98 percent of the Category 2 habitat within the analysis area is categorized as Category 2 due to overlap with WAGS habitat, Elk Winter Range, Mule Deer Winter Range, and California Bighorn Sheep Herd Range. The remaining 2 percent of Category 2 habitat (addressed as Other Habitat below) has vegetation conditions that meet the definition of Category 2 habitat as presented in the habitat categorization matrix in Attachment P1-1. A small portion of the 2 percent includes impacts to fish-bearing streams.

The habitat categories presented in Exhibit P1 reflect the inclusion of Elk Winter Range and how it modifies habitats to a Category 2 (except for agriculture and developed habitat types) within the analysis area and direct impact disturbance areas. However, the analysis of direct and indirect impacts to Category 2 Elk Winter Range is presented in Exhibit P3.

Washington Ground Squirrel Area of Potential Use

ODFW describes Category 2 WAGS habitat as an area of potential WAGS use. Category 2 WAGS habitat is the habitat adjacent to a WAGS colony (a colony is defined as a single or cluster of holes as well as the required habitat for squirrel survival), but not occupied by any squirrels either for burrowing or foraging, which is of similar habitat type and quality to the area occupied by WAGS. ODFW provided to IPC further guidance that Category 2 WAGS habitat consists of a 4,921-foot (1.5-km) buffer that extends WAGS Category 2 habitat beyond the Category 1 buffer in continuous habitat. This ODFW guidance is based on the 75th percentile for documented dispersal distances of juvenile male WAGS as reported by Klein (2005).

Direct impacts to Category 2 WAGS habitat are presented in Table P1-13. These impacts occur near Bombing Range Road in Morrow County. Temporary impacts to Category 2 WAGS habitat in introduced upland vegetation will likely be short-term as these areas have previously been disturbed. The duration of temporary impacts to Category 2 WAGS habitat in native grassland will likely be 3 to 7 years, while temporary impacts to Category 2 WAGS habitat in shrub-steppe without big sage will likely last 30 to 100 years. As described above, the duration of permanent impacts to all Category 2 WAGS habitat is expected to be indefinite as the Project is expected to remain in service in perpetuity (see Exhibit W for details). Mitigation for Category 2 WAGS habitat will be commensurate with impact duration as described in the Fish and Wildlife HMP (Attachment P1-6). Impacts to WAGS and WAGS habitat are also discussed in Exhibit Q.

Table P1-13. Direct Impacts to Category 2 WAGS Habitat

General Vegetation Type	Habitat Type	Acres Disturbed[1]					
		Proposed Route		West of Bombing Range Road Alternative 1		West of Bombing Range Road Alternative 2	
		Temp	Perm	Temp	Perm	Temp	Perm
Shrub/Grass	Introduced Upland Vegetation	10.6	1.9	5.3	0.3	5.3	0.3
	Native Grasslands	9.1	0.7	1.0	0.2	1.0	0.2
Total		**19.7**	**2.7**	**6.3**	**0.4**	**6.3**	**0.4**

[1] Numbers may not sum exactly due to rounding.
Notes: "Temp" = temporary impacts. "Perm" = permanent impacts.

Mule Deer Winter Range

Mule Deer Winter Range is displayed in Figure P1-6 and includes those areas normally occupied by deer from December through April (ODFW 2013a). Direct impacts to Category 2 ODFW Mule Deer Winter Range include both temporary and permanent impacts (Table P1-14). The Category 2 acreages presented in Table P1-14 are a subset of the total Category 2 habitat identified in Tables P1-11 and P1-12. The duration of temporary impacts to Mule Deer Winter Range will vary depending on vegetation type; mitigation will be commensurate with impact duration as described in the Fish and Wildlife HMP (Attachment P1-6).

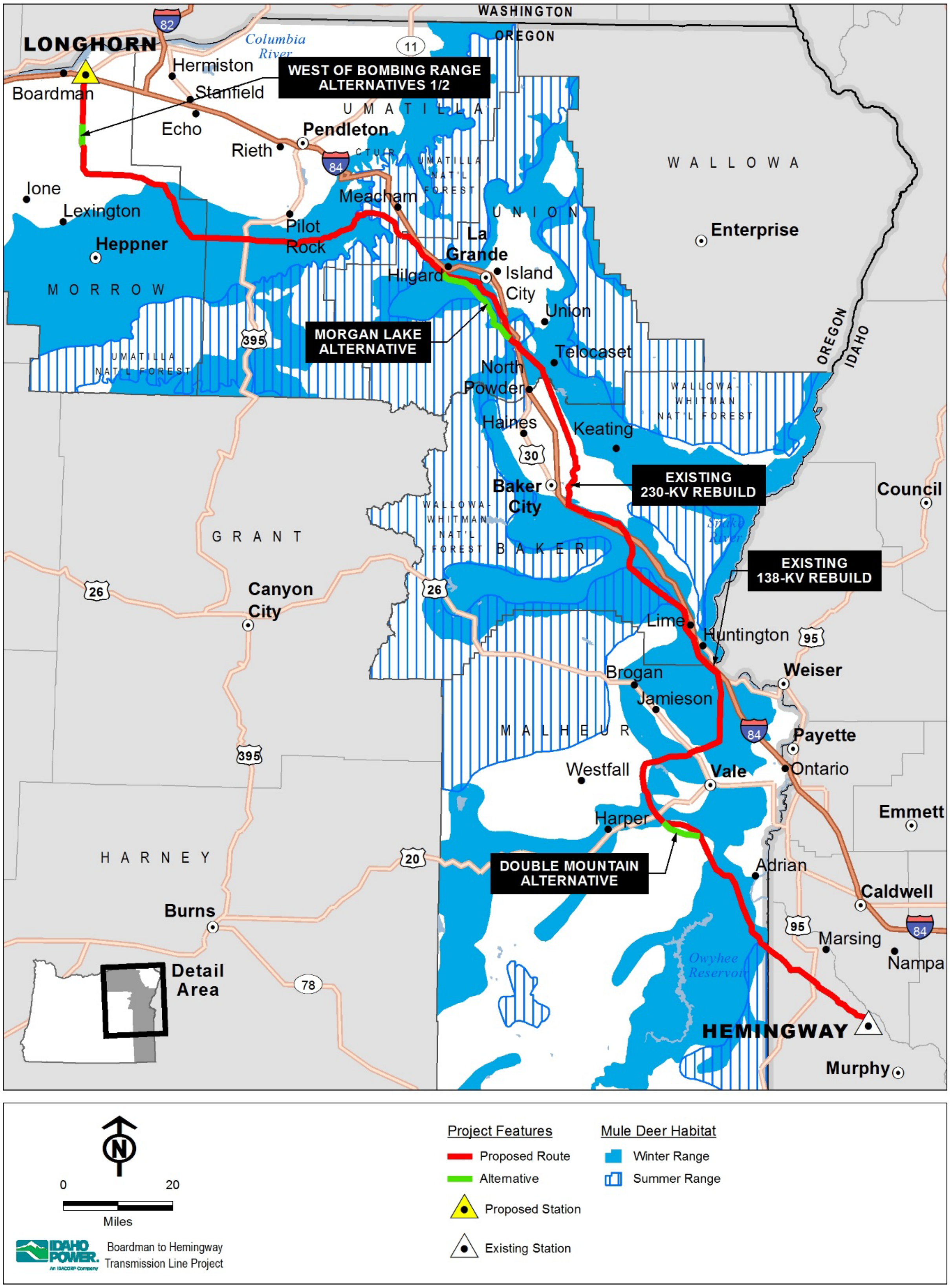

Figure P1-6. Mule Deer Winter Range and Summer Range Habitat

Table P1-14. Direct Impacts to Mule Deer Winter Range and Summer Range

ODFW Habitat Category	Acres Disturbed					
	Proposed Route		Morgan Lake Alternative		Double Mountain Alternative	
	Temp	Perm	Temp	Perm	Temp	Perm
2: Winter Range[1]	2,073.5	878.3	203.5	31.7	23.9	1.6
3: Summer Range[2]	288.8	605.8	85.2	15.1	–	–
Overlap of Winter Range and Summer Range[3]	154.2	142.6	62.5	10.2	–	–
Total[4] Category 2 + Category 3 - Overlap	**2,208.1**	**1,341.5**	**226.2**	**36.6**	**23.9**	**1.6**

[1] Winter range includes those areas normally occupied by deer from December through April (ODFW 2013a).
[2] Summer range as defined in the Mule Deer Habitat of the Western United States (WAFWA 2002)
[3] Overlap of Winter Range and Summer Range is where an area of impact occurs within both habitat types. Summer Range and Winter Range are not discrete areas.
[4] Total = [(Winter Range + Summer Range) – (Overlap of Winter Range and Summer Range)]. Total does not double count acres.

California Bighorn Sheep Herd Range

California Bighorn Sheep Herd Range is displayed in Figure P1-7 and includes those areas occupied year-round by the Burnt River herd (ODFW 2013b). Direct impacts to Category 2 ODFW California Bighorn Sheep Herd Range include both temporary and permanent impacts (Table P1-15). The Category 2 acreages presented in Table P1-15 are a subset of the total Category 2 habitat identified in Tables P1-11 and P1-12. The duration of temporary impacts to California Bighorn Sheep Herd Range will vary depending on vegetation type; mitigation will be commensurate with impact duration as described in the Fish and Wildlife HMP (Attachment P1-6).

Table P1-15. Direct Impacts to California Bighorn Sheep Herd Range

ODFW Habitat Category	Acres Disturbed	
	Proposed Route	
	Temp	Perm
2: Bighorn Sheep Herd Range[1]	1.6	14.2

[1] In Oregon, California bighorn sheep herds are non-migratory and herd ranges generally provide contiguous summer and winter range (ODFW 2003).

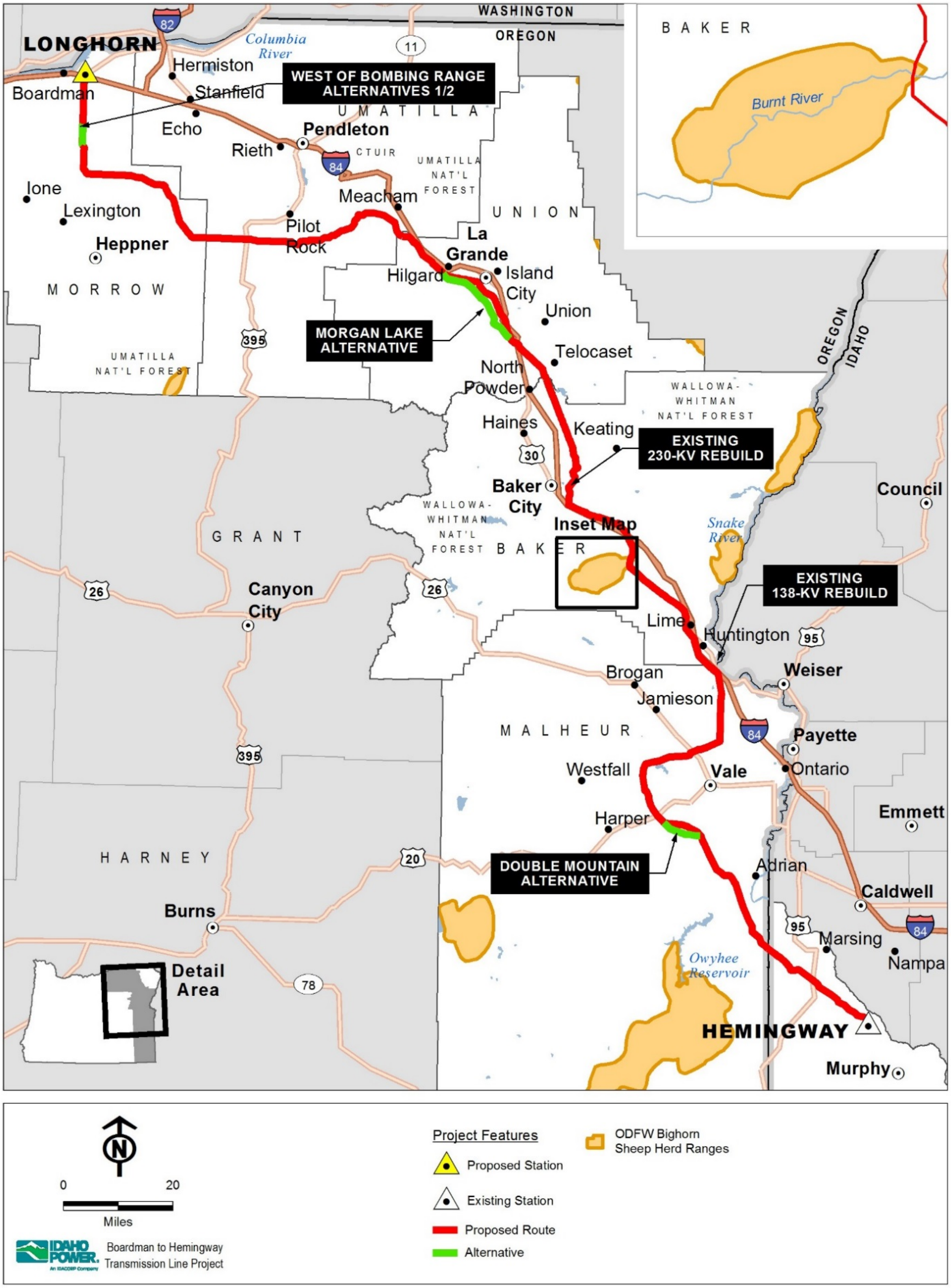

Figure P1-7. ODFW Bighorn Sheep Herd Ranges

Other Habitat

The remaining Category 2 habitat meets the definition of Category 2 habitat regardless of whether or not it overlaps Category 2 wildlife ranges. These areas were identified as Category 2 habitat types during TVES surveys based on the vegetation conditions encountered in the field. The Project will result in impacts to approximately 66 acres within these Category 2 habitat types. These habitat types meet the following criteria as defined in Attachment P1-1 (Habitat Categorization Matrix) and were included as Category 2 habitat:

- Douglas Fir/Mixed Grand Fir and Ponderosa Pine – Old forest multi-strata or old forest single strata with diameter at breast height of representative trees that is greater than 21 inches.
- Native Grasslands – In the Columbia Basin, undisturbed habitat dominated by native species with greater than 75 percent ground cover being native, or moderately disturbed habitat where 50 to 75 percent ground cover is native that contains a sagebrush component. Outside of the Columbia Basin, undisturbed habitat dominated by native species with greater than 75 percent ground cover being native.
- Emergent Wetland and Scrub-Shrub Wetland – High quality habitat dominated by native species.
- Fish-bearing Streams – Ephemeral, intermittent, and perennial fish-bearing streams. Fish presence determination is detailed in the Fish Habitat Report in Attachment P1-7B.

Category 3 Habitat

Approximately 55 percent of Category 3 habitat is categorized as such due to the presence of Elk Summer Range or Mule Deer Summer Range. The remaining 45 percent of Category 3 habitats (addressed as Other Habitat below) directly impacted by the Project were classified based on the vegetation conditions found within the habitat type during TVES surveys through application of the habitat categorization matrix in Attachment P1-1. Summer Range and Winter Range for elk and mule deer are not discrete areas. As a result, where the Category 3 Elk or Mule Deer Summer Range described here overlaps with Category 2 ODFW Elk or Mule Deer Winter Range for each species, only the Category 2 ODFW Winter Range is included in the total impact acreage (Tables P1-11 and P1-12) so areas of overlap are not double counted.

The habitat categories presented in Exhibit P1 reflect the inclusion of Elk Summer Range and how it modifies habitats to a Category 3 (except for agriculture and developed habitat types) within the analysis area and direct impact disturbance areas. However, the analysis of direct and indirect impacts to Category 3 Elk Summer Range is presented in Exhibit P3.

Mule Deer Summer Range

Mule deer summer range is displayed in Figure P1-6. Direct impacts to Category 3 ODFW Mule Deer Summer Range include both temporary and permanent impacts (Table P1-14). The duration of temporary impacts to these habitats will vary depending on vegetation type as described in Section 3.5.2; mitigation will be commensurate with impact duration as described in the Fish and Wildlife HMP (Attachment P1-6).

Other Habitat

Other Category 3 habitat occurs within habitat that meets the definition of Category 3 habitat regardless of whether or not it overlaps Elk or Mule Deer Summer Range. These areas were identified as Category 3 habitat types during TVES surveys based on the vegetation conditions encountered in the field. The Project will result in impacts to approximately 592 acres within these Category 3 habitat types. These habitat types meet the following criteria as defined in Attachment P1-1, Habitat Categorization Matrix, and were included as Category 3 habitat:

- Agriculture – Lands that appear to be enrolled in the Conservation Reserve Program based on vegetation composition and that contain later seral stage vegetation which could provide important habitat for special status wildlife species.
- Bare Ground, Cliffs, and Talus – Cliffs, talus slopes, and rock outcrops that do not contain sensitive raptor nests, or bat hibernacula-colonies.
- Douglas Fir / Mixed Grand Fir and Ponderosa Pine – Understory reinitiation forests with diameter at breast height of representative trees that is between 9 and 20.9 inches.
- Non-Fish-Bearing Streams – Ephemeral, Intermittent, and Perennial non-fish-bearing streams. Fish presence determination is detailed in Attachment P1-7B.
- Herbaceous Riparian – Area consists of a mix of native and non-native plants with a low to moderate level of disturbance.
- Desert Shrub, Shrub-steppe with Big Sage, and Shrub-steppe without Big Sage – Within the Columbia Basin, moderately disturbed habitat with a mix of natives and non-native shrubs with between 25 to 75 percent cover being native. Outside of the Columbia Basin, undisturbed habitat dominated by native species with greater than 75 percent native cover.
- Native Grasslands – In the Columbia Basin, moderately disturbed habitat with a mix of natives and non-natives with between 50 to 75 percent ground cover is native, or highly disturbed habitat with between 15 to 50 percent ground cover is native that contains a sagebrush component. Outside of the Columbia Basin, moderately disturbed habitat with a mix of natives and non-natives with between 50 to 75 percent ground cover is native.

Category 4, Category 5, and Category 6 Habitat

All Category 4, 5, and 6 habitats impacted by the Project were classified based on the vegetation conditions found within the habitat type during TVES surveys through application of the habitat categorization matrix in Attachment P1-1. Category 4 and Category 5 habitats are completely outside of the wildlife habitat overlays described in Section 3.3.2 and those same wildlife habitat overlays do not modify Category 6 habitat (agriculture/developed habitat types) per guidance from ODFW (2015b).

3.5.4 Indirect Impacts

Indirect impacts are defined as the impacts that will have an adverse effect upon fish and wildlife habitat or individuals, and that will occur later in time or in a different place than the Project activities. Indirect impacts may be permanent or temporary. Permanent impacts will exist for the entire life of the Project. Temporary impacts are those impacts that will last for a time less than the life of the Project. In this section, indirect impacts are discussed but not quantified. Exhibit P2 and Exhibit P3 quantify indirect impacts to sage-grouse and elk, respectively.

3.5.4.1 Permanent Indirect Impacts

Table P1-16 summarizes the type, timing, duration, quantification metric, and mitigation measures related to the Project’s potential permanent indirect impacts to fish and wildlife and their habitat.

Table P1-16. Type, Timing, Duration, Quantification Metrics, and Mitigation Measures Related to Permanent Indirect Impacts to Fish and Wildlife and Their Habitat

Type of Disturbance	Type of Impact	Timing of Impact	Duration of Impact	Metric to Quantify Effects on Habitat Functionality	Mitigation Measures
Permanent indirect impacts from the transmission line	Permanent indirect	Operation	Life of the Project	Not quantified – no or de minimis impacts expected; there is no reasonable and accepted methodology for quantifying these impacts	Permanent indirect impacts from vegetation clearing in forest lands will be minimized as set forth in the Vegetation Management Plan (Attachment P1-4).
Permanent indirect impacts from the access roads	Permanent indirect	Operation	Life of the Project	Not quantified – no or de minimis impacts expected; there is no reasonable and accepted methodology for quantifying these impacts	Permanent indirect impacts from the access roads will be mitigated by implementing speed limits, and controlling access on Project roads within certain habitat, subject to approval by the relevant land management agency or landowner.

Note: There is no metric to quantify the indirect impacts to the fish and wildlife species discussed here in Exhibit P1. However, certain indirect impacts are quantifiable for sage-grouse and elk, as discussed in Exhibit P2 and Exhibit P3, respectively.

Permanent Indirect Impacts from the Transmission Line

The permanent loss or alteration of habitats, described above for direct impacts, will result in some limited habitat fragmentation. Habitat fragmentation breaks up contiguous areas of habitat into small patches. Habitat fragmentation will be minimal as most of the Project crosses through low-lying vegetation that will not be permanently cleared. However, vegetative clearing and maintenance in forested/woodland areas (mostly found in the Blue Mountains region) will result in undisturbed forest/woodland patches separated by 250-foot-wide areas around the line. This will result in habitat fragmentation in forested and woodland habitats. Permanent indirect impacts from vegetation clearing in forest lands will be minimized as set forth in the Vegetation Management Plan (Attachment P1-4).

In the low-lying vegetation types (e.g., grasslands and shrublands) that make up most of the habitat crossed by the Project, a species would have to perceive the suspended transmission line itself as an appreciable break in the habitat continuity for habitat fragmentation to have a biological effect. However, the transmission line could be perceived by raptor and raven prey species as a form of habitat fragmentation in low-lying shrub and grassland habitats, due to the potential for increased predation rates near the line as a result of increased perching opportunities. Based on observations at existing power lines, it is possible that the Project could become an attractant to raptor and ravens for nesting and perching habitats (Gilmer and Wiehe 1977; Knight and Kawashima 1993; Steenhof et al. 1993; Connelly et al. 2004; Manzer and Hannon 2005; Coates and Delehanty 2010). If the Project's transmission line and structures become an attractant to raptors and ravens, and their numbers increase along the Project, this factor coupled with the reduced shrub cover in areas recovering from construction disturbances (i.e., a reduction in hiding cover for small animals) could result in increased predation rates on prey species. This effect would be most prominent where the Project is located in areas that do not contain other tall structures, such as existing transmission lines or trees. Of the 147 miles of the Proposed Route that are not located within 1 mile of an existing line, about 115 miles are located within shrubland/grassland habitats. Of the 10 miles of the Morgan Lake Alternative that are not located within 1 mile of an existing line, about 4 miles are located within shrubland/grassland habitats. Of the 7.4 miles of the Morgan Lake Alternative that are not located within 1 mile of an existing line, about 7 miles are located within shrubland/grassland habitats. However, there is no reasonable and acceptable methodology for quantifying permanent indirect impacts from the transmission line on fish and wildlife habitat, other than for elk and sage-grouse, which are addressed in Exhibits P2 and P3, respectively. Therefore, no mitigation is proposed for indirect impacts from the transmission line on fish and wildlife habitat, except for what is set forth in Exhibit P2 and P3.

Permanent Indirect Impacts from the Access Roads

New and substantially modified existing access roads are not expected to act as a barrier to fish and wildlife movement for most species. However, smaller and less mobile wildlife species may perceive the road surface as a barrier to movement due to a lack of hiding cover and prolonged exposure to predators. The introduction of traffic (i.e., motorized on- or off-road vehicles) and the presence of human activity on roads used for the Project potentially will have negative indirect impacts on fish and wildlife. The indirect impacts may include reduced utilization of adjacent habitat, fragmentation of migration corridors, and the associated disruption of breeding and foraging activities. These potential impacts can be substantially reduced through the implementation of a traffic management plan. Accordingly, as discussed above, IPC will implement speed limits and access control to minimize the effects that roads have on fish and wildlife habitat.

3.5.4.2 Temporary Indirect Impacts

Table P1-17 summarizes the type, timing, duration, quantification metric, and mitigation measures related to the Project’s potential temporary indirect impacts to fish and wildlife and their habitat.

Table P1-17. Type, Timing, Duration, Quantification Metrics, and Mitigation Measures Related to Temporary Indirect Impacts to Fish and Wildlife and Their Habitat

Type of Disturbance	Type of Impact	Timing of Impact	Duration of Impact	Metric to Quantify Effects on Habitat Functionality	Mitigation Measures
Temporary indirect impacts from access roads	Temporary indirect	Construction	Construction	Not quantified – no or de minimis impacts expected; there is no reasonable and accepted methodology for quantifying these impacts.	Temporary indirect impacts from access roads will be mitigated by implementing speed limits and controlling access on Project roads within certain habitat, subject to approval by the relevant land management agency or landowner.
Temporary indirect impacts from invasive species	Temporary indirect	Construction	Construction through re-vegetation	Not quantified – no or de minimis impacts expected; there is no reasonable and accepted methodology for quantifying these impacts.	Temporary indirect impacts from invasive species will be avoided, minimized or mitigated as set forth in the Noxious Weed Plan (Attachment P1-5) and Reclamation and Revegetation Plan (Attachment P1-3).

Temporary Indirect Impacts from Access Roads

Construction activities will result in noise, visual disturbance from heavy equipment, traffic and people, fugitive dust dispersing from the immediate construction area, and small amounts of air pollution from construction equipment's exhaust. Indirect construction impacts may also include an increased risk for the spread or establishment of invasive plant species (which can degrade habitats and exclude native species from areas), and increased access to areas previously inaccessible to the public due to the construction of Project-related roads (which can further degrade habitats as a result of increased human presence). These activities can impact fish and wildlife behavior in areas beyond the Project construction areas. For example, the habitat near the construction areas may temporarily be unsuitable during the construction period. Noise will likely have the farthest reaching effect (i.e., the effect of noise extends farther from construction sites than that of dust or other disturbances). Ambient noise in forested habitats generally ranges from 25 to 44 decibels (FWS 2006), and is usually lower in open and shrub habitats such as those found along the majority of the analysis area. Some construction activities will likely result in sound levels beyond baseline ambient levels, with a maximum instantaneous predicted noise level of 80 to 90 A-weighted decibels at 50 feet from the work site. These increases in noise will be concurrent with any disturbance associated with the presence of humans and their activities (e.g., dust, visual disturbances, etc.). These disturbances could render habitats unsuitable for a limited period of time, with disturbances ceasing once construction activities have ceased. IPC expects these impacts to be low. Even so, to avoid or minimize these impacts, IPC will implement speed limits and access control on Project roads in elk habitat, where possible.

Invasive Species Temporary Indirect Impacts

The initial clearing of vegetation and resulting soil disturbance during construction could create optimal conditions for the establishment of invasive-plant species. The establishment of invasive-plant species can affect the quality of wildlife habitat through competition with, and the eventual replacement of desirable native plant species (Westbrook 1998). The replacement of native plant species with invasive species can have various environmental effects on wildlife habitat, including changes in fire regime (e.g., increasing the frequency and severity of fires), changes in the nutrient regime of soils (thereby reducing the quality of forage species), increased soil erosion (resulting in additional loss of vegetated areas, as well as sedimentation to aquatic habitats), or reductions in the abundance of important forage species (due to invasive species excluding them from the area). These alterations to habitat quality can extend beyond the area of initial impacts (e.g., fires and/or invasive-plant species can spread to areas far beyond the initial disturbance/ignition). To avoid or minimize the risk of invasive-plant species spread or establishment, IPC will implement the Noxious Weed Plan (Exhibit P1, Attachment P1-5) and Reclamation and Revegetation Plan (Exhibit P1, Attachment P1-3). IPC proposes that the Council include the following conditions in the site certificate regarding the Noxious Weed Plan:

> ***Fish and Wildlife Condition 6****: Prior to construction, the site certificate holder shall finalize, and submit to the department for its approval, a final Noxious Weed Plan. The protective measures as described in the draft Noxious Weed Plan in ASC Exhibit P1, Attachment P1-5, shall be included and implemented as part of the final Noxious Weed Plan, unless otherwise approved by the department.*

> ***Fish and Wildlife Condition 19****: During construction, the site certificate holder shall conduct all work in compliance with the final Noxious Weed Plan referenced in Fish and Wildlife Condition 6.*

> ***Fish and Wildlife Condition 29****: During operation, the site certificate holder shall conduct all work in compliance with the final Noxious Weed Plan referenced in Fish and Wildlife Condition 6.*

3.5.4.3 Quantifying Indirect Impacts

No standard methods exist to quantify indirect impacts from the Project on fish and wildlife species other than sage-grouse and elk (which have methodologies established by ODFW). Given the unknown and likely variable response to the Project by different wildlife species, IPC will not quantify indirect impacts beyond those calculated for sage-grouse (Exhibit P2) and elk (Exhibit P3).

3.5.5 Potential Direct and Indirect Impacts to State Sensitive Species

This section discusses the potential Project impact to State Sensitive wildlife and fish species, as well as big game (excluding elk), which was identified by ODFW as a site-specific issue of concern. General impacts applicable to all species are described above; this section discusses impacts specific to certain taxa, such as mammals, birds, reptiles/amphibians, and fish. These potential impacts will be avoided or minimized by the measures discussed in Section 3.5.6.

3.5.5.1 Big Game

Big game species with potential to occur within the analysis area include elk, mule deer, bighorn sheep, and pronghorn antelope. Elk are addressed in Exhibit P3. Mule deer are expected to occur within the analysis area within seasonal ranges as described in Section 3.5.3.3 and depicted in Figure P1-6. The Burnt River herd of California bighorn sheep occupies habitat within the Burnt River Canyon between the Bridgeport Valley and the Durkee Valley. Impacts to California Bighorn Sheep Herd Range are described in Section 3.5.3.3 and the location of the Project in relation to California Bighorn Sheep Herd Range is depicted in Figure P1-7. Typical habitat characteristics of bighorn sheep include steep, rugged terrain associated with mountains, canyons, and escarpments (Van Dyke et al. 1983). Pronghorn antelope are associated with sagebrush and grassland steppes of the intermountain and Great Basin regions (Yoakum 1980). ODFW has not delineated important pronghorn habitat for eastern Oregon; therefore, acres of impacts to this species' habitat cannot be described. However, the Project's reduction of native habitat types within the shrub/grass general vegetation type has the potential to impact the species, as described below.

For big game species present during construction, there is a risk of mortality due to wildlife-vehicle collisions; however, the risk of vehicle collisions will be minimized by speed limits imposed on construction vehicles within the analysis area (see Section 3.5.3.1). Displacement of big game from both winter and parturition areas can affect winter survival by causing animals to use energy reserves that are needed to survive the winter. However, appropriate construction timing windows will be applied through seasonal restrictions within elk and mule deer winter range and will minimize the risk of disturbing big game during sensitive periods.

The Project crosses through delineated elk and mule deer winter and summer ranges and likely crosses migration routes and calving/fawning areas, and thus Project construction may result in some loss and fragmentation of habitat. Furthermore, ROW clearing for construction in forested/woodland habitats will remove thermal and hiding cover for big game; however, this clearing of vegetation has the potential to benefit big game species in some situations by providing clearings for use in foraging or traveling (Rowland et al. 1983; Stewart et al. 2000). The duration of these permanent impacts to habitat for big game species is expected to be indefinite, although areas cleared within the ROW may provide forage after 3 to 7 years. The duration of temporary impacts to habitat for big game species will vary by vegetation type as described above. Agricultural and disturbed areas will likely recover in 1 to 3 years, grasslands and herbaceous wetlands will likely recover within 3 to 7 years, shrublands may require 30 to 100 years to recover, and forested and woodland areas could take anywhere from 50 to many hundreds of years to reach pre-construction conditions. Mitigation will be commensurate with impact duration as described in the Fish and Wildlife HMP (Attachment P1-6).

Transmission line structures are not expected to limit the movement or distribution of big game species through fragmentation, as mule deer and pronghorn are expected to readily pass under transmission lines and associated structures. Bighorn sheep utilizing the Burnt River Canyon are unlikely to be affected, as the transmission line will span the canyon and the tower structures are set back from the steep rock escape habitat preferred by bighorn sheep. New and altered existing Project roads are similarly not expected to act as a barrier to big game movement in and of themselves. However, the introduction of traffic (i.e., motorized on or off-road vehicles) and the presence of human activity on roads used for the Project have the potential to negatively impact big game (ODFW 2015b).

Indirect impacts to big game from increased traffic rates may include reduced utilization of habitat, fragmentation of migration corridors, and the associated disruption of important big game life processes. However, these indirect impacts from roads to big game and their habitat can be significantly reduced with the implementation of a traffic management plan and best management practices (BMPs) (ODFW 2015b). IPC will implement access control to minimize the effects that roads have on big game and big game habitat. Access control may involve fencing, gates, barriers, and/or signage as preferred by the landowner while maintaining effectiveness. Specific road segments proposed for access control are described in IPC's Road Classification Guide and Access Control Plan (Exhibit B, Attachment B-5). See Exhibit P3 for further analysis of impacts from access roads on elk.

Although access control will reduce indirect impacts to big game on many Project roads, access control is not proposed for all Project roads and thus some indirect impacts are expected. For a description of which access roads will receive access control, see Exhibit B, Attachment B-5.

3.5.5.2 Small Fur-bearing Mammals

Potential impacts of the Project's construction and operation to State Sensitive small fur-bearers (i.e., pygmy rabbit, white-tailed jackrabbit, Pacific marten, and fisher) are similar to those discussed in Sections 3.5.3 and 3.5.4. During field surveys for the Project, one white-tailed jackrabbit was observed within the analysis area (Table P1-5). No pygmy rabbits, martens, or fishers were observed, although potential habitat for these species occurs indicating there is some potential for the Project to have impacts on the species.

Many small fur-bearers are fossorial animals (i.e., living underground). Construction equipment could result in the crushing of burrows and underground tunnels that could contain small mammals, resulting in direct mortality. The disturbance of soils and loss of vegetative cover can make these species more obvious to predators (i.e., removing hiding cover), thereby indirectly increasing their predation rates. This taxa may also experience a higher predation rate during operation, as they are likely to be a prey source for raptors and ravens that, as discussed in Section 3.5.4.1, could consolidate along the transmission line due to increased perching opportunities.

Temporary impacts to habitat for State Sensitive small fur-bearing mammal species will vary by species and habitat type, and depend on the pre-construction conditions. The duration of temporary impacts to pygmy rabbit habitat will likely last greater than 50 years as they require dense stands of sagebrush. For white-tailed jackrabbits, the grass and forb habitat component will likely recover relatively quickly, within 3 to 7 years, while the shrubs required for winter forage will likely take over 30 years to establish. As martens and fisher require mature, unfragmented forest, temporary impacts to habitat for this State Sensitive Species are likely to last 50 to many hundreds of years. Mitigation for both temporary and permanent impacts to habitat will be commensurate with impact duration as described in the Fish and Wildlife HMP (Attachment P1-6).

3.5.5.3 Bats

Impacts to bats were minimized by routing the Project to avoid mines, caves, and known bat hibernacula. However, bats will utilize habitats outside of these structures/areas as well, and the sensitive bat species in the analysis area can utilize trees and snags as habitat. State Sensitive bat species likely to use the analysis area include California myotis, long-legged myotis, hoary bat, silver-haired bat, fringed myotis, spotted bat, pallid bat, and Townsend's big-eared bat (Table P1-5). These species were not observed during Project surveys, although two records from existing databases show the presence of long-legged myotis within the analysis area in ponderosa pine habitat within Union County. If present during construction, impacts may include disturbance at roosts and hibernacula sites, and a reduction in foraging habitat as a result of vegetation removal. In order to minimize disturbance at bat roosts and hibernacula, IPC proposes that the Council include the following condition in the site certificate:

> ***Fish and Wildlife Condition 14****: During construction, if the roost of a State Sensitive bat species is observed during the biological surveys set forth in Fish and Wildlife Conditions 1, 2, or 3, the site certificate holder shall submit to the department for its approval a notification addressing the following:*
> *a. Identification of the State Sensitive bat species observed;*
> *b. Location of the roost; and*
> *c. Any actions the site certificate holder will take to avoid, minimize, or mitigate impacts to the roost.*

Direct mortality during construction is expected to be low, as bats would likely flush from trees and snags during construction. However, flushing of bats from day roosts or maternity colonies could result in the bats using up their bodily energy reserves, exposing themselves to predation, and potentially causing them to permanently abandon a suitable site. If disturbance occurs near winter hibernacula, bats may leave their roost and venture out to find a new one. This could result in mortality of the bats as bodily energy reserves are often low during winter and they may not find another suitable hibernaculum before their reserves are spent; however, all known bat hibernacula were avoided during Project routing so no direct impacts are expected. Disturbance at maternity colonies could have a negative impact if the bats are induced to abandon the colony, as suitable maternity colony structures have specific characteristics and another suitable structure may not exist nearby.

Removal of vegetation, especially around riparian areas, could impact prey abundance for foraging bats. The duration of impacts to riparian habitat that will be removed during construction, but restored following construction (i.e., temporary impacts) will likely be 50 or more years depending on the tree species composition and sensitivity of the habitat to disturbance. Riparian habitats with fast growing tree and shrub species such as willow or alder could recover in less than 50 years, while riparian habitats with slower growing species or located in harsher conditions for plant growth could take hundreds of years to recover. Mitigation for both temporary and permanent impacts to riparian habitat will be commensurate with impact duration as described in the Fish and Wildlife HMP (Attachment P1-6).

There is a record of a bat mortality resulting from a collision with a transmission line (Dedon et al. 1989), indicating that some adverse impacts could occur during operations. Nevertheless, potential mortalities to State Sensitive bats are expected to be low to non-existent.

3.5.5.4 Avian Species

Potential impacts of the Project's construction and operations to State Sensitive bird species will be similar to those discussed in Sections 3.5.3 and 3.5.4, except that birds might be more sensitive to direct mortality and disturbance during nesting than other species. Twenty-five State Sensitive bird species are likely to use the analysis area, including eight raptor species (Table P1-5). Several State Sensitive avian species were observed during Project surveys, and breeding activity was confirmed for four species within the analysis area: Swainson's hawk, long-billed curlew, burrowing owl, and Lewis' woodpecker.

In order to limit direct mortality and disturbance during nesting, construction activities will be limited to time periods outside of the primary avian breeding period to the extent practical. Similar to construction, maintenance and vegetation management activities during Project operations have the potential to cause direct mortality and disturbance during nesting. IPC will conduct routine line maintenance and vegetation clearing activities outside the breeding season if possible. However, construction and operation activities may need to be performed during the primary avian breeding period, in which case IPC proposes that the Council include the following condition in the site certificate in an effort to avoid impacts to state sensitive raptor species during the nesting season:

> ***Fish and Wildlife Condition 12:*** *During construction, the site certificate holder shall not conduct ground-disturbing activities within the following timeframes and spatial buffers surrounding occupied nests of certain raptor species. Upon request by the site certificate holder, the department may provide exceptions to this restriction. The site certificate holder's request must include a justification for the request, including any actions the site certificate holder will take to avoid, minimize, or mitigate impacts to the raptor and its nest.*

Nesting Species	Spatial Buffers (radius around nest site):	Temporal Restrictions
Western burrowing owl	0.25 mile	April 1 to August 15
Ferruginous hawk	0.50 mile	March 15 to August 15
Swainson's hawk	0.25 mile	April 1 to August 15
Great gray owl	0.25 mile	March 1 to August 15
Flammulated owl	0.25 mile	March 1 to August 15

If vegetation-clearing activities are performed during the primary avian breeding period, direct mortality and disturbance to native, non-raptor migratory bird nesting attempts could occur. To address that possibility, IPC proposes Fish and Wildlife Condition 13, providing IPC will survey for native, non-raptor bird species no more than 7 days prior to ground-disturbing activities if construction will occur during the migratory bird nesting season between April 1 and July 15.

The duration of impacts to habitat for State Sensitive avian species will vary by habitat type. The State Sensitive avian species likely to use the analysis area require a range of habitat types, including grasslands, wetlands, and shrublands, as well as forests and riparian corridors (Table P1-5). As described above, temporary Project impacts to grasslands and herbaceous wetlands will likely last between 3 and 7 years, shrublands may require 30 to 100 years to recover, and forested areas could take anywhere from 50 to many hundreds of years to reach pre-construction conditions. Mitigation will be commensurate with impact duration as described in the Fish and Wildlife HMP (Attachment P1-6).

There is a potential risk of avian collisions with transmission lines or other Project-related structures, which could result in elevated mortality rates for some avian species. A variety of factors influence avian transmission line collisions, such as: configuration and location of transmission lines; the tendency of specific species to collide with transmission lines; and environmental factors such as weather, topography, and habitat (APLIC and FWS 2005). Line placement with respect to other structures and topography can influence the collision rate of avian species at a given transmission line. Collisions usually occur near water or migration corridors, and occur more often during inclement weather. Less agile birds, such as heavy-bodied birds or birds that travel in flocks, are more likely to collide with overhead lines because they lack the ability to quickly negotiate obstacles. IPC has an existing Avian Protection Plan (Attachment P1-9); this plan is in compliance with Avian Power Line Interaction Committee

(APLIC) suggested practices, and includes measures that would be taken if avian mortalities are discovered (either as an incidental observation or during routine maintenance and monitoring), and modification and/or additions to the line that can be made if elevated mortalities of avian species are discovered. For example, if collisions are documented, a site-specific evaluation will be conducted and measures to reduce collision hazard will be implemented, such as marking the line by installing bird flight diverters or possibly removing the static line (i.e., overhead ground or optical ground wire) from a specific span (IPC 2008).

The presence of transmission line structures will provide additional nesting and perching opportunities for raptors and ravens as discussed in Section 3.5.4.1. While this may benefit some avian species, it will also have adverse impacts on avian prey species.

3.5.5.5 Reptiles and Amphibians

Potential impacts of the Project's construction and operations to State Sensitive reptile and amphibian species will be similar to those discussed in Sections 3.5.3 and 3.5.4 except that they may be more susceptible than other taxa to direct mortality due to some reptile and amphibian species' defense method of remaining still when threatened (i.e., they may not flee from construction equipment). State Sensitive herpetofauna that may be present within the analysis area include the northern sagebrush lizard, western toad, Rocky Mountain tailed frog, northern leopard frog, western painted turtle, and Columbia spotted frog (Table P1-5). These species were not observed during Project surveys, although a sagebrush lizard unidentifiable to subspecies observed during surveys could have been a northern sagebrush lizard. If present during construction and/or operation, direct impacts to State Sensitive reptiles and amphibians may include direct mortality and habitat loss.

The impact of individual mortalities would vary depending on the reproductive strategy of the species and the robustness of the population. Mortality of an individual could have no discernible effect on a large, quickly reproducing population, but could have an effect that lasts generations on a small, vulnerable, or slowly reproducing population such as the northern sagebrush lizard. Most reptiles produce a moderate number of young per year (e.g., a few to a dozen, occasionally two dozen or more), do not reach maturity until their second or third year, and do not always reproduce every year (Storm and Leonard 1995). Amphibians may not reproduce until their second year, but can lay up to 1,000 eggs. Therefore, both reptiles and amphibians are moderate in their ability to recover from population perturbations such as the death of individuals, but amphibians are likely better able to recover than reptiles due to the greater number of young that they produce. A small population, however, would experience a greater impact than a large one, regardless of the species, due to the number of reproductive individuals remaining after the impact.

The four State Sensitive amphibians and one of the reptiles (western painted turtle) likely to use the analysis area may be affected by impacts to waterbodies. Potential impacts to waterbodies including a description of the duration of impacts, and their effects to aquatic species are addressed in Section 3.5.5.6. The two State Sensitive reptiles and the Western toad may be affected by impacts to terrestrial habitats. As northern sagebrush lizards require shrubs such as big sagebrush and antelope bitterbrush, as well as rocks, logs, or burrows of other animals for perching and hiding, habitat for this species could take 30 to 100 years to recover, both for the shrubs to re-establish and for other animals to burrow into the disturbed soil. Western painted turtles use terrestrial habitat for nesting and hibernation, with nesting habitat being sparsely vegetated with little to no canopy cover within 325 feet of aquatic habitat. Terrestrial habitat for western painted turtles includes shrubland and grassland areas adjacent to waterbodies; temporary disturbance to grasslands will likely last between 3 and 7 years and temporary disturbances to shrublands between 30 and 100 years. Western toads use a variety of grassland, shrubland, woodland, and forest habitats outside of the breeding season; temporary impacts to these habitats will likely last between 3 and 7 years in grasslands, between 30 and 100 years in shrublands, and between 50 and many hundreds of years in woodland and forest habitats. IPC has proposed measures to avoid and minimize impacts to fish and wildlife species, as well as aquatic and terrestrial habitats (see Section 3.5.6).

3.5.5.6 Fish

State Sensitive fish species with potential to occur within the analysis area include Columbia Basin rainbow trout, Lower Snake River summer steelhead, Middle Columbia River summer steelhead, Pacific lamprey, and western brook lamprey. Habitat would vary among these fish species depending on their distribution. Based on results presented in the Fish Habitat Report (Attachment P1-7B), the most complete known distribution for any of the State Sensitive fish species in the analysis area is for the trout and steelhead species. Pacific lamprey and western brook lamprey habitat is not well documented in the analysis area, but would not extend outside of streams known to contain rainbow trout. Therefore, potential impacts to the known rainbow trout habitat are used as a proxy for potential effects to Pacific lamprey and western brook lamprey habitat within the analysis area.

Impacts to State Sensitive fish species and their habitat will occur at locations where the Project either crosses areas that contain fish, at crossings directly upstream of occupied areas (approximately 600 feet upstream [6]), as well as occupied areas that are not directly crossed but which are located adjacent to general soil disturbance and vegetation clearing. The amount of soil disturbance adjacent to waterbodies, as well as the number of waterbody crossings, the types of waterbodies crossed (e.g., intermittent or seasonally dry ephemeral, versus perennial streams), and the methods used to cross these waterbodies (i.e., transmission line spanning waterbodies versus access roads directly crossing them), will affect the type and magnitude of impacts that could occur to fish species and their habitats. Potential Project-related impacts to fish species/habitats could include alterations to LWD input, temperature, suspended sediment, sedimentation, as well as the toxic effect of spills and use of chemicals adjacent to or within waterbodies.

As currently proposed, the transmission line will span 47 fish-bearing streams and 18 roads will cross fish-bearing streams that will require modifications to the road or the stream crossing (Table P1-18). All of these crossings would potentially include Columbia Basin rainbow trout. The occurrence of sensitive species at the crossings (or within 600 feet upstream of the crossing location) is provided in Table P1-18. The fish passage plans and designs for the seven temporary road crossing structures that will require review by the ODFW are provided in Exhibit BB, Attachment BB-3. Of these seven crossings, none of the crossings will require work inside the channel bankfull margins. In addition, there are two road crossings located 600 feet upstream of fish-bearing streams; however, there will be no improvement to the existing crossing structures at these two crossings, as only the roads will be improved. Table P1-18 documents the crossings and associated general soil disturbance and riparian forest vegetation clearing.

Removal of riparian vegetation can have several potential adverse effects to aquatic systems, including an increase in erosion, reduced filtration of run-off, destabilization of stream banks,

[6] Research by Ritter (1984) suggests that noticeable increases in suspended sediment (e.g., over 20 milligrams per liter) would not likely occur within 100 feet downstream for small perennial streams and possibly about 200 feet for large perennial streams. These results from Ritter (1984), as well as other studies, were utilized for streams crossed by transmission lines or roads where actions actually disturb the stream bank or bottom (see further discussion below discussing turbidity and sedimentation potential impacts). Based on these studies, 600 feet was used to evaluate the distance sediment could be transported to or within a fish-bearing stream.

reduction of stream shade, reduced input of important terrestrial food source (i.e., allochthonous input), and a decrease in the availability of LWD. Riparian vegetation loss will initially occur during construction; however, ongoing vegetation maintenance in forested habitats will result in a permanent loss of taller trees within the analysis area of the transmission line. As the Project crosses through mostly low-lying shrubland vegetation, and forested/woodland habitats are mostly restricted to the Blue Mountains region, removal of trees in riparian areas is expected to be low (see Table P1-18). Furthermore, in areas spanned by the transmission line, trees will not be removed as long as the height of the tree (once mature) will not come within 50 feet of the wires (see Attachment P1-4, Vegetation Management Plan).

Construction of new and improvement of existing access roads across forested riparian areas could also result in removal of trees within the extent of the road bed. These roads will typically consist of a 14- to 16-foot-wide cleared area on flat ground, but may be up to 30 feet wide in some sloping areas to accommodate cut or fill. Of the 18 crossings over fish-bearing streams, 2 will be on new roads, 3 on roads needing 21 to 70 percent improvement, 7 on roads needing 71 to 100 percent improvement, and 6 on existing roads not requiring improvements other than temporary structures at the crossing locations. Due to the limited disturbance, road location, and vegetation type present at each of the 18 crossings, there will be some removal of woody vegetation from riparian areas at 5 of these crossings (see Table P1-18).

Table P1-18. Stream Crossing Characteristics of New or Reconstructed Project Roads and Transmission Lines Containing State Sensitive Trout and Steelhead

						Stream Name		Riparian Habitat Impacts at Crossing			Sensitive Fish Species at Crossing or as indicated within 600 feet Downstream				
Route Name	County	Subbasin Name	Subbasin HUC	Crossing Type	MP[1]	At Crossing Location	Tributary to:	Riparian Vegetation Type[2]	Impact to Forested Riparian (acres)[3]	Total Soil Impact within 500 feet of Stream (acres)[4]	Known Habitat Use (excluding rainbow trout)	Columbia Basin Rainbow Trout	Middle Columbia River Summer Steelhead	Lower Snake River Summer Steelhead	Bull Trout
Road Crossings[5]															
Proposed Route	Morrow, OR	Ayers Canyon-Butter Creek	170701030907	Road, Existing, 71-100% Improved	34.2	Butter Creek	Umatilla River	Non-forested	0.00	2.71		X			
Proposed Route	Umatilla, OR	West Birch Creek	170701030606	Road, Existing, 71-100% Improved	59.7	West Birch Creek	Birch Creek	Non-forested	0.00	0.73	Spawning/Rearing	X	X		
Proposed Route	Umatilla, OR	Lower East Birch Creek	170701030603	Road, Existing, 71-100% Improved	64.1	California Gulch	East Birch Creek	Mixed	0.02	0.46	Spawning/Rearing	X	X		
Proposed Route	Umatilla, OR	Lower East Birch Creek	170701030603	Road, Existing, 71-100% Improved	64.2	East Birch Creek	Birch Creek	Non-forested	0.00	0.34	Spawning/Rearing	X	X		
Proposed Route	Umatilla, OR	Stewart Creek-Birch Creek	170701030608	Road, Existing, 71-100% Improved	65.9	Ray Creek	Stewart Creek	Non-forested	0.00	0.69		X			
Proposed Route	Umatilla, OR	Wood Hollow-McKay Creek	170701030403	Road, Existing, 71-100% Improved	75.5	Unnamed Stream [1185935454536] (previously Wood Hollow)	McKay Creek	Mixed	0.11	0.40		X			
Proposed Route	Umatilla, OR	Wood Hollow-McKay Creek	170701030403	Road, Existing, 71-100% Improved	75.5	McKay Creek	Umatilla River	Mixed	0.12	0.31		X			
Proposed Route	Union, OR	Coleman Ridge-Grande Ronde River	170601040307	New, Primitive	99.6	Unnamed stream [1182366453311] [6]	Grande Ronde River	Mixed	NA [7]	NA [7]	Spawning/Rearing (Steelhead), Migration (Bull Trout)	X[6]		X[6]	X[6]
Morgan Lake Alternative	Union, OR	Rock Creek	170601040306	Road, Existing, No Substantial Improvements	102.9	Little Rock Creek [8, 9]	Rock Creek	Mixed	0.00	0.00	Spawning/Rearing	X		X	
Morgan Lake Alternative	Union, OR	Rock Creek	170601040306	Road, Existing, No Substantial Improvements	102.9	Rock Creek [8, 9]	Grande Ronde River	Mixed	0.00	0.00	Spawning/Rearing	X		X	
Morgan Lake Alternative	Union, OR	Rock Creek	170601040306	Road, Existing, No Substantial Improvements	103.0	Rock Creek [8, 9]	Grande Ronde River	Mixed	0.00	0.00	Spawning/Rearing	X		X	
Morgan Lake Alternative	Union, OR	Rock Creek	170601040306	Road, Existing, No Substantial Improvements	103.2	Rock Creek [8, 9]	Grande Ronde River	Mixed	0.00	0.00	Spawning/Rearing	X		X	
Morgan Lake Alternative	Union, OR	Upper Ladd Creek	170601040601	Road, New-Bladed	112.9	Unnamed stream [1180502451927]	Ladd Creek Pickup Ditch	Forested	0.16	0.88		X			
Proposed Route	Union, OR	East Fork Ladd Creek	170601040602	Road, Existing, 21-70% Improved	116.3	Unnamed Stream [1180266452136] (previously Ladd Canyon)	Ladd Creek Pickup Ditch	Mixed	0.07	0.38		X			
Proposed Route	Baker, OR	Powell Creek-Burnt River	170502020603	Road, Existing, 21-70% Improved	173.9	Powell Creek	Burnt River	Non-forested	0.00	0.37		X			
Proposed Route	Baker, OR	Dixie Creek	170502020807	Road, Existing, 21-70% Improved	183.6	Unnamed Stream [1173717444476] (previously Anderson Gulch) [6]	Dixie Creek	Non-forested	NA [7]	NA [7]		X[6]			
Proposed Route	Baker, OR	Jett Creek-Burnt River	170502020808	Road, New-Bladed	188.4	Goodman Creek [9]	Burnt River	Non-forested	0.00	0.31		X			
Proposed Route	Baker, OR	Durbin Creek-Burnt River	170502020809	Road, Existing, No Substantial Improvements	190.7	Cavanaugh Creek [8, 9]	Burnt River	Non-forested	0.00	0.00		X			
Proposed Route	Baker, OR	Benson Creek	170502010205	Road, Existing, No Substantial Improvements	195.4	Benson Creek [8, 9]	Snake River	Non-forested	0.00	0.97					

						Stream Name		Riparian Habitat Impacts at Crossing			Sensitive Fish Species at Crossing or as indicated within 600 feet Downstream				
Route Name	**County**	**Subbasin Name**	**Subbasin HUC**	**Crossing Type**	**MP[1]**	**At Crossing Location**	**Tributary to:**	**Riparian Vegetation Type[2]**	**Impact to Forested Riparian (acres)[3]**	**Total Soil Impact within 500 feet of Stream (acres)[4]**	**Known Habitat Use (excluding rainbow trout)**	**Columbia Basin Rainbow Trout**	**Middle Columbia River Summer Steelhead**	**Lower Snake River Summer Steelhead**	**Bull Trout**
Proposed Route	Owyhee, ID	Hardtrigger Creek	170501030701	Road, Existing, 21-70% Improved	288.9	Hardtrigger Creek	Snake River	Non-forested	0.00	0.43					
Transmission Line Crossings															
Proposed Route	Morrow, OR	Middle Little Butter Creek	170701031002	Transmission Line	27.7	Little Butter Creek	Butter Creek	Non-forested	0.00	0.00		X			
Proposed Route	Morrow, OR	Ayers Canyon-Butter Creek	170701030907	Transmission Line	28.1	Butter Creek	Umatilla River	Non-forested	0.00	0.00		X			
Proposed Route	Morrow, OR	Ayers Canyon-Butter Creek	170701030907	Transmission Line	34.2	Butter Creek	Umatilla River	Non-forested	0.00	0.63		X			
Proposed Route	Umatilla, OR	Hog Hollow-Butter Creek	170701030904	Transmission Line	50.1	Butter Creek	Umatilla River	Non-forested	0.00	0.27		X			
Proposed Route	Umatilla, OR	Bear Creek-West Birch Creek	170701030604	Transmission Line	58.6	Bear Creek	West Birch Creek	Non-forested	0.00	0.00	Spawning/Rearing	X	X		
Proposed Route	Umatilla, OR	West Birch Creek	170701030606	Transmission Line	59.7	West Birch Creek	Birch Creek	Non-forested	0.00	0.06	Spawning/Rearing	X	X		
Proposed Route	Umatilla, OR	Lower East Birch Creek	170701030603	Transmission Line	64.1	California Gulch	East Birch Creek	Non-forested	0.00	0.37	Spawning/Rearing	X	X		
Proposed Route	Umatilla, OR	Lower East Birch Creek	170701030603	Transmission Line	64.7	East Birch Creek	Birch Creek	Non-forested	0.00	1.34	Spawning/Rearing	X	X		
Proposed Route	Umatilla, OR	Sevenmile Creek-McKay Creek	170701030406	Transmission Line	75.6	McKay Creek	Umatilla River	Mixed	1.00	0.16		X			
Proposed Route	Umatilla, OR	Wood Hollow-McKay Creek	170701030403	Transmission Line	80.3	Rail Creek	McKay Creek	Forested	1.49	0.00		X			
Proposed Route	Umatilla, OR	Beaver Creek-Meacham Creek	170701030201	Transmission Line	83.4	Little Beaver Creek	Beaver Creek	Forested	1.49	0.28	Spawning/Rearing	X	X		
Proposed Route	Umatilla, OR	Beaver Creek-Meacham Creek	170701030201	Transmission Line	84.8	Beaver Creek	Meacham Creek	Forested	1.49	1.15	Spawning/Rearing	X	X		
Proposed Route	Union, OR	Pelican Creek	170601040402	Transmission Line	94.8	Dry Creek	Pelican Creek	Forested	1.49	1.12	Spawning/Rearing	X	X		
Proposed Route	Union, OR	Coleman Ridge-Grande Ronde River	170601040307	Transmission Line	99.5	Grande Ronde River	Snake River	Mixed	0.88	0.00	Spawning/Rearing (Steelhead), Migration (Bull Trout)	X		X	X
Morgan Lake Alternative	Union, OR	Coleman Ridge-Grande Ronde River	170601040307	Transmission Line	99.6	Grande Ronde River	Snake River	Mixed	0.68	0.00	Spawning/Rearing (Steelhead), Migration (Bull Trout)	X		X	X
Proposed Route	Union, OR	Rock Creek	170601040306	Transmission Line	101.1	Rock Creek	Grande Ronde River	Mixed	0.23	0.00	Spawning/Rearing	X		X	
Morgan Lake Alternative	Union, OR	Rock Creek	170601040306	Transmission Line	101.5	Graves Creek	Rock Creek	Forested	1.49	0.13	Spawning/Rearing	X		X	
Morgan Lake Alternative	Union, OR	Rock Creek	170601040306	Transmission Line	101.8	Rock Creek	Grande Ronde River	Mixed	1.46	0.50	Spawning/Rearing	X		X	
Morgan Lake Alternative	Union, OR	Rock Creek	170601040306	Transmission Line	102.5	Sheep Creek	Rock Creek	Forested	1.49	0.27	Spawning/Rearing	X		X	

Route Name	County	Subbasin Name	Subbasin HUC	Crossing Type	MP[1]	Stream Name: At Crossing Location	Stream Name: Tributary to:	Riparian Habitat Impacts at Crossing: Riparian Vegetation Type[2]	Riparian Habitat Impacts at Crossing: Impact to Forested Riparian (acres)[3]	Riparian Habitat Impacts at Crossing: Total Soil Impact within 500 feet of Stream (acres)[4]	Sensitive Fish Species at Crossing or as indicated within 600 feet Downstream: Known Habitat Use (excluding rainbow trout)	Columbia Basin Rainbow Trout	Middle Columbia River Summer Steelhead	Lower Snake River Summer Steelhead	Bull Trout
Morgan Lake Alternative	Union, OR	Rock Creek	170601040306	Transmission Line	104.2	Sheep Creek	Rock Creek	Mixed	1.32	0.00	Spawning/Rearing	X		X	
Proposed Route	Union, OR	Gekeler Slough	170601040603	Transmission Line	106.5	Mill Creek	Gekeler Slough	Forested	1.49	0.00	Spawning/Rearing	X		X	
Proposed Route	Union, OR	Lower Ladd Creek	170601040604	Transmission Line	114.1	Ladd Creek Pickup Ditch	Catherine Creek	Mixed	0.03	0.00	Spawning/Rearing	X		X	
Morgan Lake Alternative	Union, OR	Upper Ladd Creek	170601040601	Transmission Line	115.2	Ladd Creek Pickup Ditch	Catherine Creek	Mixed	1.48	0.00		X			
Proposed Route	Union, OR	East Fork Ladd Creek	170601040602	Transmission Line	115.8	Unnamed Stream [1180266452136] (previously Ladd Canyon)	Ladd Creek Pickup Ditch	Mixed	0.19	0.00		X			
Proposed Route	Union, OR	Jimmy Creek	170502030603	Transmission Line	124.7	Clover Creek	Jimmy Creek	Non-forested	0.00	0.00		X			
Proposed Route	Union, OR	Jimmy Creek	170502030603	Transmission Line	124.9	Jimmy Creek	Powder River	Non-forested	0.00	0.00		X			
Proposed Route	Union, OR	Thief Valley Reservoir-Powder River	170502030605	Transmission Line	128.2	Powder River	Snake River	Non-forested	0.00	0.00		X			
Proposed Route	Baker, OR	Lower Alder Creek	170502020703	Transmission Line	166.0	Alder Creek	Pritchard Creek	Non-forested	0.00	0.02		X			
Proposed Route	Baker, OR	Powell Creek-Burnt River	170502020603	Transmission Line	171.3	Burnt River	Snake River	Mixed	0.43	0.00		X			
Proposed Route	Baker, OR	Powell Creek-Burnt River	170502020603	Transmission Line	175.0	Powell Creek	Burnt River	Mixed	0.74	0.00		X			
Proposed Route	Baker, OR	Dixie Creek	170502020807	Transmission Line	185.4	Dixie Creek	Burnt River	Non-forested	0.00	4.16		X			
Proposed Route	Baker, OR	Jett Creek-Burnt River	170502020808	Transmission Line	188.3	Goodman Creek	Burnt River	Non-forested	0.00	2.58		X			
Proposed Route	Baker, OR	Durbin Creek-Burnt River	170502020809	Transmission Line	190.7	Cavanaugh Creek	Burnt River	Non-forested	0.00	0.00		X			
Proposed Route	Baker, OR	Durbin Creek-Burnt River	170502020809	Transmission Line	192.8	Durbin Creek	Burnt River	Non-forested	0.00	0.71		X			
Proposed Route	Baker, OR	Benson Creek	170502010205	Transmission Line	195.0	Benson Creek	Snake River	Non-forested	0.00	1.45		X			
Proposed Route	Malheur, OR	Lower Birch Creek	170502010204	Transmission Line	199.1	Birch Creek	Snake River	Non-forested	0.00	0.00		X			
Proposed Route	Malheur, OR	Willow Creek	170501190603	Transmission Line	215.7	Willow Creek	Malheur River	Non-forested	0.00	6.76		X			
Proposed Route	Malheur, OR	Swede Flat Creek-Cottonwood Creek	170501180303	Transmission Line	226.8	Cottonwood Creek	Bully Creek	Non-forested	0.00	1.37		X			
Proposed Route	Malheur, OR	Washington Creek-Bully Creek	170501180302	Transmission Line	228.4	Bully Creek	Malheur River	Non-forested	0.00	0.78		X			
Proposed Route	Malheur, OR	Vine Hill-Malheur River	170501170403	Transmission Line	231.9	Malheur River	Snake River	Mixed	0.14	1.22		X			
Proposed Route	Malheur, OR	Rock Spring Canyon-Owyhee River	170501100704	Transmission Line	255.2	Owyhee River	Snake River	Non-forested	0.00	0.00		X			
Proposed Route	Malheur, OR	South Alkali Creek-Succor Creek	170501030907	Transmission Line	266.9	Succor Creek	Snake River	Mixed	0.63	1.00		X			

						Stream Name		Riparian Habitat Impacts at Crossing			Sensitive Fish Species at Crossing or as indicated within 600 feet Downstream				
Route Name	**County**	**Subbasin Name**	**Subbasin HUC**	**Crossing Type**	**MP[1]**	**At Crossing Location**	**Tributary to:**	**Riparian Vegetation Type[2]**	**Impact to Forested Riparian (acres)[3]**	**Total Soil Impact within 500 feet of Stream (acres)[4]**	**Known Habitat Use (excluding rainbow trout)**	**Columbia Basin Rainbow Trout**	**Middle Columbia River Summer Steelhead**	**Lower Snake River Summer Steelhead**	**Bull Trout**
Proposed Route	Owyhee, ID	Middle Jump Creek	170501031002	Transmission Line	276.2	Poison Creek	(no outlet)	Non-forested	0.00	0.15		X			
Proposed Route	Owyhee, ID	Middle Jump Creek	170501031002	Transmission Line	278.0	Jump Creek	Snake River	Mixed	0.09	1.43		X			
Proposed Route	Owyhee, ID	Lower Squaw Creek	170501030703	Transmission Line	283.4	Squaw Creek	Snake River	Forested	1.49	0.29		X			
Proposed Route	Owyhee, ID	Hardtrigger Creek	170501030701	Transmission Line	289.2	Hardtrigger Creek	Snake River	Non-forested	0.00	1.59		X			
Proposed Route	Owyhee, ID	Lower Reynolds Creek	170501030604	Transmission Line	294.0	Reynolds Creek	Snake River	Non-forested	0.00	0.26		X			

[1] MP = milepost; the mileposts reflect the location of the crossing relative to the Proposed Route.
[2] Riparian areas were determined as one site-potential tree height (150 feet) from the GAP data. The USFS and BLM (1997) indicated that site potential tree height in the forested areas of the Project is 150 feet in areas considered to be “Moist Forest” and 120 feet in “Dry Forest.” The GAP data and associated analysis sorted vegetation types into forest, which include all class designated as having trees, "non-forest" were all types classified as not having trees (e.g. shrubs/grasses or wetlands), "mixed" indicates that the area adjacent (within 150 feet of the stream) to the stream that included some area of forest and non-forest vegetation types.
[3] Area of project right-of-way (ROW), plus any ground disturbance caused by construction outside of the ROW, within 150 feet of road and transmission line stream crossings, which are also classified as forested. This is the maximum potential removal of forest area; however, much of the area will not be cleared due to various lengths of transmission line spanning trees at most crossings.
[4] Soil disturbance includes area of new and improved roads, tower pads and pulling sites within 500 feet of the stream at the specific crossing.
[5] Roads at crossing were either "new," meaning a new road would be constructed to the crossing; "improved," meaning an existing road is present, but some modification will be needed on the road; or "unchanged," meaning the road is adequate but the stream crossing would need modification.
[6] These crossings are of non-fish-bearing streams within 600 feet (stream distance) upstream of a fish bearing stream.
[7] NA=no assessment of disturbance or vegetation removal were assessed at these crossings as they are not at fish-bearing stream crossings; however, they are included in the table as they occur within 600 feet upstream of fish-bearing streams.
[8] These stream crossings were determined from field surveys to possibly need improvement even though no road improvements are planned.
[9] Requires a temporary structure over a fish-bearing stream in Oregon and will require review by the ODFW (Exhibit BB, Attachment BB-3 provides the fish passage plans and designs).

Stream temperature can be affected by removal of streamside vegetation. For example, cool stream temperatures are required for proper completion of the life cycle functions of some fish species (e.g., salmon and trout in Northwest streams), while warm water temperatures can limit rearing, spawning, egg incubations, and migration of salmon and trout (ODEQ 1995; McCullough 1999; McCullough et al. 2001; Sauter et al. 2001; Ecology 2002; EPA 2003). For example, the maximum temperature in the short term (i.e., less than a week) that may cause direct mortality of salmon and trout ranges from about 22 to 26 degrees Celsius (°C) depending on the species (ODEQ 1995; Ecology 2002; EPA 2003). Under laboratory conditions, bull trout mortality has been documented in less than 24 hours when bull trout are exposed to temperatures of 26°C or more (Selong et al. 2001). Hicks (2000) recommended that daily maximum temperatures remain below 19 to 20°C to prevent directly lethal conditions to steelhead. Furthermore, rearing habitat quality may be reduced when temperature exceeds 12 to 20°C for extended periods, depending on species and food availability (EPA 2003), and bull trout do not typically utilize habitats where the water temperatures exceed 15°C.

Temperatures changes from loss of riparian vegetation are likely to be varied among streams. Generally, the larger the relative area exposed to solar radiation the greater the magnitude of temperature change. Total temperature change across a cleared area, however, would be greater in small streams than large ones, due largely to shallower depth and lower volume of water in smaller streams. However, as most of the riparian areas in the analysis area currently consist of shrubs and grasses, and much of this vegetation would not be permanently cleared by the Project, retained streamside vegetation is likely to be suitable to maintain adequate shade to prevent substantial temperature increases. DeWalle (2010) examined models of the effect of buffer height, width, and vegetation density on maintaining adequate shade on streams. He concluded that for a moderate to high density of canopy thickness, a ratio of buffer height to stream width of five would maintain adequate stream shade. This suggests that streams in the range of about 3 to 7 feet wide, with a vegetation buffer of 15 and 35 feet high or wide, may be adequately buffered to maintain temperature if the density of vegetation is high, indicating even moderate retention of vegetation could help moderate stream water temperatures crossed by the Project. As a result, Project actions would not likely result in a substantial temperature increase that could result in a biological effect at most locations that contain fish resources.

Clearing of riparian vegetation at transmission line crossings and other construction facilities can reduce the source and quantity of LWD to streams. LWD present in streams will take decades to decay for the larger pieces (Murphy and Koski 1989). Beechie et al. (2000) considered 1.5 to 2.0 percent per year loss of in-stream LWD in Northwest streams to be reasonable. Thus, much of the current LWD in streams will remain over several decades. However, in the long term, at the transmission line crossings of streams LWD quantity will be reduced, resulting in reducing overall local and possibly downstream habitat conditions. The area of wooded riparian vegetation removed, assuming complete removal of all trees within one site potential tree height (150 feet) on each side of the stream crossing, is shown in Table P1-16. This could reduce site-specific LWD supply directly in fish streams.

The clearing of riparian vegetation, installation or modification of stream crossing structures, as well as the presence and use of access roads can increase the input of sedimentation into adjacent waterbodies. Increased turbidity and sedimentation can impact fish behavior and physiological processes (e.g., blood chemistry, gill trauma, immune system resistance), and can result in reduced growth, health, and an increase in the risk of mortality. Sediment entering the water column can be redeposited on downstream substrates, which could bury aquatic macroinvertebrates (an important food source for some fish species). Additionally, downstream sedimentation could impact spawning habitat, spawning activities, eggs, larvae, and juvenile fish survival, as well as benthic community diversity and health. Because the impacts of increased sedimentation and turbidity are often limited to the period of work / soil disturbance, the duration of these impacts is expected to be relatively short. However, specific site characteristics including flow, substrate composition, relative disturbance, and other factors could extend the duration of construction impacts. Construction of access roads across waterbodies and installation or modification of stream crossing structures, as well as any other in-water work, is typically a major contributor to waterbody sedimentation. As presented in Table P1-18, 7 roads will cross fish-bearing streams that will require temporary structures over the road crossings. None of these 7 crossings will require work to be done inside the channel bankfull margins; no other instream work will occur for the other 11 crossings on fish-bearing streams. In addition to those 7 crossings over fish-bearing streams, there are 2 road crossings located 600 feet upstream of fish-bearing streams; however, at these 2 crossings there will be no improvement to the existing crossing structure, as only the roads will be improved.

Use of existing access roads, soil disturbance adjacent to waterbodies, as well as clearing of riparian vegetation in areas where the transmission line would span waterbodies would, however, contribute to the risk of erosion and sedimentation. Two of the most important factors in determining the risk of erosion and sedimentation to streams are soil disturbance (e.g., from existing roads, tower pads, clearing of vegetation) distance from the stream and the presence of vegetation between the disturbance and the stream (MacDonald et al. 2001; Croke and Hairsine 2006; Rashin et al. 2006; Olsen et al. 2007; McCune 2010). Some studies noted that approximately 100-foot vegetated buffers have been considered effective at reducing sediment to streams from land-disturbing activities (Croke and Hairsine 2006; Olsen et al. 2007). Modeling by Olsen et al. (2007), however, noted large contributions of sediment from beyond this distance with or without buffers. McCune (2010) found that direct connection of flow from roads, which would include sediment, decreased linearly for a distance up to about 660 feet (200 meters). Knutson and Naef (1997) summarized literature on riparian function, including riparian distance considered suitable to adequately reduce sediment entry from overland runoff to streams. The maximum vegetative buffer distance considered in the literature to adequately control sediment entry to water bodies was 300 feet (Knutson and Naef 1997). Based on these studies the total ground disturbance area proximity to the streams can influence sediment contribution to streams, with potential increases in erosion and sedimentation associated with soil disturbance between 100 and 660 feet. Considering the varied results from literature and likely vegetation disturbance resulting from project activities, a distance of 500 feet was considered conservative for potential sediment movement to streams from soil disturbance activity.

Regarding downstream sediment transport, Ritter (1984) developed a model estimating downstream distance and concentration of suspended sediment from construction of a pipeline from wet bottom trenching (i.e., a very significant form of stream bottom disturbance). This form of bottom disturbance is likely much greater than what will occur from normal stream crossing related to transmission line construction activities. Transmission line disturbance is likely more similar to, but much less than, the “dry” crossing pipeline construction type, in which bottom disturbance is isolated from flowing water (e.g., empirical suspended sediment data by Reid et al. [2002] found that dry, open-cut pipeline installation produced about one-seventh the amount of sediment produced by wet cut pipeline methods). Adjusting the Ritter (1984) wet bottom trenching model for the lower suspended sediment concentration (in proportion to estimates for dry crossing method) suggests that noticeable increases in suspended sediment (e.g., over 20 milligrams per liter) will not likely occur within 100 feet downstream for small fish streams and possibly about 200 feet for large fish streams crossed by the transmission line where actions actually disturb the stream bank or bottom. This estimate is likely still higher than what is likely to occur from transmission line stream crossings that will occur as a result of the Project. It should be noted that turbidity levels (as measured in nephelometric turbidity units) are strongly correlated with suspended sediment levels (Lloyd et al. 1987; Rosetta 2005) and will follow similar patterns of change in magnitude.

The FWS (2004 and 2007) evaluated potential effects associated with construction of stream crossing structures and instream restoration projects and identified that turbidity and sedimentation plumes may occur up to 600 feet downstream of individual projects. In addition, the FWS (2004 and 2007) documented that besides direct construction, turbidity and sedimentation plumes could also affect fish during the initial seasonal high flows for brief periods (e.g., 3 hours). Based on the literature from Ritter (1984), Reid et al. (2002), and FWS (2004 and 2007), increased turbidity and sedimentation could occur between 100 and 600 feet downstream of a crossing, with the potential to impact State Sensitive fish species and their habitat. Considering the varied results from literature, a distance of 600 feet was used to evaluate the distance sediment could be transported to or within a fish-bearing stream.

To reduce the potential for the Project to increase sedimentation and turbidity resulting from clearing of riparian vegetation, installation or modification of stream crossing structures, as well as the presence and use of access roads, IPC has developed various construction and operation plans, including the Vegetation Management Plan (see Attachment P1-4; Fish and Wildlife Conditions 5, 17, and 27) and the Reclamation and Revegetation Plan (see Attachment P1-3; Fish and Wildlife Conditions 4 and 16).

Unrestricted access to habitat is important for both resident and anadromous salmonids. Upstream-migrating fish require access to suitable spawning gravel and juvenile fish must be able to disperse upstream and downstream to take advantage of available rearing habitat. If culverts or other types of road crossing structures are poorly designed, constructed, or maintained, they can affect the population of entire stream drainages. As presented in Table P1-18, 18 roads will cross fish-bearing streams that will require improvements, with 7 of the 18 requiring temporary road crossing structures that will be reviewed by the ODFW. The fish passage plans and designs prepared for ODFW review are provided in Exhibit BB, Attachment BB-3. None of these 7 crossings will require work to be done inside the channel bankfull margins. If any future route modification require road crossing improvement or modifications beyond those identified in the fish passage plans, IPC will install all culverts or other stream crossing structures in accordance with ODFW fish passage rules and approvals. In addition, any crossing structure not already approved will be installed in accordance with BLM and USFS requirements on federally managed lands. As a result of these fish passage plans and designs, as well as the overall Project designs to minimize the number of fish-bearing crossings, the Project is unlikely to adversely affect fish passage. To ensure compliance with the Fish Passage Plan, IPC proposes the following site certificate conditions:

> ***Other Information Condition 1****: Prior to construction, the site certificate holder shall finalize, and submit to the department for its approval, a final Fish Passage Plan. The protective measures described in the draft Fish Passage Plan in ASC Exhibit BB, Attachment BB-2, shall be included as part of the final Fish Passage Plan, unless otherwise approved by the department.*

> ***Other Information Condition 4****: During construction, the site certificate holder shall conduct all work in compliance with the final Fish Passage Plan referenced in Other Information Condition 1.*

Another potential impact to fish habitat during construction is the risk of hazardous materials entering surface water supplies. For example, petroleum products entering streams can have direct toxic effects to fish and indirect effects by impacting aquatic macroinvertebrates (i.e., a major food source for fish). With the use of heavy and light equipment within the analysis area, there is the potential for spills of fuel and oils from storage containers, equipment working in or near streams, and fuel transfers. In addition, the construction of the tower footings would require the pouring of concrete. If wet concrete or concrete cleaning water enters streams, it could have an adverse effect on fish and other aquatic organisms from elevation of pH levels (e.g., stress, injury). Herbicides used near waterbodies (used to control invasive-plant species) can leach into waterbodies, or run off into waterbodies during rain events. These herbicides can have adverse effects on fish species, resulting in reduced fitness or mortality. To reduce the risk of oils, wet concrete, or wash water entering streams, IPC will follow the avoidance and minimization measures outlined in the Spill Prevention, Containment, and Countermeasures (SPCC) Plan (see Exhibit G, Attachment G-4, as well as Exhibit J, which contains some of the preliminary measures that will be followed), which will be fully developed during final design of the Project and submitted to ODOE prior to construction of the Project. Both Exhibit G, Attachment G-4, and Exhibit J contain measures that will prevent hazardous substances from entering fish-bearing streams. Use of herbicides will follow agency-approved types and application methods on federal lands and manufacturer's recommendations on private lands (see Attachment P1-5, Noxious Weed Plan, and Attachment P1-4, Vegetation Management Plan), which will include restrictions on where herbicides could be used (e.g., restriction on use near waterbodies).

Fish salvage (i.e., removal or exclusion of fish from an area) is often necessary during installation of culverts or other crossing structures on perennial streams. Potential adverse effects of fish salvage include fish injury, stress, and direct mortality. Injury and stress could result in the individual fish becoming more susceptible to infection or predation, thereby resulting in mortality. All structure installations at the identified crossings will be temporary and require ODFW approval, however, and none of the crossings will require work within the bankfull channel. Therefore, the Project will not likely require any work area isolation and fish salvage. Although no fish salvage is currently proposed for the Project, any site related to the Project that requires work area isolation and fish salvage will adhere to the ODFW-approved methods and therefore limit potential adverse effects to fish species.

3.5.6 Measures to Avoid, Reduce, or Mitigate Adverse Effects

OAR 345-021-0010(1)(p)(G): A description of any measures proposed by the applicant to avoid, reduce or mitigate the potential adverse impacts described in (F) in accordance with the ODFW mitigation goals described in OAR 635-415-0025 and a discussion of how the proposed measures would achieve those goals.

This section describes the avoidance, minimization, and mitigation measures that have been and will be implemented to avoid, reduce, or mitigate potential adverse impacts to fish and wildlife habitat and State Sensitive species, and discusses how the proposed measures achieve ODFW habitat mitigation goals. Mitigation is further discussed in the Fish and Wildlife HMP (Attachment P1-6).

3.5.6.1 Avoidance and Minimization Measures

Project Design

During initial routing of the Project, avoidance of sensitive resources related to fish and wildlife habitat and State Sensitive species was taken into consideration by IPC. Applicable sensitive resource areas that were avoided to the extent practical during the initial siting process included, but were not limited to:

- BLM-designated areas of critical environmental concern;
- BLM-designated wilderness study areas;
- Waterbodies and wetlands, including wild and scenic rivers and streams with special status species;

- FWS and NOAA Fisheries critical habitats for federal Endangered Species Act–listed species;
- Areas with sensitive wildlife resources, such as WAGS colonies, elk and mule deer winter range, sage-grouse habitat, and raptor nests;
- USFS-designated inventoried roadless areas; and
- Category 1 WAGS and State Sensitive wildlife habitat on the NWSTF Boardman.

To minimize impacts, the Project was designed to follow existing developments and utility corridors, such as existing roads and power lines, to the extent practical in order to consolidate impacts of the proposed line in areas that have already been disturbed, as opposed to impacting undisturbed areas.

IPC also conducted extensive public outreach, as well as consultations with land-managing agencies regarding possible route locations for the Project. A route that completely avoided impacts to all sensitive resources was not possible due to the distribution of sensitive resources across the landscape. As avoidance of one sensitive resource can often result in the route being located within range of another sensitive resource (e.g., avoiding forested habitats can cause the route to pass through more shrubland habitats), input from the public and land-managing agencies led to alternative routes that weighed avoidance of one resource against another. Documentation of the siting process is available in Exhibit B. Details regarding the siting process and the constraints considered during the development of the proposed and alternative routes are presented in the Project Siting Studies (Attachments B-1, B-2, and B-4 in Exhibit B).

Efforts to avoid and minimize impacts to fish species and habitat have been and will continue to be coordinated with ODFW as reflected in the fish passage plans and designs provided in Exhibit BB, Attachment BB-3.

Construction and Operation Plans

IPC has prepared a Reclamation and Revegetation Plan (Attachment P1-3), a Vegetation Management Plan (Attachment P1-4), a Noxious Weed Plan (Attachment P1-5), an SPCC Plan (Exhibit G, Attachment G-4), and an Erosion and Sediment Control Plan (ESCP) as part of the National Pollution Discharge Elimination System General Permit #1200-C (Exhibit I, Attachment I-3).

The Reclamation and Revegetation Plan describes and recommends actions that will minimize the effects associated with ROW preparation and the construction of Project facilities and will immediately stabilize disturbed areas to facilitate native plant revegetation. The Vegetation Management Plan describes the methods by which vegetation along the transmission line will be managed during operation of the Project, including the use of herbicides. The Noxious Weed Plan describes the measures that IPC will undertake to control noxious weed species and prevent the introduction of these species during construction and operation activities. The SPCC Plan outlines preventative measures and practices to reduce the likelihood of an accidental release of a hazardous or regulated liquid and, in the event such a release occurs, to expedite the response to and remediation of the release. The ESCP shows a representative 1-mile section of the Project and presents typical erosion and sediment control measures, BMPs, and notes for proper implementation of the plans. These plans will work to avoid and minimize the potential adverse impacts to fish and wildlife habitat presented in this Exhibit.

The Vegetation Management Plan, Reclamation and Revegetation Plan, and Noxious Weed Plan are addressed in Fish and Wildlife Conditions 4, 5, 6, 16, 17, 18, 27, and 28. IPC is proposing a site certificate condition in Exhibit G regarding an ODEQ-approved SPCC Plan and a site certificate condition in Exhibit I regarding an ODEQ-approved ESCP.

Environmental Training

Construction personnel will attend mandatory training on protection of sensitive resources, as well as the need to adhere to all applicable restrictions and permit requirements. The training will ensure that all Project personnel understand and are aware of the environmental requirements, protection measures, and compliance. To ensure compliance with the environmental training program, IPC proposes that the Council include the following condition in the site certificate providing that IPC will ensure all Project personnel are trained on environmental matters:

> ***Fish and Wildlife Condition 9****: Prior to construction, the site certificate holder shall instruct all construction personnel on the protection of cultural, paleontological, ecological, and other natural resources such as (a) federal and state laws regarding antiquities, paleontological resources, and plants and wildlife, including collection and removal; (b) the importance of these resources; (c) the purpose and necessity of protecting them; and (d) reporting and procedures for stop work.*

Seasonal Restrictions

During construction and operation, IPC will implement seasonal restrictions for big game habitat (Fish and Wildlife Condition 10, Exhibit P3), sage-grouse habitat (Fish and Wildlife Condition 11, Exhibit P2), raptor nests (Fish and Wildlife Condition 12), non-raptor breeding birds (Fish and Wildlife Condition 13), and fish-bearing streams. IPC will observe the seasonal fisheries restrictions listed in Table P1-19 below. In addition to the seasonal fisheries restrictions associated with in-water work actions, per the fish passage plans and designs (see Exhibit BB, Attachment BB-3) additional seasonal restrictions may apply to IPC operational use of each of the seven crossings following ODFW review and final approval of the plans and designs. These restrictions are described in detail in Exhibit BB, Attachment BB-3 (see Other Information Conditions 1 and 4).

Table P1-19. Seasonal Fisheries Restrictions for In-water Work Actions Recommended by the ODFW1 Applicable to Proposed Road Stream Crossing Locations

Subbasin	Waterbody Crossed	Tributary to:	Date Range[1]	Location of Sensitive Fish Relative to Crossing
Rock Creek	Little Rock Creek	Rock Creek	July 1–October 31	At Crossing
Rock Creek	Rock Creek	Grande Ronde River	July 1–October 31	At Crossing
Rock Creek	Rock Creek	Grande Ronde River	July 1–October 31	At Crossing
Rock Creek	Rock Creek	Grande Ronde River	July 1–October 31	At Crossing
Jett Creek-Burnt River	Goodman Creek	Burnt River	July 1–October 31	At Crossing
Durbin Creek-Burnt River	Cavanaugh Creek	Burnt River	July 1–October 31	At Crossing
Benson Creek	Jordan Creek	Snake River	July 1–October 31	At Crossing

[1] Source: ODFW 2008

[2] In addition to seasonal restrictions associated with in-water work actions, additional seasonal restrictions may apply to use of each of the seven crossings following ODFW review and final approval of the plans and designs (see Exhibit BB, Attachment BB-3).

Avian Protection

In addition to applicable avian seasonal restrictions discussed above, IPC designed the Project in accordance with the APLIC suggested practices to minimize the potential impact of the Project on avian species, including State Sensitive avian species likely to use the analysis area. IPC will also adhere to its Avian Protection Plan (Attachment P1-9), which provides protocols for minimizing electrocution and collision events and managing nests during operations, including the protection of nests during vegetation management activities (see Fish and Wildlife Condition 21).

Mapping and Flagging of Sensitive Resources

IPC will develop a set of maps that depict the extent of spatial and/or temporal restriction areas within the analysis area. These maps will be maintained at the Project site. Sensitive wildlife resources that occur within or adjacent to the ROW and work areas will be flagged on the ground, where practical, to ensure they are avoided. IPC requests that the Council include the following condition in the site certificate regarding flagging of sensitive resources:

> ***Fish and Wildlife Condition 15:*** *During construction, the site certificate holder shall flag the following environmentally sensitive areas as restricted work zones:*
> *a. State protected plant species;*
> *b. Wetlands and waterways that are not authorized for construction impacts;*
> *c. Areas with active spatial and seasonal restrictions; and*
> *d. Category 1 habitat.*
> *The site certificate holder shall submit a mapset showing the location of environmentally sensitive areas and restricted work zones to the department for its approval. The site certificate shall make the mapset available to all construction personnel.*

Wildlife Injury

IPC will implement traffic control measures to minimize the risk to wildlife of direct loss due to vehicle collision. This includes adhering to speed limits (see Fish and Wildlife Condition 3) on Project roads and limiting access on Project roads (see Fish and Wildlife Conditions 10 and 11).

3.5.6.2 Compliance with ODFW Fish Passage Rules

All historic and current fish-bearing streams associated with the Proposed Route and alternatives were surveyed where access was granted to IPC. Based on these surveys, fish distributions for the Project were developed by IPC and approved by ODFW. Utilizing the ODFW-approved fish distributions, Project roads that intersected fish streams were surveyed and evaluated to determine if a given crossing required a new or improvement to existing road crossing. This approach was intended to help meet ODFW Fish Passage Rules by surveying and evaluating each road crossing. As presented in Table P1-16, seven Project roads will cross fish-bearing streams that will require temporary structures over the road crossings. None of these 7 crossings will require work to be done inside the channel bankfull margins; no other instream work will occur for the other 11 crossings on fish-bearing streams.

The fish passage plans and designs for the seven road crossings that will require temporary structures are provided in Exhibit BB, Attachment BB-3. The development and future review and approval from the ODFW for these Project-related fish passage plans and designs demonstrates IPC's compliance with ODFW Fish Passage Rules. If any future route modification requires road crossing improvement or modifications beyond those identified, IPC will install all culverts or other stream crossing structures in accordance with ODFW fish passage rules and approvals. Currently, no fish-bearing stream crossings occur on federally managed lands (BLM and USFS). If any future route modification requires road crossing improvement or modifications on federally managed lands, the crossing will be installed in accordance with BLM and USFS requirements on federally managed lands. IPC has developed the Fish Passage Plan to ensure compliance with the Fish Passage Rules, and IPC will conduct all work according to that plan (see Fish and Wildlife Conditions 15 and 16).

3.5.7 Monitoring Plan

OAR 345-021-0010(1)(p)(H): A description of the applicant's proposed monitoring plans to evaluate the success of the measures described in (G).

The Reclamation and Revegetation Plan and the Noxious Weed Plan both include monitoring components. IPC also will monitor mitigation actions to determine if mitigation performance measures have been met at habitat mitigation sites. The Fish and Wildlife HMP (Attachment P1-6) discusses habitat mitigation actions and will identify monitoring of those actions. In addition, as described in Exhibit BB, Attachment BB-3, any stream crossing structure put in place for the Project will be inspected for status within a week of any high-flow event during Project construction.

4.0 IDAHO POWER'S PROPOSED SITE CERTIFICATE CONDITIONS

IPC proposes the following site certificate conditions to ensure compliance with the relevant EFSC standards which are relevant to the analysis of fish and wildlife.

<u>Prior to Construction</u>

Fish and Wildlife Condition 1*: Prior to construction, the site certificate holder shall conduct, as applicable, the following biological surveys on those portions of the site boundary that have not been surveyed at the time of issuance of the site certificate:*
a. Great Gray Owl;
b. Flammulated Owl;
c. Terrestrial Visual Encounter Surveys;
d. Wetlands; and
e. Fish Presence and Crossing Assessment Surveys.

Fish and Wildlife Condition 2*: Prior to construction, the site certificate holder shall conduct, as applicable, the following biological surveys on all portions of the site boundary, regardless of whether those portions have been surveyed at the time of issuance of the site certificate:*
a. Washington ground squirrels;
b. Raptor Nests; and
c. State-Listed Threatened and Endangered Plants.

Fish and Wildlife Condition 4: *Prior to construction, the site certificate holder shall finalize, and submit to the department for its approval, a final Reclamation and Revegetation Plan. The protective measures described in the draft Reclamation and Revegetation Plan in ASC Exhibit P1, Attachment P1-3, shall be included and implemented as part of the final Reclamation and Revegetation Plan, unless otherwise approved by the department.*

***Fish and Wildlife Condition 5:** Prior to construction, the site certificate holder shall finalize, and submit to the department for its approval, a final Vegetation Management Plan. The protective measures described in the draft Vegetation Management Plan in ASC Exhibit P1, Attachment P1-4, shall be included as part of the final Vegetation Management Plan, unless otherwise approved by the department.*

***Fish and Wildlife Condition 6**: Prior to construction, the site certificate holder shall finalize, and submit to the department for its approval, a final Noxious Weed Plan. The protective measures as described in the draft Noxious Weed Plan in ASC Exhibit P1, Attachment P1-5, shall be included and implemented as part of the final Noxious Weed Plan, unless otherwise approved by the department.*

***Fish and Wildlife Condition 7**: Prior to construction, the site certificate holder shall finalize, and submit to the department for its approval, a final Fish and Wildlife Habitat Mitigation Plan (HMP).*
a. The final Fish and Wildlife HMP shall include the following, unless otherwise approved by the department:
- *i. The areas that were surveyed for biological resources;*
- *ii. The location of all facility components and related and supporting facilities;*
- *iii. The areas that will be permanently and temporarily disturbed during construction;*
- *iv. The protective measures described in the draft Fish and Wildlife HMP in ASC Exhibit P, Attachment P-6; and*
- *v. The results of the biological surveys referenced in Fish and Wildlife Condition 1 and Fish and Wildlife Condition 2.*

b. The final Fish and Wildlife HMP shall address the potential habitat impacts through mitigation banking, an in-lieu fee program, development of mitigation projects by the site certificate holder, or a combination of the same.
- *i. To the extent the site certificate holder shall develop its own mitigation projects, the final Habitat Mitigation Plan shall:*
  - *1. Identify the location of each mitigation site, including a map of the same;*
  - *2. Identify the number of credit-acres that each mitigation site will provide for the site certificate holder;*
  - *3. Include a site-specific mitigation management plan for each mitigation site that provides for:*
    - *A. A baseline ecological assessment;*
    - *B. Conservation actions to be implemented at the site;*
    - *C. An implementation schedule for the baseline ecological assessment and conservation actions;*
    - *D. Performance measures;*
    - *E. A reporting plan; and*
    - *F. A monitoring plan.*
- *ii. To the extent the site certificate shall utilize a mitigation bank or in-lieu fee program, the final Habitat Mitigation Plan shall:*
  - *1. Describe the nature, extent, and history of the mitigation bank or in-lieu fee program; and*
  - *2. Identify the number of credit-acres that each mitigation site will provide for the site certificate holder.*

c. Oregon's Elk Mitigation Framework shall be used to calculate the amount of elk habitat compensatory mitigation required for the facility.
d. The final Fish and Wildlife Habitat Mitigation Plan may be amended from time to time by agreement of the site certificate holder and the department. Such amendments may be made without amendment to the site certificate. The Council authorizes the department to agree to amendments of the plan and to mitigation actions that may be required under the plan; however, the Council retains the authority to approve, reject, or modify any amendment of the plan agreed to by the department.

***Fish and Wildlife Condition 9**: Prior to construction, the site certificate holder shall instruct all construction personnel on the protection of cultural, paleontological, ecological, and other natural resources such as (a) federal and state laws regarding antiquities, paleontological resources, and plants and wildlife, including collection and removal; (b) the importance of these resources; (c) the purpose and necessity of protecting them; and (d) reporting and procedures for stop work.*

<u>During Construction</u>

***Fish and Wildlife Condition 12:** During construction, the site certificate holder shall not conduct ground-disturbing activities within the following timeframes and spatial buffers surrounding occupied nests of certain raptor species. Upon request by the site certificate holder, the department may provide exceptions to this restriction. The site certificate holder's request must include a justification for the request, including any actions the site certificate holder will take to avoid, minimize, or mitigate impacts to the raptor and its nest.*

Nesting Species	Spatial Buffers (radius around nest site):	Temporal Restrictions
Western burrowing owl	0.25 mile	April 1 to August 15
Ferruginous hawk	0.50 mile	March 15 to August 15
Swainson's hawk	0.25 mile	April 1 to August 15
Great gray owl	0.25 mile	March 1 to August 15
Flammulated owl	0.25 mile	March 1 to August 15

***Fish and Wildlife Condition 13**: During construction, if the site certificate holder will be conducting ground-disturbing activities during the migratory bird nesting season between April 1 and July 15, the site certificate holder shall conduct, as applicable, biological surveys for native, non-raptor bird species nests on all portions of the site boundary a maximum of 7 days prior to ground-disturbing activities, regardless of whether those portions have been previously surveyed. If the site certificate holder identifies a native, non-raptor bird species nest, the site certificate holder shall submit to the department for its approval a notification addressing the following:*
a. Identification of the native, non-raptor species observed;
b. Location of the nest; and
c. Any actions the site certificate holder will take to avoid, minimize, or mitigate impacts to the nest.

***Fish and Wildlife Condition 14**: During construction, if the roost of a State Sensitive bat species is observed during the biological surveys set forth in Fish*

and Wildlife Conditions 1, 2, or 3, the site certificate holder shall submit to the department for its approval a notification addressing the following:
a. Identification of the State Sensitive bat species observed;
b. Location of the roost; and
c. Any actions the site certificate holder will take to avoid, minimize, or mitigate impacts to the roost.

Fish and Wildlife Condition 15: *During construction, the site certificate holder shall flag the following environmentally sensitive areas as restricted work zones:*
a. State protected plant species;
b. Wetlands and waterways that are not authorized for construction impacts;
c. Areas with active spatial and seasonal restrictions; and
d. Category 1 habitat.
The site certificate holder shall submit a mapset showing the location of environmentally sensitive areas and restricted work zones to the department for its approval. The site certificate shall make the mapset available to all construction personnel.

Fish and Wildlife Condition 16*: During construction, the site certificate holder shall employ a speed limit of 25 miles per hour on facility access roads, unless the applicable land-management agency or landowner has designated an alternative speed limit.*

Fish and Wildlife Condition 17: *During construction, the site certificate holder shall conduct all work in compliance with the final Reclamation and Revegetation Plan referenced in Fish and Wildlife Condition 4.*

Fish and Wildlife Condition 18: *During construction, the site certificate holder shall conduct all work in compliance with the final Vegetation Management Plan referenced in Fish and Wildlife Condition 5.*

Fish and Wildlife Condition 19*: During construction, the site certificate holder shall conduct all work in compliance with the final Noxious Weed Plan referenced in Fish and Wildlife Condition 6.*

Fish and Wildlife Condition 20*: During construction, the site certificate holder shall commence implementation of the conservation actions set forth in the final Fish and Wildlife HMP referenced in Fish and Wildlife Condition 7.*

Fish and Wildlife Condition 22: *During construction, the site certificate holder shall construct the transmission line to avian-safe design standards consistent with the site certificate holder's Avian Protection Plan (Idaho Power 2015).*

<u>During the Third Year of Operation</u>

Fish and Wildlife Condition 24*: During the third year of operation, the site certificate holder shall provide to the department a report demonstrating that fish and wildlife habitat mitigation shall be commensurate with the final compensatory mitigation calculations.*
a. The final calculations shall be based on the as-constructed footprint of the facility.
b. Oregon's Elk Mitigation Framework shall be used to calculate the amount of elk habitat compensatory mitigation required for the facility, and the information from the pre- and post-construction traffic studies shall be used in the calculation.

During Operation

***Fish and Wildlife Condition 26**: During operation, the site certificate holder shall employ a speed limit of 25 miles per hour on facility access roads, unless the applicable land-management agency or landowner has designated an alternative speed limit.*

***Fish and Wildlife Condition 27**: During operation, the site certificate holder shall employ access control on facility access roads within elk habitat (i.e., elk summer range and elk winter range) and sage-grouse habitat (i.e., areas of high population richness, core area habitat, low density habitat, or general habitat), subject to approval by the applicable land-management agency or landowner.*

***Fish and Wildlife Condition 28:** During operation, the site certificate holder shall conduct all work in compliance with the final Vegetation Management Plan referenced in Fish and Wildlife Condition 5.*

***Fish and Wildlife Condition 29**: During operation, the site certificate holder shall conduct all work in compliance with the final Noxious Weed Plan referenced in Fish and Wildlife Condition 6.*

5.0 CONCLUSION

Exhibit P1—together with Exhibit P2 and Exhibit P3—includes the application information provided for in OAR 345-021-0010(1)(p). Additionally, Exhibits P1, P2, and P3 show the design, construction, and operations of the Project, taking into account mitigation, will be consistent with ODFW's Habitat Mitigation Goals and Standards contained in OAR 635-415-0025.

6.0 COMPLIANCE CROSS-REFERENCES

Table P1-20 identifies the location within the application for site certificate of the information responsive to the application submittal requirements in OAR 345-021-0010(1)(p), the Fish and Wildlife Standard at OAR 345-022-0060, and the relevant Amended Project Order provisions, as those requirements apply to species other than greater sage-grouse, which is addressed in Exhibit P2.

Table P1-20. Compliance Requirements and Relevant Cross-References

Requirement	Location
OAR 345-021-0010(1)(p)	
Exhibit P. Information about the fish and wildlife habitat and the fish and wildlife species, other than the species addressed in subsection (q) that could be affected by the proposed facility, providing evidence to support a finding by the Council as required by OAR 345-022-0060. The applicant shall include:	
(A) A description of biological and botanical surveys performed that support the information in this exhibit, including a discussion of the timing and scope of each survey.	Exhibit P1, Section 3.2, Attachments P1-2, P1-7A, and P1-7B
(B) Identification of all fish and wildlife habitat in the analysis area, classified by the habitat categories as set forth in OAR 635-415-0025 and a description of the characteristics and condition of that habitat in the analysis area.	Exhibit P1, Section 3.3.1 and 3.3.2 and Attachment P1-1

Requirement	Location
(C) A map showing the locations of the habitat identified in (B).	Exhibit P1, Section 3.3.3 and Attachment P1-8
(D) Based on consultation with the Oregon Department of Fish and Wildlife (ODFW) and appropriate field study and literature review, identification of all State Sensitive Species that might be present in the analysis area and a discussion of any site-specific issues of concern to ODFW.	Exhibit P1, Section 3.4 and Attachments P1-7A and P1-7B
(E) A baseline survey of the use of habitat in the analysis area by species identified in (D) performed according to a protocol approved by the Department and ODFW.	Exhibit P1, Section 3.2, Attachments P1-2 and P1-7A and P1-7B
(F) A description of the nature, extent and duration of potential adverse impacts on the habitat identified in (B) and species identified in (D) that could result from construction, operation and retirement of the proposed facility.	Exhibit P1, Sections 3.5.1, 3.5.2, 3.5.3, 3.5.4, and 3.5.5
(G) A description of any measures proposed by the applicant to avoid, reduce or mitigate the potential adverse impacts described in (F) in accordance with the ODFW mitigation goals described in OAR 635-415-0025 and a discussion of how the proposed measures would achieve those goals.	Exhibit P1, Sections 3.5.6, Section 4.0, Attachments P1-3, P1-4, P1-5, P1-6, and P1-9.
(H) A description of the applicant's proposed monitoring plans to evaluate the success of the measures described in (G).	Exhibit P1, Section 3.5.7, Attachments P1-3, P1-4, P1-5, P1-6, and P1-9
OAR 345-022-0060	
To issue a site certificate, the Council must find that the design, construction and operation of the facility, taking into account mitigation, are consistent with: (1) The general fish and wildlife habitat mitigation goals and standards of OAR 635-415-0025(1) through (6) in effect as of February 24, 2017, and (2) For energy facilities that impact sage-grouse habitat, the sage-grouse specific habitat mitigation requirements of the Greater Sage-Grouse Conservation Strategy for Oregon at OAR 635-415-0025(7) and OAR 635-140-0000 through -0025 in effect as of February 24, 2017.	Exhibit P1, Section 3.3 and 3.5 and Attachment P1-6; Exhibit P2
Amended Project Order Provisions, Section III(p)	
The applicant has proposed a "phased survey" approach for data collection during the site certificate review process. The Department understands that the entirety of the site boundary for the proposed facility may not yet have been surveyed, mapped for vegetation types, and categorized under ODFW's habitat categorization guidance. Nevertheless, Exhibit P shall include as much information as possible about the results of the field surveys conducted to date for biological resources and the schedule for future surveys.	Exhibit P1, Sections 3.2, 3.3, and 3.4 and Attachments P1-7A, P1-7B, and P1-8

Requirement	Location
Exhibit P shall include analysis of how the evidence provided supports a finding by the Council that the proposed facility meets the Council's fish and wildlife habitat standard.	Exhibit P1, Section 3.0 and Attachment P1-6
Exhibit P must include the results of all surveys for fish and wildlife habitat in the analysis area.	Exhibit P1, Section 3.2.4 and Attachments P1-7A, P1-7B, and P1-8
Exhibit P must also identify all state sensitive species that may be present in the analysis area and include the results of surveys for state sensitive species.	Exhibit P1, Section 3.4, Attachments P1-7A and P1-7B
Please also include the survey methodology, including scope and timing of each survey. Surveys must be performed by qualified survey personnel during the season or seasons appropriate to the detection of the species in question.	Exhibit P1, Section 3.2.4, and Attachments P1-7A and P1-7B
The applicant must also include in Exhibit P its habitat categorization and tables depicting the estimated temporary and permanent impacts, broken down by habitat categories.	Exhibit P1, Section 3.5.3.3
If particular fish and/or wildlife habitat or state sensitive species are identified within the analysis area that could be adversely affected as a result of the proposed facility, the applicant shall include description of the nature, extent and duration of potential adverse impacts and a description of any proposed mitigation measures. Fish and Wildlife Habitat Mitigation Policy (OAR Chapter 635, Division 415) classifies six habitat categories and establishes a mitigation goal for each category. The applicant for a site certificate must identify the appropriate habitat category for all areas affected by the proposed facility and provide the basis for each category designation, subject to ODFW review. The applicant must show how it would comply with the habitat mitigation goals and standards by appropriate monitoring and mitigation.	Exhibit P1, Section 3.5, and Attachment P1-6
As a result of the access timing issues for this proposed facility, please also provide proposed site certificate conditions for the Council's consideration related to requirements for the applicant to complete all unfinished surveys within the project's site boundary prior to construction. The proposed site certificate conditions should also address submittal requirements for reporting future survey results, adjustment of previously calculated impact areas (if necessary), and the applicant's proposed approach to document approval of final results by agencies or the Council prior to commencing construction activities.	Exhibit P1, Section 4.0

7.0 RESPONSE TO COMMENTS FROM REVIEWING AGENCIES AND THE PUBLIC

Table P1-21 provides cross references between comments cited in the Amended Project Order from reviewing agencies and the public and where discussion can be found in this Exhibit.

1 **Table P1-21. Reviewing Agency and Public Comments**

Comments	Location in Exhibit
Reviewing Agency and Public Comments	
Potential impacts to species and habitats include habitat fragmentation and loss of connectivity (especially between summer and winter range for big game); disruption of migratory patterns; stream impacts from sedimentation, vegetation clearing, and herbicide use; introduction of invasive species; and impacts to vegetation important for forage and browsing (especially winter range areas).	Exhibit P1, Section 3.5
Potential impacts to species and habitats include disruption of elk, mule deer, bighorn sheep, and pronghorn migration routes, breeding areas, and feeding areas.	Exhibit P1, Section 3.5.3 and 3.5.5.1
The project may impact fish (steelhead, bull trout, and salmon), birds (sage-grouse, owls, bald eagle, golden eagle, swans, cranes, and waterfowl), and bat species. Exhibit P must address temporary and permanent impacts to fish, birds, bats, and other wildlife species.	Exhibit P1, Sections 3.5.3, 3.5.4, and 3.5.5
Long-term maintenance of the transmission line corridor would result in the need for early detection and rapid response procedures to limit establishment of invasive species, control invasive species, and respond to wildfires.	Exhibit P1, Attachments P1-3 and P1-5 Exhibit U, Attachment U-3
The ASC should include a revegetation and weed control plan both for construction activities and for long-term operation of the proposed facility. This information may be included in Exhibit P, or as part of soil protection measures discussed in Exhibit I.	Exhibit P1, Attachments P1-3, P1-4, and P1-5
Noise impacts, both from construction and operation of the proposed transmission line. Applicant shall address noise impacts and compliance with state noise standards in Exhibit X. Potential noise impacts to wildlife shall be addressed in Exhibits P and Q.	Exhibit P1, Sections 3.5.3 and 3.5.4
Impacts to water sources shall be addressed in Exhibit I (especially erosion and sediment control and impacts of herbicide use on above- and below-ground water supplies), Exhibit O (water use and sources), and Exhibit P (especially impacts to fish-bearing streams from construction activities and herbicide use).	Exhibit P1, Section 3.5.5.6 and Attachment P1-7B
Numerous commenters expressed concern about potential impacts to fish and wildlife habitat, including habitat fragmentation and loss of connectivity (especially between summer and winter range for big game); disruption of migratory patterns; stream impacts from sedimentation, vegetation clearing, and herbicide use; introduction of invasive species; and impacts to vegetation important for forage and browsing (especially winter range areas). A commenter also expressed concern about impacts to ongoing conservation projects for riparian areas, wetlands, and native grasslands in the Virtue Flat and Keating areas. Exhibit P shall address temporary and permanent impacts to fish and wildlife habitat and to fish and wildlife species.	Exhibit P1, Sections 3.5.2, 3.5.3, 3.5.4, 3.5.5, and Attachments P1-3 and P1-5 Exhibit P3

Comments	Location in Exhibit
Numerous commenters expressed concern about wildlife impacts, including disruption of elk, mule deer, bighorn sheep, and pronghorn migration routes, breeding areas, and feeding areas. Concern about potential impacts to fish (steelhead, bull trout, and salmon), birds (sage grouse, owls, bald eagle, golden eagle, swans, cranes, and waterfowl), and bat species were also mentioned frequently in the comments. Exhibit P shall address temporary and permanent impacts to fish and wildlife habitat and fish and wildlife species.	Exhibit P1, Sections 3.5.2, 3.5.3, 3.5.4, 3.5.5, and 4.0 Exhibit P3
Commenters expressed concern about long-term maintenance of the transmission line corridor and the need for early detection and rapid response procedures to limit establishment of invasive species, control invasive species, and respond to wildfires. The application shall include a revegetation and weed control plan both for construction activities and for long-term operation of the proposed facility. This information may be included in Exhibit P, or as part of soil protection measures discussed in Exhibit I.	Exhibit P1, Attachments P1-3 and P1-5, Exhibit U, Attachment U-3

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ATTACHMENT P1-1
HABITAT CATEGORIZATION MATRIX

Nature Serve Ecological Systems and NWI categories[1]	General Vegetation Type	Habitat Type	ODFW Habitat Category Types[2]					
			Category 1	Category 2	Category 3	Category 4	Category 5	Category 6
		Applicable to All Habitat Types[3]	• Trees or structures which contain a special status raptor nest; • Occupied Washington ground squirrel colony (with a 785-foot buffer around the colony, buffer extent restricted to suitable squirrel habitat[4]).	• ODFW designated big game winter range for elk and mule deer; • Area of potential ground squirrel use; defined as the area adjacent to (within 4,921 feet [1.5km]) WAGS Category 1 habitat, but not occupied by any squirrels either for burrowing or foraging, which is of similar habitat type and quality to the adjacent WAGS Category 1 habitat.	• Elk summer range as identified by the Rocky Mountain Elk Foundation; or • Mule deer summer range as identified in the Mule Deer Habitat Mapping Project developed by Utah State University in conjunction with the Western Association of Fish and Wildlife Agencies.			
Conservation Reserve Program (CRP)	Agriculture / Developed	Agriculture			Lands enrolled in the CRP that contain later seral stage vegetation and which could provide important habitat for special status wildlife species (e.g., areas similar to natural conditions prior to agricultural development).	Irrigated-grazed pastures and hay meadows, as well as lands enrolled in the CRP that lack later seral stage vegetation or are less important for special status wildlife species due to land management or location.		All other agricultural lands with low potential to become productive wildlife habitat.
Pasture/Hay								
Cultivated Crops and Irrigated Agriculture								
Developed, High Intensity		Developed						All developed areas including roads, residential areas, and industrial areas.
Developed, Medium Intensity								
Developed, Low Intensity								
Columbia Plateau Ash and Tuff Badland	Bare Ground	Bare Ground, Cliffs, Talus	Bat hibernacula or maternity colonies.	Bat colonies.	Cliffs, talus slopes, and rock outcrops that do not contain sensitive raptor nests, or bat hibernacula-colonies.			Bare ground and developed areas (excluding cliffs, talus slopes, and rock outcrops; see Cat 3 description).
Inter-Mountain Basins Cliff and Canyon								
Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest	Forest / Woodland	Douglas Fir / Mixed Grand Fir		Old forest multi-strata or old forest single strata (defined by the Umatilla National Land and Resource Forest Plan as > 21 inches dbh).	Understory reinitiation forests (defined by the Umatilla National Land and Resource Forest Plan as from 9 inches dbh to 20.9 inches dbh).	Stem exclusion forests (defined by the Umatilla National Land and Resource Forest Plan as 1 inch to 4.9 inches dbh for saplings and 5 to 8.9 inches dbh for pole stands).	Stand initiation forests (i.e., clearcuts, seedlings, and areas dominated by grass-forbs).	
Northern Rocky Mountain Ponderosa Pine Woodland and Savanna		Ponderosa Pine		Old forest multi-strata or old forest single strata (defined by the Umatilla National Land and Resource Forest Plan as > 21 inches dbh).	Understory reinitiation forests (defined by the Umatilla National Land and Resource Forest Plan as from 9 inches dbh to 20.9 inches dbh).	Stem exclusion forests (defined by the Umatilla National Land and Resource Forest Plan as 1 inch to 4.9 inches dbh for saplings and 5 to 8.9 inches dbh for pole stands).	Stand initiation forests (i.e., clearcuts, seedlings, and areas dominated by grass-forbs).	

Nature Serve Ecological Systems and NWI categories[1]	General Vegetation Type	Habitat Type	ODFW Habitat Category Types[2]					
			Category 1	**Category 2**	**Category 3**	**Category 4**	**Category 5**	**Category 6**
Columbia Plateau Western Juniper Woodland and Savanna	Forest / Woodland	Western Juniper / Mountain Mahogany Woodland		Columbia Basin Area: Woodlands dominated by old-growth juniper trees with rounded tops.	Columbia Basin Area: Woodlands with few old-growth junipers Intermountain Basin Area: Woodlands that are not invading sage brush habitats, or which could not be converted into sage brush habitats.		Intermountain Basin Area: Shrub-steppe and grassland areas that are being invaded by young juniper woodlands.	
Harvested forest-tree regeneration		Forested-Other		Old forest multi-strata or old forest single strata (defined by the Umatilla National Land and Resource Forest Plan as > 21 inches dbh).	Understory reinitiation forests (defined by the Umatilla National Land and Resource Forest Plan as from 9 inches dbh to 20.9 inches dbh).	Stem exclusion forests (defined by the Umatilla National Land and Resource Forest Plan as 1 inch to 4.9 inches dbh for saplings and 5 to 8.9 inches dbh for pole stands).	Stand initiation forests (i.e., clearcuts, seedlings, and areas dominated by grass-forbs).	
Harvested forest-grass regeneration								
Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland	Shrub / Grass	Native Grasslands		*Columbia Basin Area*: Undisturbed habitat dominated by native species (i.e., greater than 75% ground cover is native), or moderately disturbed habitat (i.e., between 50 to 75% ground cover is native) that contains a sage brush component. *Intermountain Basin Area*: Undisturbed habitat dominated by native species (i.e., greater than 75% ground cover is native).	*Columbia Basin Area*: Moderately disturbed habitat with a mix of natives and non-natives (i.e., between 50 to 75% ground cover is native), or highly disturbed habitat (i.e., between 15 to 50% ground cover is native) that contains a sage brush component. *Intermountain Basin Area*: Moderately disturbed habitat with a mix of natives and non-natives (i.e., between 50 to 75% ground cover is native).	*Columbia Basin Area*: Highly disturbed habitat with a high percentage of non-native plant species (i.e., between 15 to 50% ground cover is native), or very highly disturbed habitats (i.e., less than 15% ground cover is native) that contain a sage brush component. *Intermountain Basin Area*: Highly disturbed habitat with a high percentage of non-native plant species (i.e., between 15 to 50% ground cover is native).	*Columbia Basin Area*: Very highly disturbed habitats with a high percentage of non-native plant species (i.e., less than 15% ground cover is native), but which do not contain a sage brush component. *Intermountain Basin Area*: Very highly disturbed habitats with a high percentage of non-native plant species (i.e., less than 15% ground cover is native).	
Columbia Plateau Steppe and Grassland								
Columbia Basin Foothill and Canyon Dry Grassland								
Inter-Mountain Basins Semi-Desert Grassland								
Columbia Basin Palouse Prairie								
Rocky Mountain Subalpine-Montane Mesic Meadow								
Inter-Mountain Basins Mixed Salt Desert Scrub		Desert Shrub		*Columbia Basin Area*: Undisturbed habitat dominated by native species (i.e., greater than 75% cover is native).	*Columbia Basin Area*: Moderately disturbed habitat with a mix of natives and non-natives (i.e., between 25 to 75% cover is native). *Intermountain Basin Area*: Undisturbed habitat dominated by native species (i.e., greater than 75% cover is native).	*Columbia Basin Area*: Highly disturbed habitat with a high percentage of non-native species (i.e., less than 25% cover is native). *Intermountain Basin Area*: Moderately disturbed habitat with a mix of natives and non-natives (i.e., between 25 to 75% cover is native), may contain juniper encroachment into habitat.	*Intermountain Basin Area*: Highly disturbed habitat with a high percentage of non-native plant species (i.e., less than 25% cover is native).	
Inter-Mountain Basins Greasewood Flat								

Nature Serve Ecological Systems and NWI categories[1]	General Vegetation Type	Habitat Type	ODFW Habitat Category Types[2]					
			Category 1	Category 2	Category 3	Category 4	Category 5	Category 6
Inter-Mountain Basins Big Sagebrush Shrubland	Shrub / Grass	Shrub-Steppe with Big Sage		*Columbia Basin Area*: Undisturbed habitat dominated by native species (i.e., greater than 75% cover is native).	*Columbia Basin Area*: Moderately disturbed habitat with a mix of natives and non-natives (i.e., between 25 to 75% cover is native). *Intermountain Basin Area*: Undisturbed habitat dominated by native species (i.e., greater than 75% cover is native).	*Columbia Basin Area*: Highly disturbed habitat with a high percentage of non-native plant species (i.e., less than 25% cover is native). *Intermountain Basin Area*: Moderately disturbed habitat with a mix of natives and non-natives (i.e., between 25 to 75% cover is native), may contain juniper encroachment into habitat.	*Intermountain Basin Area*: Highly disturbed habitat with a high percentage of non-native plant species (i.e., less than 25% cover is native).	
Inter-Mountain Basins Big Sagebrush Steppe								
Inter-Mountain Basins Montane Sagebrush Steppe								
Columbia Plateau Scabland Shrubland	Shrub / Grass	Shrub-Steppe without Big Sage		*Columbia Basin Area*: Undisturbed habitat dominated by native species (i.e., greater than 75% cover is native).	*Columbia Basin Area*: Moderately disturbed habitat with a mix of natives and non-natives (i.e., between 25 to 75% cover is native). Intermountain Basin Area: Undisturbed habitat dominated by native species (i.e., greater than 75% is native).	*Columbia Basin Area*: Highly disturbed habitat with a high percentage of non-native plant species (i.e., less than 25% cover is native). *Intermountain Basin Area*: Moderately disturbed habitat with a mix of natives and non-natives (i.e., between 25 to 75% cover is native), may contain juniper encroachment into habitat.	*Intermountain Basin Area*: Highly disturbed habitat with a high percentage of non-native plant species (i.e., less than 25% cover is native).	
Northern Rocky Mountain Montane-Foothill Deciduous Shrubland								
Columbia Plateau Low Sagebrush Steppe								
Inter-Mountain Basins Semi-Desert Shrub-Steppe								
Introduced Upland Vegetation - Forbland		Introduced Upland Vegetation					Low quality habitat.	
Introduced Upland Vegetation - Annual Grassland								
Introduced Upland Vegetation - Perennial Grassland								

Nature Serve Ecological Systems and NWI categories[1]	General Vegetation Type	Habitat Type	ODFW Habitat Category Types[2]					
			Category 1	Category 2	Category 3	Category 4	Category 5	Category 6
Rocky Mountain Lower Montane Riparian Woodland and Shrubland	Riparian Vegetation	Riparian Woodland and Shrubland		High quality habitat dominated by native species.	Area consists of a mix of native and non-native plants with a low to moderate level of disturbance.			
Columbia Basin Foothill Riparian Woodland and Shrubland								
Palustrine Emergent Wetland		Herbaceous Riparian		High quality habitat dominated by native species.	Area consists of a mix of native and non-native plants with a low to moderate level of disturbance.			
Introduced Riparian and Wetland Vegetation		Introduced Riparian			Area dominated by non-native plants. Within the analysis area, Russian olive is most common.		Farmed or previously filled wetland that is highly disturbed and dominated by non-native species	
Palustrine Emergent Wetland (NWI)	Wetland	Emergent Wetland		High quality habitat dominated by native species.	Area consists of a mix of native and non-native plants with a low to moderate level of disturbance.		Farmed or previously filled wetland that is highly disturbed and dominated by non-native species.	
Palustrine Scrub-Shrub Wetland (NWI)		Scrub-Shrub Wetland		High quality habitat dominated by native species.	Area consists of a mix of native and non-native plants with a low to moderate level of disturbance.		Farmed or previously filled wetland that is highly disturbed and dominated by non-native species.	
Palustrine Forested Wetland (NWI)		Forested Wetland		High quality habitat dominated by native species; forested wetlands that are part of a large wetland complex, old forest, or riparian area.	Area consists of a mix of native and non-native plants with a low to moderate level of disturbance (e.g., area is predominately sapling to pole-sized timber, evidence of fire, insects or other disease).			
Palustrine Aquatic Bed (NWI)		Aquatic Bed Wetland		High quality habitat dominated by native species.	Area consists of a mix of native and non-native plants with a low to moderate level of disturbance.			

Nature Serve Ecological Systems and NWI categories[1]	General Vegetation Type	Habitat Type	ODFW Habitat Category Types[2]					
			Category 1	Category 2	Category 3	Category 4	Category 5	Category 6
Lacustrine (NWI)	Open Water / Unvegetated Wetland	Ponds and Lakes		Lakes and ponds with high quality habitat that is dominated by native species.	Lakes and ponds with lower quality habitat which contains a mix of native and non-native species; or highly degraded open water habitats (permanent or seasonal) that are located in areas where water is limited on the landscape.	Highly degraded permanent open water areas that are almost completely dominated by non-native plant species or otherwise highly degraded, and which are not limited on the landscape.	Highly degraded seasonal open water areas that are almost completely dominated by non-native plant species or otherwise highly degraded.	
Palustrine Unconsolidated Bottom (NWI)								
Palustrine Unconsolidated Shore (NWI)								
Riverine (NWI)		Perennial Streams		Perennial fish-bearing streams. Fish presence determination is detailed in Attachment P1-7B.	Perennial non-fish-bearing streams. Fish presence determination is detailed in Attachment P1-7B.			
Riverine (NWI)		Intermittent Streams		Intermittent fish-bearing streams. Fish presence determination is detailed in Attachment P1-7B.	Intermittent non-fish-bearing streams. Fish presence determination is detailed in Attachment P1-7B.	Artificial man-made intermittent streams (canal or ditch) without fish.		
Canal								
Riverine (NWI)		Ephemeral Streams		Ephemeral fish-bearing streams. Fish presence determination is detailed in Attachment P1-7B.	Ephemeral non-fish-bearing streams. Fish presence determination is detailed in Attachment P1-7B.			

[1] Unless otherwise indicated, the entries in this column correspond to NatureServe Ecological Systems (Comer et al. 2003). Entries corresponding to the National Wetland Inventory (NWI) are indicated in brackets following the entries' name. All habitats within the analysis area that are grouped under the Wetland and Open Water/Unvegetated Wetland general vegetation types are either delineated wetlands, delineated non-wetland waters, or have not yet been delineated and rely on NWI existing data.
[2] Some of the habitat types are classified differently depending on if they are physically located in the Columbia Basin or the Intermountain Basin. Because some habitats are less common/more limited, they may be more important in one region compared to another (e.g., sagebrush habitats are less common in the Columbia Basin Area compared to the Intermountain Basin Area within the analysis area)
[3] The modifiers in the "Applicable to All Habitat Types" row can only move the category type up to a high level, not down (e.g., if the Category type is a 2 based on vegetation and the area overlaps with big game summer range [i.e., a Category 3 modifier] the area remains a Category 2 habitat type). The GIS methods for categorizing habitat within the analysis area are detailed in Appendix A.
[4] The extent of a WAGS buffer is confined to areas between the colony and any break in suitable habitat within the applicable buffer (e.g., if a paved road or farmland exists 200 feet from the colony, the buffer will only extend out to that road or farmland, not to the full extent of the buffer).

APPENDIX A
METHODS AND MODELS USED FOR HABITAT CATEGORIZATION

Introduction

The goal of this document is to describe the model used to apply the habitat category values defined in the Oregon Department of Fish and Wildlife (ODFW) Habitat Mitigation Policy to the Boardman to Hemingway Transmission Line Project (B2H Project). The process presented here provides enough detail to understand the Geographic Information System (GIS) model concept and what the input datasets and output dataset include. It is not intended to be a step-by-step instruction manual on how to re-create the process. This document is not exhaustive of all data considered and does not disclose all modeling processes, because this level of information would detract from presenting the model in a basic and concise manner.

The GIS model results in a habitat category value (Categories 1 through 6 as defined in Oregon Administrative Rule [OAR] 635-415-0025) being attributed to Site Boundary for the Project. This is accomplished through a model that takes several input datasets (both existing data and Project-specific survey data) and creates a single output dataset. The output dataset is the Site Boundary broken into hundreds of polygons, each attributed with a habitat category value.

The GIS model was created using ESRI ArcGIS computer software. The software is a platform for designing and managing solutions through the application of geographic knowledge. More information regarding the software used in this process can be found at www.esri.com.

Input Data

All input datasets used in the model are polygon shapefiles. Each polygon shapefile represents the areal extent (i.e., spatial extent) of some designation or measure of quality of wildlife habitat. This may be species-specific information such as the designation of Washington ground squirrel (WAGS) habitat around a colony, or more vegetation-based information such as U.S. Department of Agriculture Forest Service (USFS) forest stand data.

The baseline data for this process have been collected through the Terrestrial Visual Encounter Survey (TVES) performed for the Project (see Exhibit P1, Attachment P1-7, Biological Field Survey Technical Reports). One of the goals of the TVES was to define the ecological systems within the Site Boundary and attribute those systems with a habitat category. The habitat category value given to each ecological system depended on the quality of the habitat encountered in the field. Where access was denied to acquire TVES survey data, IPC reviewed aerial photography and habitat categorization values assigned to adjacent polygons during TVES to assign an ecological system classification and habitat category to the entire Site Boundary. The definitions for each habitat category value within an ecological system are presented in the Habitat Categorization Matrix created specifically for this Project. An ecological system is a group of plant community types that tend to co-occur within landscapes with similar ecological processes, substrates, and/or environmental gradients. For more information on the ecological system classification, refer to *Ecological Systems of the United States, A working Classification of U.S. Terrestrial Systems* (Comer et al. 2003).

The TVES and desktop review resulted in the entire Site Boundary being delineated by ecological systems and given a habitat category value. An example of the TVES shapefile and its attribute table are presented in Figure 1. The attribute table is a database or tabular file containing information about the geographic features being displayed in the shapefile.

Object_ID	Ecological System	Vegetation Habitat Type	General Vegetation	TVES Vegetation Habitat Category
1	Inter-Mountain Basins Big Sagebrush Shrubland	Shrub-Steppe with Big Sage	Shrub-Grass	3
2	Inter-Mountain Basins Big Sagebrush Shrubland	Shrub-Steppe with Big Sage	Shrub-Grass	4
3	Cultivated Crops and Irrigated Agriculture	Agriculture	Developed/ Agriculture	6

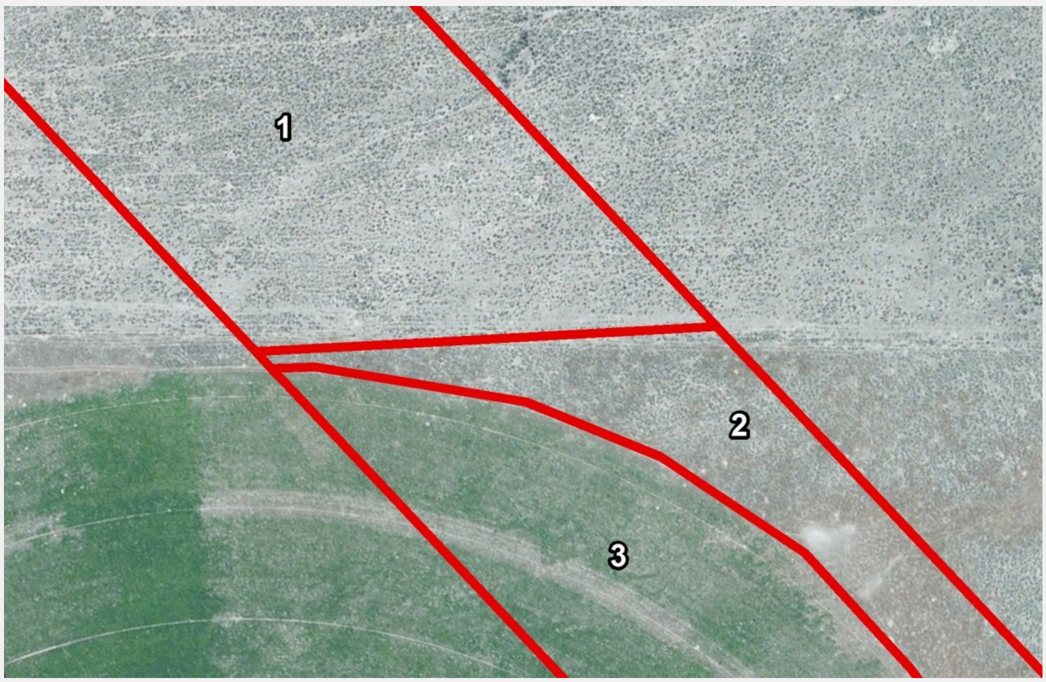

Figure 1. Example TVES Shapefile and Attribute Table

The following shapefiles were included with the TVES shapefile as model inputs:

1. ODFW Elk Winter Range **(corresponds to Habitat Category 2)**
2. Rocky Mountain Elk Foundation Elk Summer Range **(corresponds to Habitat Category 3)**
3. ODFW Mule Deer Winter Range **(corresponds to Habitat Category 2)**
4. Western Association of Fish and Wildlife Agencies Mule Deer Summer Range **(corresponds to Habitat Category 3)**
5. USFS Old Forest **(corresponds to Habitat Category 2)**
6. USFS Understory Re-initiation Forest **(corresponds to Habitat Category 3)**
7. USFS Stem Exclusion Forest **(corresponds to Habitat Category 4)**
8. WAGS Habitat **(corresponds to Habitat Category 1 & 2)**

Each of the model inputs has a column in its attribute table for the habitat category value seen in bold and parenthesis in the above list. This column of the attribute table is important, as each of the model inputs contains a habitat category value which can modify the baseline habitat category identified in the TVES shapefile.

ODFW Elk Winter Range	
Object_ID	Elk Winter Range Habitat Category
1	2
2	2
3	2

WAGS Habitat	
Object_ID	WAGS Habitat Category
1	1
2	2
3	1

USFS Understory Re-initiation Forest	
Object_ID	Forest Habitat Category
1	3
2	3
3	3

Figure 2. Sample Attribute Tables with Habitat Category Values

Model

The GIS model was created in ArcGIS ModelBuilder. ModelBuilder allows GIS processes to be laid out in a flow-chart style that aids in the step-through process of manipulating datasets. Figure 2 is a screenshot of the model.

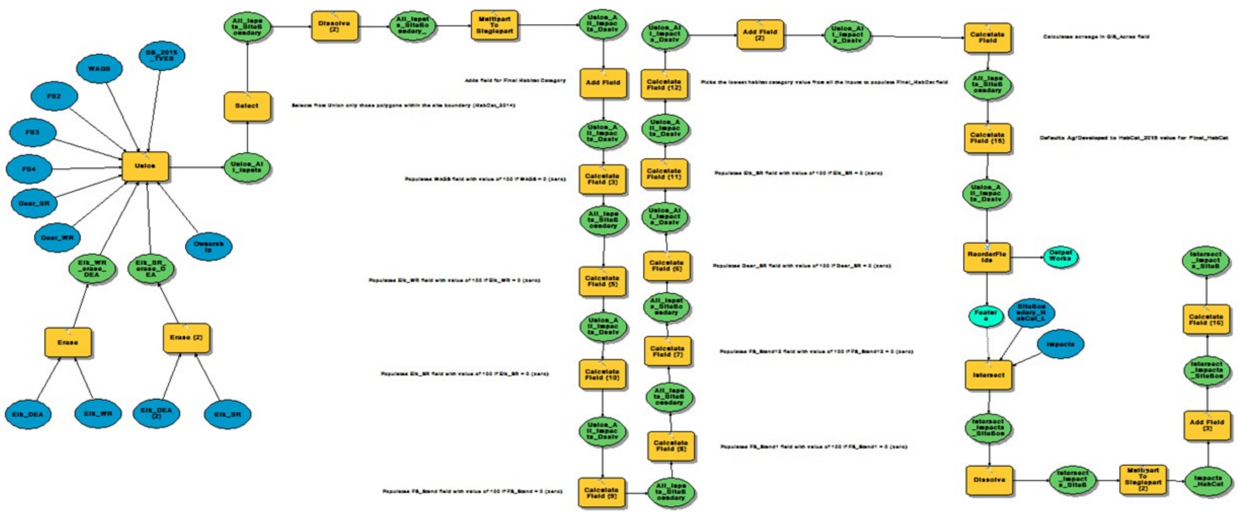

Figure 2. Screenshot of GIS Model

Note that the GIS model steps through several iterative field calculations and table organization steps that are not critical to the reader's understanding of this process. Figure 3 is a simplified example of the model created to determine the habitat categories for the Project. The model is simplified to three basic steps.

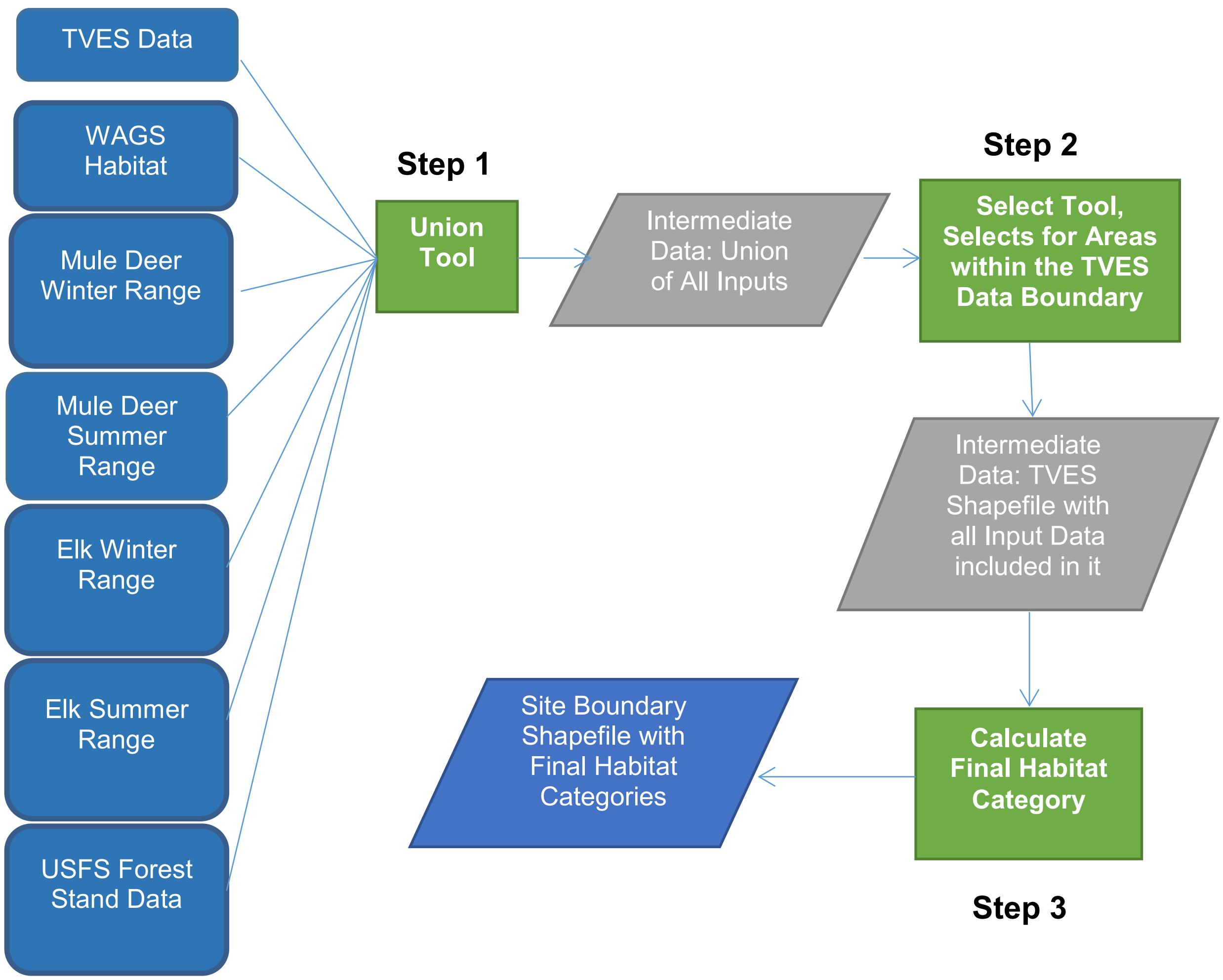

Figure 3. Simplified Example of the GIS Model

Step 1

All the input datasets were combined in the model using the Union tool. Figure 4 shows a depiction of what a Union does with the input data.

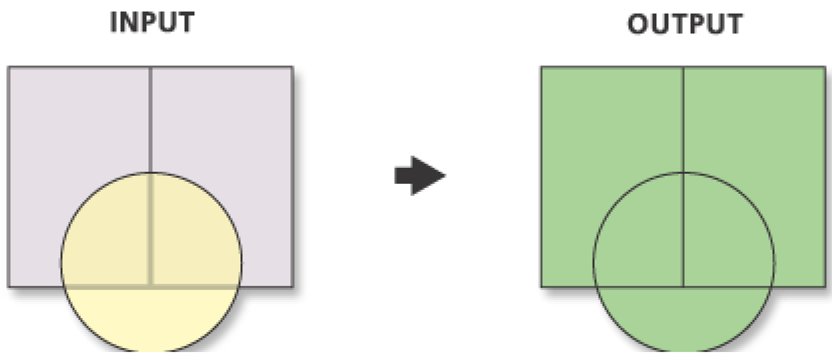

Figure 4. Depiction of ESRI ArcGIS Union Tool **(image from ESRI [2013])**

Once the data were overlaid using the Union tool, the intermediate dataset ("Union of All Inputs," Figure 3) included the extents of all the inputs (e.g., entire elk winter range, entire mule deer summer range). This resulted in a shapefile whose spatial extent encompassed an area much larger than the Site Boundary of this Project. In addition, the attribute table of this intermediate dataset now incorporates the attributes of all the input layers (Figure 5). A null value (<Null>) indicates that data do not exist for that attribute. For instance, it is not expected that WAGS habitat would overlap with a USFS stem exclusion forest. Therefore, in portions of the dataset that are WAGS habitat, the USFS Stem Exclusion Forest attribute column receives a null value because there are no forested areas within WAGS habitat.

Object_ID	Ecological System	Vegetation Habitat Type	General Vegetation	TVES Vegetation Habitat Category	WAGS Habitat	ODFW Big Game Winter Range	USFS Stem Exclusion Forest
1	<Null>	<Null>	<Null>	<Null>	2	2	<Null>
2	Inter-Mountain Basins Big Sagebrush Shrubland	Shrub-Steppe with Big Sage	Shrub-Grass	4	<Null>	2	<Null>
3	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	4
4	<Null>	<Null>	<Null>	<Null>	<Null>	2	<Null>
5	<Null>	<Null>	<Null>	<Null>	2	<Null>	<Null>
6	Inter-Mountain Basins Big Sagebrush Shrubland	Shrub-Steppe with Big Sage	Shrub-Grass	4	2	2	<Null>

Figure 5. Portion of Attribute Table from "Union of All Inputs" Intermediate Dataset

Step 2

Only those polygons that are within the Site Boundary (“TVES Data” shapefile is the Site Boundary) are part of the habitat categorization process. In order to reduce the “Union of All Inputs” shapefile to include just the polygons within the “TVES Data” shapefile, the Select tool was used. The Select tool extracts data from an existing shapefile and stores them in a new output shapefile. The data are extracted by using a logical expression within the Select tool. The logical expression in this model selects polygons with the attribute ‘TVES Vegetation Habitat Category’ (outlined in yellow in Figure 5) that are not equal to <Null> (rows highlighted in red in Figure 5).

Basically, if a polygon within the “Union of All Inputs” falls outside of the input data layer “TVES Data” it will not have a value for the attribute TVES Vegetation Habitat Category (highlighted in yellow in Figure 5) or any of the other attributes that are unique to the “TVES Data” input layer. The output of this step is a new shapefile that matches the spatial extent of the baseline ‘TVES Data’ shapefile and maintains all of the attributes of the “TVES Data” shapefile, but now contains the information (both spatial and tabular) of all the other input data where the other input data overlap it.

Step 3

The next step in the model calculates a new field (column in the attribute table) called Final Habitat Category that looks at all of the habitat category field values for each row and outputs the lowest value in that row. For instance, if the TVES came up with a habitat category of 3 based on vegetation metrics in the field, but WAGS habitat overlaps that area and is a Category 2 habitat, then the Final Habitat Category value is 2 (Figure 6, row with Object_ID = 1). It is possible that no other input layers overlap with the baseline TVES Data and whatever habitat category value was calculated in the field would be the Final Habitat Category value (Figure 6, row with Object_ID = 5).

Object_ID	TVES Vegetation Habitat Category	WAGS Habitat	ODFW Big Game Winter Range	USFS Stem Exclusion Forest	USFS Elk Winter Range	Mule Deer Summer Habitat	Final Habitat Category
1	3	**2**	<Null>	<Null>	<Null>	3	**2**
2	4	<Null>	**2**	4	<Null>	<Null>	**2**
3	5	<Null>	<Null>	4	<Null>	**3**	**3**
4	**5**	<Null>	<Null>	<Null>	<Null>	<Null>	**5**
5	**4**	<Null>	<Null>	<Null>	<Null>	<Null>	**4**
6	5	<Null>	<Null>	4	**3**	4	**3**

Figure 6. Portion of Attribute Table from “Union of All Inputs” Intermediate Dataset

The final output data “Site Boundary Shapefile with Final Habitat Categories” contains an acreage field for each of the several hundred polygons created during the Union of the input data layers. This allows the Site Boundary to be described in terms of area. The attribute table is able to be exported to Microsoft Excel software and analyzed in a pivot table to describe the Site Boundary by any combination of attribute fields.

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ESRI. 2013. Union (Analysis). Image taken from ArcGIS Online Help 10.1. Accessed July, 2013 at: http://resources.arcgis.com/en/help/main/10.1/index.html#//00080000000s000000

ATTACHMENT P1-2
REVISED FINAL BIOLOGICAL SURVEY WORK PLAN

Revised
Final Biological Survey Work Plan
Volume I

Boardman to Hemingway Transmission Line Project

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ABBREVIATIONS AND ACRONYMS

ACECs	areas of critical environmental concern
API	aerial photo interpretation
ASC	Application for Site Certificate
B2H	Boardman to Hemingway Transmission Line Project
BLM	Bureau of Land Management
BOR	Bureau of Reclamation
CAP	Community Advisory Process
CRP	Conservation Reserve Program
EFSC	Energy Facility Siting Council
EFU	Exclusive Farm Use
EIS	Environmental Impact Statement
ES	Ecological Systems
ESA	Endangered Species Act
GeoBOB	Geographic Biotic Observations
GIS	Geographic Information System
IDFG	Idaho Department of Fish and Game
IFWIS	Idaho Fish and Wildlife Information System
IDWR	Idaho Department of Water Resources
INFISH	Inland Native Fish Strategy
INHP	Idaho Natural Heritage Program
IPC	Idaho Power Company
kV	kilovolt
MIS	Management Indicator Species
NAIP	National Agriculture Imagery Program
NEPA	National Environmental Policy Act
NLC	National Land Cover Data
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NRCS	Natural Resources Conservation Service
NVCS	National Vegetation Classification System
NWI	National Wetland Inventory
ODA	Oregon Department of Agriculture
ODFW	Oregon Department of Fish and Wildlife

ABBREVIATIONS AND ACRONYMS (continued)

ODOE	Oregon Department of Energy
ODSL	Oregon Department of State Lands
ONHP	Oregon Natural Heritage Program
ORNHIC	Oregon Natural Heritage Information Center
PACFISH	Pacific Anadromous Fish Strategy
PNW	Pacific Northwest
ReGAP	Regional Gap Analysis Project
RHCA	Riparian Habitat Conservation Areas
ROW	right-of-way
TVES	Terrestrial Visual Encounter Survey
UTM	Universal Transverse Mercator
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
USFWS	U.S. Fish and Wildlife Service
WSA	wilderness study area

EXECUTIVE SUMMARY

The Boardman to Hemingway Transmission Line Project (B2H) will require biological surveys to support the evaluation of potential impacts under the National Environmental Policy Act (NEPA) and to demonstrate compliance with Oregon Department of Energy (ODOE)-Energy Facility Siting Council (EFSC) standards. The comprehensive lists of federal- and state-listed species, designated as Sensitive by the Bureau of Land Management (BLM) and USDA Forest Service (USFS), as well as the USFS Management Indicator Species, were considered for project surveys (these species will be referred to as special status species). Representatives of Oregon Department of Fish and Wildlife (ODFW), Idaho Department of Fish and Game (IDFG), USFS, U.S. Fish and Wildlife Service (USFWS), National Oceanic and Atmospheric Administration Fisheries Division (NOAA Fisheries), and BLM have participated in planning meetings regarding which species from these lists could potentially occur near the project area (Appendix E lists the special status species that could occur within the project area), and this list has been updated throughout the development of this Work Plan.

Section 1 of this Biological Survey Work Plan (Work Plan) describes a three-phased biological survey process and includes specific protocols that will be used to meet data adequacy requirements for NEPA and ODOE-EFSC. The phased approach is based on species that have the potential to occur in previously identified routes between the proposed Boardman Substation (Boardman, Oregon) and the Hemingway Substation (Melba, Idaho) (Figure 1).

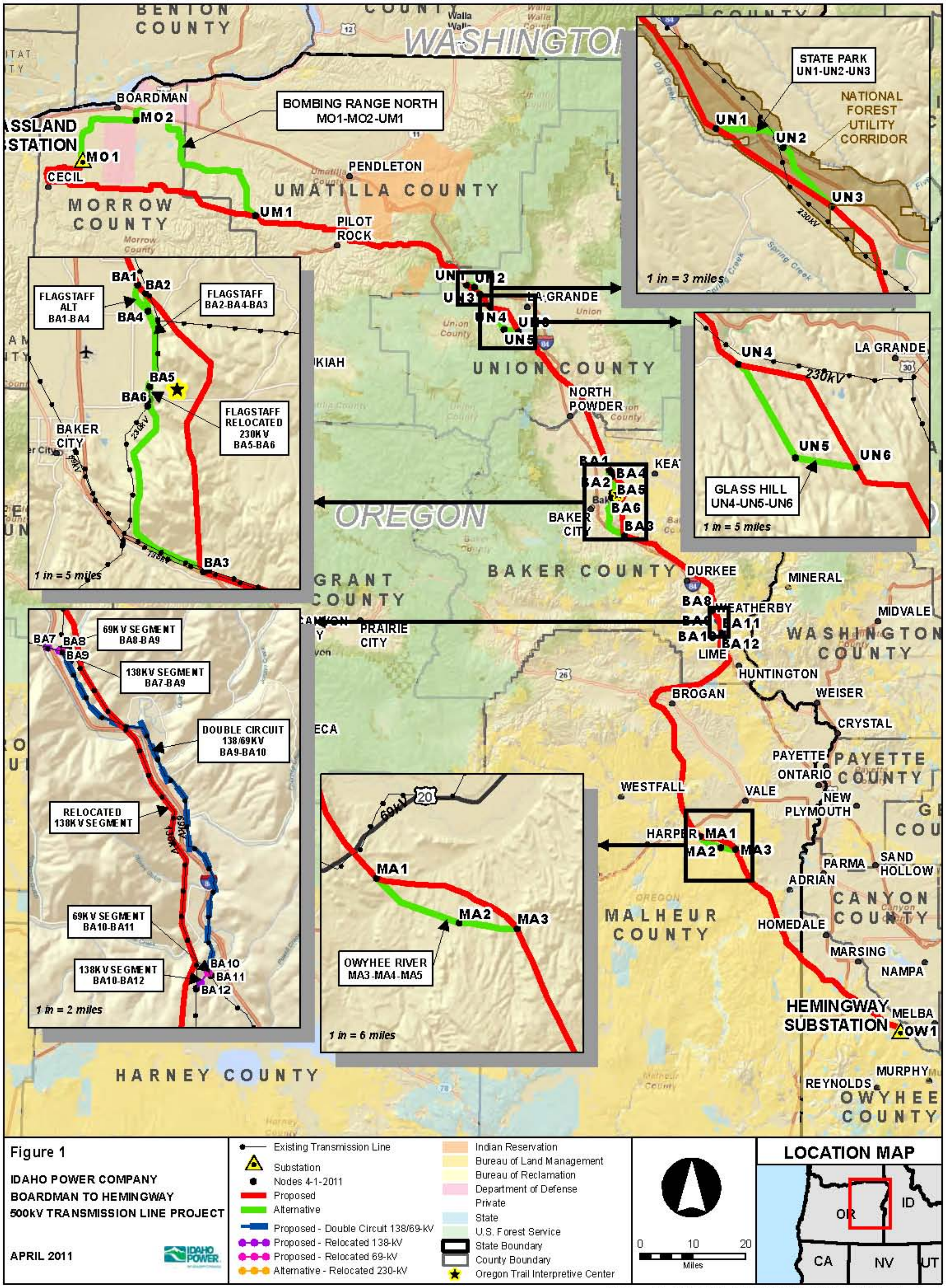
Biological Survey Phases

The objective for Phase 1 is to obtain adequate and equal biological information for all route alternatives to be considered in the Draft Environmental Impact Statement (EIS), and included Idaho Power Company's (IPC's) Application for Site Certificate (ASC) to ODOE-EFSC and subsequent Draft Proposed Order. Phase 2 involves additional comprehensive survey efforts specific to the Draft EIS BLM "preferred alternative" and IPC's Proposed Route contained in the ODOE-EFSC Proposed Order. Phase 3 includes pre-construction surveys that may be necessary to identify special status species locations for avoidance and mitigation compliance with temporal or spatial restrictions, micro-siting route changes, or close data gaps in areas where access was previously denied.

Phase 1

Phase 1 provides the basis for the Draft EIS analysis and for ODOE-EFSC to deem the ASC as complete and issue the Draft Proposed Order. Phase 1 will gather existing data to create vegetation maps that identify the potential for occurrence of special status plant and animal species within the survey areas of the NEPA alternatives and IPC's Proposed Route contained in the ASC. Phase 2 data collection (Section 3) will focus on BLM's "Preferred Alternative" and IPC's Proposed Route contained in the ASC[1].

[1] IPC assumes that if the BLM Preferred Alternative and IPC Proposed Route under EFSC review differ, IPC, BLM, and ODOE would engage in a collaborative process to reconcile route differences and allow the NEPA and EFSC processes to continue concurrently.



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Existing Resource Data

The description of the affected environment and environmental effects in the Draft EIS are based on existing data. Examples of existing data include land use and species management plans (BLM Resource Management Plans, Greater Sage-Grouse Conservation Assessment and Strategy for Oregon), vegetation maps (Northwest Regional Gap, 1-foot color imagery), species occurrence data from Oregon Natural Heritage Information Center (ORNHIC), Idaho Fish and Wildlife Information System (IFWIS), and wetland data from Pacific Northwest (PNW) Hydrography Clearinghouse, National Wetland Inventory (NWI), and National Hydrography Dataset.

Analysis of these data will allow each alternative to be treated equally in the Draft EIS, while providing sufficient information to understand the differences between alternatives and potential resource effects.

Vegetation Mapping

Vegetation mapping developed during Phase 1 of this Work Plan created a land cover dataset that will be applied across the entire project area, including both public and private lands. Vegetation mapping provides the basis for identifying habitat and the occurrence of special status species (Volume II-Final Biological Survey Map Book). This task includes the following:

- Incorporating elements of Geographic Information System (GIS) modeling and classification in combination with aerial photo interpretation of 1-foot color imagery (3Di West) and 1.6- to 6.6-foot color imagery of the National Agriculture Imagery Program (NAIP) to identify National Vegetation Classification System (NVCS) vegetation community types;
- Providing a mechanism for identifying suitable habitat for special status plant and animal species;
- To the extent practical, evaluating the quality of habitat for special status species using remote sensing, and incorporating substantial agency input and limited systematic field verification sampling; and
- Providing baseline information to categorize B2H habitats in accordance with ODFW Fish and Wildlife Habitat Mitigation Policy (OAR 635-415-0000 through -0025).

Phase 2

Phase 2 supplements the Draft EIS analysis and provides protocol level information about BLM's Preferred Alternative and IPC's Proposed Route contained in the ASC. The focus of Phase 2 will be specific wildlife and plant surveys that will identify, in detail, the biological resources that occur within the survey areas described in this Work Plan. These surveys will be the basis for final vegetation mapping, wetland delineations, habitat mapping, and categorization as described herein.

Wildlife Field Surveys

The following special status species were identified during coordination meetings with the BLM, USFS, USFWS, NOAA Fisheries, ODFW, and IDFG, and will require site-specific field surveys:

- Washington ground squirrel and associated burrows;
- all raptors, including these special status species: the northern goshawk, ferruginous hawk, golden eagle, bald eagle, Swainson's hawk, peregrine falcon, flammulated owl, and great gray owl;
- greater sage-grouse and Columbian sharp-tailed grouse;
- three-toed woodpecker;
- Columbia spotted frog; and
- other special status species (as identified in Table ES-1) that will be surveyed concurrently.

Burrowing owl and pygmy rabbit will require site-specific field surveys if encountered during other species protocol surveys or Terrestrial Visual Encounter Survey (TVES). Note that on BLM-managed lands, protocol-level surveys for pygmy rabbits will be conducted in all areas with deep soil that contains big sagebrush species (including Mountain, Basin and Wyoming sage) with more than 5 percent canopy cover. These surveys will be conducted on BLM-managed lands, regardless of whether or not TVES surveyors identify rabbit activity. These protocol-level surveys will be conducted concurrently with TVES surveys; however, the surveyor conducting the pygmy rabbit surveys on BLM-administered lands will not be a part of or participate in the TVES surveys (i.e., his or her efforts will be spent exclusively on the pygmy rabbit protocol surveys for the duration of the survey).

This Work Plan includes field survey protocols for the above species (Appendix B-1 through B-11). Methods and timing are based on input from agency personnel as well as established survey protocols. Table ES-1 displays information on species-specific timing of surveys and the corresponding phase of the Work Plan in which the survey will be completed. The survey objectives for both wildlife and plant surveys are to collect site-specific information on wildlife and plant species and their occurrence within the survey area, which will be used to describe the affected environment, assist with final siting of the proposed transmission line and associated facilities, evaluate the potential impacts of construction, operations, and maintenance of the project, and provide the basis for environmental protection measures and appropriate mitigation measures.

Special Status Plant Species and Noxious Weed Surveys

Plants listed as threatened or candidate species under the Endangered Species Act (ESA) may occur within the project area. Plants listed as threatened or endangered by the state of Oregon, and as Sensitive by the BLM and USFS, have the potential to occur in the project area. These species will be addressed in Phase 2 of the Work Plan. Table ES-1 displays a list of these species and their survey timeframes.

Noxious weeds are nonnative, invasive species that threaten agriculture, rangelands, waterways, parks, wildlife, property values, public health and safety, and general ecological health and diversity of native ecosystems. Noxious weeds will be recorded concurrently during plant surveys. The Oregon Department of Agriculture (ODA) categorizes noxious weeds into two primary groups—List A, and List B. List A contains weeds of known economic importance that occur in the state in small enough infestations to make eradication or containment possible or weeds that are not known to currently occur in Oregon. Idaho noxious weeds are grouped into one of three lists maintained by the Idaho State Department of Agriculture: Statewide Early Detection and Rapid Response, Statewide Control, and Statewide Containment. See Appendix C-3 for a listing of Oregon and Idaho noxious weeds that may occur along the 500-foot survey corridor.

Waters of the United States

The Work Plan describes the proposed methodology for identifying, documenting, and delineating Waters of the U.S., including wetlands, that may be affected by the proposed transmission line to satisfy requirements of the U.S. Army Corps of Engineers (USACE), Oregon Department of State Lands (ODSL), and the Idaho Department of Water Resources (IDWR). The survey approach and appropriate functional assessment methodology will be finalized based on input from ODSL and USACE regulatory staff during a pre-application meeting. Direct impacts to Waters of the U.S. will be avoided and, where possible, minimized during micro-siting of project components (structures, access roads, pulling and tensioning areas, staging areas, and fly yards). A physical delineation and survey of these areas would occur only if a proposed project component is within 100 feet of Waters of the U.S.

Habitat Surveys

Identification and assessment of habitats is an integral part in evaluating the potential for occurrence of special status plant and wildlife species. Identification of the occurrence of unique habitats such as rock-ash-calcareous outcroppings, talus slopes, cliffs, caves, riparian zones, sand inclusions, mature timber stands, permanent and seasonal ponds, lakes, and wetlands, will take place in Phase 1 Vegetation Mapping. These unique features will be ground-verified during Phase 2 plant and wildlife surveys.

Phase 3

Preconstruction surveys will be implemented for select species during Phase 3. These may include surveys for active raptor nests, as well as general avian species nest surveys or specific plant species as appropriate. It is the intent that all vegetation clearing and grubbing will be performed prior to nesting and would negate the need to conduct nest surveys for most migratory birds. In the event that clearing would be needed during the nesting season, nesting surveys would be performed within 10 days of clearing, grubbing, grading or excavation activities.

If the Proposed Route alternatives or associated infrastructure change after Phase 2 surveys have been conducted, or where previously denied access has be granted, additional wildlife or plant surveys or wetland delineations will also be required during Phase 3 (Table ES-1).

Table ES-1. B2H Timeframe for Performing Pre-Field Mapping/Preparation and Biological Field Surveys

Survey Type		Survey Periods								
Common Name	**Scientific Name**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
PHASE 1—(IPC Proposed Route and NEPA Alternatives)										
VEGETATION and HABITAT MAPPING										
Vegetation Cover Mapping										
Unique Habitat Mapping										
Wetlands and Riparian (concurrently with Vegetation Mapping)										
PHASE 2—(BLM Preferred Alternative and IPC's Proposed Route and Route Alternatives)										
WILDLIFE										
Greater sage-grouse and Columbian sharp-tailed grouse	*Centrocercus urophasianus, Tympanuchus phasianellus*									
Washington ground squirrel	*Spermophilus washingtoni*									
Flammulated owl	*Otus flammeolus*									
Great gray owl	*Strix nebulosa*									
Northern goshawk	*Accipiter gentilis*									
Three-toed woodpecker	*Picoides dorsalis*									
Columbian spotted frog	*Rana luteiventris*									
Raptor Nest Surveys										
Ferruginous hawk	*Buteo regalis*									
Golden eagle	*Aquila chrysaetos*									
Swainson's hawk	*Buteo swainson*									
Peregrine falcon	*Falco peregrinus*									
Bald eagle	*Haliaeetus leucocephalus*									
Terrestrial Visual Encounter Surveys										
Burrowing Owl[1/]	*Anthene cunicularia*									
Black-throated sparrow	*Amphispiza bilineata*									
Brewer's sparrow	*Spizella breweri*									
Grasshopper sparrow	*Ammodramus savannarum*									
Loggerhead shrike	*Lanius ludovicianus*									
Long-billed curlew	*Numenius americanus*									

Table ES-1. B2H Timeframe for Performing Pre-Field Mapping/Preparation and Biological Field Surveys (continued)

Survey Type		Survey Periods								
Common Name	**Scientific Name**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
Northern waterthrush	*Parkesia noveboracensis*									
Sage sparrow	*Amphispiza belli*									
Sage thrasher	*Oreoscoptes montanus*									
Mojave black-collard lizard	*Crotaphytus bicinctores*									
Sagebrush lizard	*Sceloporus graciosus*									
Western ground snake	*Sonora semiannulata*									
Pygmy rabbit[1/]	*Brachylagus idahoensis*									
White-tailed jackrabbit	*Lepus townsendii*									
All other wildlife occurrences	N/A									
VEGETATION										
Howell's spectacular thelypody	*Thelypodium howellii ssp. Spectabilis*									
Slickspot peppergrass	*Lepidium papilliferum*									
Biennial stanleya	*Stanleya confertifolia*									
Bigelow's four-o'clock	*Mirabilis laevis* var. *retorsa*									
Calcareous buckwheat	*Eriogonum ochrocephalum* var. *calcareum*									
Cronquist's stickseed	*Hackelia cronquistii*									
Cusick's false yarrow	*Chaenactis cusickii*									
Cusick's lupine	*Lupinus lepidus* var. *cusickii*									
Desert pincushion	*Chaenactis stevioides*									
Dimeresia	*Dimeresia howellii*									
Douglas' clover	*Trifolium douglasii*									
Greeley's wavewing	*Cymopteris acaulis* var. *greeleyorum*									
Janish's penstemon	*Penstemon janishiae*									
Laurence's milkvetch	*Astragalus collinus* var. *laurentii*									

Table ES-1. B2H Timeframe for Performing Pre-Field Mapping/Preparation and Biological Field Surveys (continued)

Survey Type		Survey Periods								
Common Name	**Scientific Name**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
Least phacelia	*Phacelia minutissima*									
Least snapdragon	*Sairocarpus Kingii*									
Many-flowered phlox	*Phlox multiflora*									
Malheur cryptantha	*Cryptantha propria*									
Malheur yellow phacelia	*Phacelia lutea* var. *calva*									
Mingan's moonwort	*Botrychium minganense*									
Mountain moonwort	*Botrychium montanum*									
Mulford's milkvetch	*Astragalus mulfordiae*									
Oregon semaphore grass	*Pleuropogon oregonus*									
Owyhee clover	*Trifolium owyheense*									
Packard's mentzelia	*Mentzelia packardiae*									
Packard's wormwood	*Artemisia packardiae*									
Red-fruited lomatium	*Lomatium erythrocarpum*									
Retrorse sedge	*Carex retrorsa*									
Salt heliotrope	*Heliotropum curvassavicum*									
Simpon's hedgehog cactus	*Pediocactus simpsonii*									
Smooth mentzelia	*Mentzelia mollis*									
Snake River goldenweed	*Pyrrocoma radiata*									
Sterile milkvetch	*Astragalus cusickii* var. *sterilis*									
Stiff milkvetch										
White-margined waxplant	*Glyptopleura marginata*									
HABITATS										
Vegetation Map Refinement										
Unique Habitat Ground Verification										
Wetland Delineations										

Table ES-1. B2H Timeframe for Performing Pre-Field Mapping/Preparation and Biological Field Surveys (continued)

Survey Type		Survey Periods								
Common Name	**Scientific Name**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
PHASE 3—(Preconstruction Surveys and Modifications to Project Features)[2/]										
WILDLIFE										
Active Raptor Nest Survey										
VEGETATION										
Vegetation Clearance Surveys in Areas of Disturbance										
OTHER										
Wildlife, Vegetation, and Habitat Surveys of Modified Route or Project Features										

Notes:

1/ Protocol surveys for these species will be conducted if individuals or their sign are documented during other protocol surveys or TVES and could occur during any phase of the project; on BLM-managed lands, protocol-level surveys for pygmy rabbits will be conducted in all areas with deep soil that contains big sagebrush species (including Mountain, Basin, and Wyoming sage) with more than 5 percent canopy cover.

2/ Surveys would be conducted during appropriate species timing requirements.

1.0 INTRODUCTION

The Applicant, Idaho Power Company (IPC), is proposing to construct, operate, and maintain approximately 300 miles of single-circuit 500-kilovolt (kV) transmission line, known as the Boardman to Hemingway Transmission Line Project (B2H). This Biological Survey Work Plan (Work Plan) describes the survey process and species-specific surveys that will be conducted to meet full data adequacy for National Environmental Policy Act (NEPA) and Oregon Department of Energy (ODOE) - Energy Facility Siting Council (EFSC) evaluation for B2H. This Work Plan presents all of the tasks required to successfully complete the biological resources studies and surveys for B2H. This work is being undertaken to comply with federal and Oregon State Endangered Species Acts (ESAs), ODOE-EFSC requirements, and Oregon Department of Fish and Wildlife (ODFW) habitat categorization requirements. The purpose of the surveys is to identify wildlife resources, including special status species, vegetation resources, including special status species, and Waters of the U.S. that may be present within the Applicant's Proposed Route and its alternatives for B2H. Special status and listed fish (Appendix E) will be assumed present in streams that have been documented to contain these species. Fisheries surveys will not be conducted; however, stream data (i.e., stream morphology, riparian vegetation characteristics, and substrate characteristics) will be collected at all locations where the project has the potential to adversely impact fish habitats (see Sections 2.1.2 and 3.3.3).

The initial process of identifying a route began in late 2007, when IPC submitted an SF-299 application for a Right-of-Way Grant to the Bureau of Land Management (BLM) and Bureau of Reclamation (BOR), a Special Use Permit to the USFS, and a Notice of Intent (NOI) to ODOE-EFSC. Following the public scoping meetings held in October 2008, these agencies received public input requesting that IPC conduct more extensive outreach while identifying the transmission line route. In response, IPC initiated a process to engage communities from Boardman, Oregon, to Murphy, Idaho, in siting the B2H Transmission Line Project. This process is called the Community Advisory Process (CAP). IPC met with various private landowners, local officials, business leaders and other stakeholders from May 2009 through May 2010 to identify community issues and concerns, develop a range of possible routes, and recommend proposed and alternate routes. Based on comments received in the CAP, IPC submitted a revised application to the BLM and USFS in June 2010, and a NOI to the ODOE-EFSC in July 2010. The objectives for siting the project were to address community concerns, avoid sensitive resources when possible, balance regulatory requirements, address construction difficulty, and estimate overall project costs. Sensitive resources areas that were avoided to the extent practical during the siting process included, but were not limited to, city and town boundaries, the Boardman Bombing Range, Exclusive Farm Use (EFU) zones, areas of critical environmental concern (ACECs), wilderness study areas (WSAs), all waterbodies (including wetlands, wild and scenic rivers, special status streams), visual resource retention and preservation lands, inventoried roadless areas, ESA-listed critical habitats, and areas with sensitive wildlife resources (e.g., sage grouse leks, eagle nests). Details regarding the siting process and the constraints considered regarding proposed and alternative routes are presented in the B2H Siting Study (IPC 2010).

The BLM, as the lead agency responsible for NEPA compliance, conducted a second public scoping period that ended in late September 2010. ODOE-EFSC conducted public meetings concurrently with the BLM's scoping meetings. Based on the scoping process, it was determined that BLM will work with cooperating agencies to determine which routes, including alternatives, will be analyzed in detail in the EIS. Once the NEPA alternatives have been established, a reevaluation of special status species in the project area will occur with input from BLM, USFWS, NOAA Fisheries, ODFW, and ODA. BLM's Preferred Alternative and IPC's Proposed Route as contained in the ASC will continue to be refined throughout the permitting process. The Phased Study approach, as described in the Work Plan, will ensure that appropriate biological resource surveys will be conducted as necessary.

Purpose of the Work Plan

The purpose of this Work Plan is to serve as a guide for specific species that will be surveyed for and method (protocol) that will be used to complete the surveys. This Work Plan will also serve as an agreement between IPC and the agencies (BLM, Idaho Department of Fish and Game [IDFG], ODFW, ODA, NOAA Fisheries, and the USFWS) on which species need to be surveyed to meet the requirements of the NEPA document and ODOE-EFSC Application for Site Certificate (ASC). This plan contains a list of the specific species that will be surveyed for, the timing of the surveys, and detailed protocols for the surveys for each species.

Agency Coordination

On August 22, 2008, a meeting was held with land managers and biologists from all of the involved BLM, USFS, NOAA Fisheries, USFWS, and ODFW offices in Baker City, Oregon, to discuss the need for protocol surveys for identified wildlife species, rare plant species, wetlands, vegetation, and general habitat surveys. Methods to develop vegetation mapping were also discussed and agreed upon. Subsequent meetings with ODFW biologists were held in Baker City on September 30, 2008, and in Pendleton, Oregon, on October 17, 2008. A meeting with the IDFG was held in Boise, Idaho, on February 9, 2009. The draft Work Plan was submitted to agency specialists on February 10, 2009, followed by an interagency meeting involving representatives of ODFW, BLM, USFS, ODOE, NOAA Fisheries, and USFWS to discuss proposed survey protocols on February 17, 2009. Shortly after, IPC initiated the CAP to develop a broader range of possible routes and recommend proposed and alternate routes. Following completion of the CAP, a second interagency meeting involving representatives of ODFW, BLM, USFS, ODOE, NOAA Fisheries, and USFWS was held on October 26, 2010, to obtain additional input on species and habitats along IPC's Proposed Route and route alternatives. A final meeting with these agencies was held in Baker City, Oregon, on February 15, 2011, to finalize the Work Plan. Input from agency specialists was used to identify the special status federal and state species that would require field surveys, the species targeted during concurrent field surveys, and the species for which field surveys would not be required.

Data Standards

The BLM NEPA handbook H-1790-1 (USDI-BLM 2008) does not provide specific guidance on required data standards. It does state that information should be of sufficient detail to serve as a baseline against which to measure the potential effects of implementing an action. Council on Environmental Quality regulations (40 Code of Federal Regulations 1500.1 [b]) state that:

> "NEPA procedures must insure that environmental information is available to public officials and citizens before decisions are made and before actions are taken. The information must be of high quality. Accurate scientific analysis, expert agency comments, and public scrutiny are essential to implementing NEPA. Most important, NEPA documents must concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail."

ODOE-EFSC requires the applicant to complete appropriate site-specific studies to characterize the fish and wildlife habitat at the site and nearby areas. The purpose of these studies is two-fold. The first is to determine the quality of the fish and wildlife habitat based on species presence or absence, and the second is to determine whether direct impacts to species or their habitat will occur or if the habitat can be avoided. If the impacts to species or habitat cannot be avoided, then mitigation must be developed.

The applicant must also provide appropriate studies of the site to identify threatened or endangered species that the proposed facility could affect. If a potential risk to the survival or recovery of a threatened or endangered species exists, the applicant must redesign or relocate the facility to avoid that risk or propose appropriate mitigation measures.

This Work Plan was developed through consultation with the ODFW, IDFG, ODA, USFS, USFWS, NOAA Fisheries, and BLM, and contains a comprehensive list of sensitive species that could be affected by the proposed B2H project. Surveys for the species documented in this Work Plan will provide an appropriate baseline for the NEPA analysis and will comply with ODOE-EFSC standards.

Updates to the Work Plan

All of the surveys that will occur in support of the B2H project have seasonally specific time frames in which they must occur. Any deferral in initiating the surveys or the need to conduct additional surveys could result in a delay in obtaining species data necessary for the ODOE-EFSC ASC. Therefore, updates to this Work Plan will be limited to the following conditions:

1. Change in status of a species by its federal listing as threatened or endangered
2. Changes to the location of IPC's Proposed Route or route alternatives that would affect special status species or their habitats that are not currently documented in this Work Plan.

1.1 Biological Survey Phases

IPC will collect biological resource data in three phases (Table 1). The phased approach was developed to meet the unique and not always complementary data needs, timelines, and regulatory processes of the BLM, USFS, and ODOE-EFSC for a multi-state transmission line project. The phased approach provides all of the data typical for these processes, while also accounting for changes in the project as engineering design is refined and as permission to access private lands is granted.

Phase 1 utilizes existing data to create vegetation maps that describe the occurrence and potential for occurrence of biological resources within the project area. Phase 1 will provide biological information for the full range of route alternatives in the Draft EIS and provide the majority of information necessary for the ASC submittal to ODOE-EFSC, and issuance of a Draft Proposed Order.

Phase 2 includes protocol level surveys to be completed along the BLM Preferred Alternative and ODOE-EFSC Proposed Route identified in the ASC and provides the data necessary to complete a Final EIS and the issuance of ODOE-EFSC's Proposed Order. This phase includes ground surveys for Washington ground squirrel, Columbia spotted frogs, northern goshawk, great gray owl, flammulated owl, three-toed woodpecker, and aerial surveys of greater sage-grouse and nesting raptors. Surveys for special status plant and wildlife species will be conducted concurrently. During these surveys, all wildlife species and any sensitive plant species that are observed will be recorded. Other species-specific protocol surveys may be required along portions of the route if an unanticipated species is located during survey efforts.

Phase 3 includes pre-construction surveys that may be necessary to comply with temporal or spatial restrictions and/or provide information for any changed condition (e.g., modifications to project features).

Table 1. Phased Biological Surveys Approach

PURPOSE OF PHASED STUDY PLAN APPROACH

The purpose of this phased study plan is to provide a road map of the transmission line area of analysis, types of data to be collected and timing of collection. The objective is to devise a plan that will allow the NEPA, BLM Right-of-Way (ROW) Grant, Forest Service Special Use Permit and EFSC Site Certificate processes to proceed concurrently based on an adequate level of detail needed for making intermediate and final agency decisions. The specific phasing of data described below takes into account the unique nature of a long cross-state high-voltage line, public interest in line adjustments, and the inherent flexibility of transmission line components to be micro-sited to avoid impact. When the three phases are taken as a total the data collected and analyzed meet all of the typical BLM and USFS survey requirements, as well as all the substantive requirements of ODOE-EFSC regulations.

Biological Resources Phased Study Plan

<table>
<tr><th>Resource Category</th><th colspan="2">Phase 1 Data Collection
Provides the basis for the Draft EIS analysis and for ODOE-EFSC to deem the ASC complete and issued Draft Proposed Order.</th><th colspan="2">Phase 2 Data Collection
Supplements the Draft EIS analysis and provides protocol level information about the Agency preferred alternative and Applicants Proposed Route filed with ODOE-EFSC that are presented in the Final EIS and Proposed Order.</th><th colspan="2">Phase 3 Data Collection
Provides detailed site specific data for resources that could be affected at the time of construction as well as information on any changed conditions.</th></tr>
<tr><td colspan="7">MAJOR SCHEDULE ACTIVITIES</td></tr>
<tr><td rowspan="2">Schedule Timeline Activities</td><td colspan="2">12 months</td><td colspan="2">12 months</td><td colspan="2">4-6 months</td></tr>
<tr><td>BLM/FS with cooperating agencies
• BLM/USFS SF 299s.
• Federal Register NOI.
• Scoping Meetings.
• Scoping Report.
• Preliminary Draft EIS.
• Administrative Draft EIS.
• Draft EIS.</td><td>ODOE-EFSC with ODFW
• NOI (by Proponent).
• Public Notice.
• Public Information Meetings.
• Preliminary ASC (by proponent).
• Data requests.
• Deemed Complete.
• Draft Proposed Order.</td><td>BLM/FS with cooperating agencies
• Comment period.
• Public Meetings.
• Final EIS.</td><td>ODOE-EFSC with ODFW
• Public Hearings.
• Proposed Order.</td><td>After BLM/FS
• Record of Decision.
• Appeal Period.
• ROW Grant and Special Use Permit issued.
• Approval of Construction Plan of Development (POD).</td><td>After ODOE-EFSC
• Contested Case.
• Site Certificate.
• Appeal Period.
• Compliance with all conditions of Certificate.</td></tr>
</table>

Table 1. Phased Biological Surveys Approach (continued)

STUDY PARAMETERS			
Resource Category	**Phase 1 Data Collection** Provides the basis for the Draft EIS analysis and for ODOE-EFSC to deem the ASC complete and issued Draft Proposed Order.	**Phase 2 Data Collection** Supplements the Draft EIS analysis and provides protocol level information about the Agency preferred alternative and Applicants Proposed Route filed with ODOE-EFSC that are presented in the Final EIS and Proposed Order.	**Phase 3 Data Collection** Provides detailed site specific data for resources that could be affected at the time of construction as well as information on any changed conditions.
Alternatives	• Range of alternatives based on BLM / ODOE-EFSC scoping. The alternatives will be evaluated at same level of analysis in the Draft EIS based on the Phase 1 data sources described below. These will be the same range of alternatives presented in Applicant's preliminary ASC which will also be based on the Phase 1 data sources described below.	Includes IPC's and route alternatives presented in the Final ASC, BLM preferred alternative based on the Draft EIS comments, and any new reasonable alternatives identified as a result of scoping.	Includes route changes identified late in project permitting due to site-specific conditions.
Analysis Areas	• The analysis area will be specific to each resource area as determined by environmental practice, BLM guidelines or ODOE-EFSC standards.	The analysis area will be specific to each resource area as determined by environmental practice, BLM guidelines, or ODOE-EFSC standards.	
Disturbance Footprint	• The disturbance areas within the ROW include access roads, transmission structure sites, and pulling and tensioning sites. Disturbance areas outside ROW include service and access roads, staging areas and fly yards.	The disturbance areas within the ROW include access roads, transmission structure sites, and pulling and tensioning sites. Disturbance areas outside ROW include service and access roads, staging areas and fly yards.	Final modifications included in construction BLM POD and Supplemental ODOE-EFSC filing identifying any changes in conditions since Final Project Order.

Table 1. Phased Biological Surveys Approach (continued)

Resource Category	Phase 1 Data Collection Provides the basis for the Draft EIS analysis and for ODOE-EFSC to deem the ASC complete and issued Draft Proposed Order.	Phase 2 Data Collection Supplements the Draft EIS analysis and provides protocol level information about the Agency preferred alternative and Applicants Proposed Route filed with ODOE-EFSC that are presented in the Final EIS and Proposed Order.	Phase 3 Data Collection Provides detailed site specific data for resources that could be affected at the time of construction as well as information on any changed conditions.
WILDLIFE			
Greater Sage-grouse	Existing Data • ODFW and IDFG lek data. • Sage-Grouse Conservation Assessment and Strategy for Oregon: habitat ranks/viability data. • ODFW occurrence data. • IDFG sage-grouse telemetry data. • The Oregon Natural Heritage Program (ONHP) data. • Idaho Fish and Wildlife Information System (IFWIS) Database. • Idaho Sage-grouse Habitat Planning Map. • Conservation Plan for the greater sage-grouse in Idaho. • Local Working Group sage-grouse conservation plans (e.g., Owyhee, West Central, Idaho, others). Additional Data • Aerial lek surveys of potential routes completed in April 2010. • Follow-up ground surveys may be conducted at suspected lek locations. A sage grouse specialist would make determination as to whether ground survey is needed. • Refine potential habitat types along routes using ReGAP.	• Incorporate any new sage-grouse data from ODFW and IDFG. 2011 aerial lek surveys of Proposed Route and associated project features (access roads, lay-down areas, and fly yards) not flown in 2010.	• Follow-up surveys of modifications to all project features.
Sharp-tailed Grouse	Existing Data • ONHP data. • IDFG lek data. Additional Data • Will be considered during all sage-grouse efforts (above).	• Incorporate any new grouse data from ODFW and IDFG.	
Burrowing Owl	Existing Data • ONHP data. • IDFG data. • BLM Location and habitat data. • ODFW Location and habitat data. Additional Data • Map potentially suitable habitat along all proposed routes.	• Ground surveys in potential habitat along the Proposed Route where right of entry granted. • Protocol surveys will be conducted in the immediate area (as defined by protocols) if owls or their sign are documented during Terrestrial Visual Encounter Survey (TVES) or other protocol species surveys.	• Follow-up surveys of modifications to all project features.

Table 1. Phased Biological Surveys Approach (continued)

Resource Category	Phase 1 Data Collection Provides the basis for the Draft EIS analysis and for ODOE-EFSC to deem the ASC complete and issued Draft Proposed Order.	Phase 2 Data Collection Supplements the Draft EIS analysis and provides protocol level information about the Agency preferred alternative and Applicants Proposed Route filed with ODOE-EFSC that are presented in the Final EIS and Proposed Order.	Phase 3 Data Collection Provides detailed site specific data for resources that could be affected at the time of construction as well as information on any changed conditions.
Washington Ground Squirrel	Existing Data • Existing data from ONHP, The Nature Conservancy, and Boardman Bombing Range. Additional Data • Map potentially suitable habitat along all proposed routes based on ReGAP and high-quality aerial photography.	• Pedestrian protocol surveys of all potential habitats along IPC's proposed route, route alternative, and associated project features (on private lands where right of entry is granted) in March-May 2011. • Aerial route surveys to verify mapping in areas where access not granted.	• Follow-up surveys of modifications to all project features.
Great Gray Owl	Existing Data • USFS nest occurrence data. • USFS publications: Ecology of the Great Gray Owl. Additional Data • Map potentially suitable habitat along all proposed routes based on ReGAP, National land Cover Data (NLCD), stand data if available, aerial photography.	• Ground survey of potential nesting habitat along the Proposed Route and associated project features in April-July 2011.	• Follow-up surveys of modifications to all project features.
Flammulated Owl	Existing Data • ONHP. • Idaho Natural Heritage Program (INHP) Observations Database. Additional Data • Map potentially suitable habitat along all proposed routes based on ReGAP.	• Concurrent ground survey (with great gray owl and goshawk) of potential nesting habitat along the Proposed Route and associated project features in 2011.	• Follow-up surveys of modifications to all project features.
Northern Goshawk	Existing Data • ONHP. • Idaho NHP Observations Database. • Forest Service data. Additional Data • Map potential habitat types along all proposed routes based on ReGAP and stand data from the USFS.	• Ground survey of potential nesting habitat along the Proposed Route and associated project features in May- July of 2011.	• Follow-up surveys of modifications to all project features.
Three-toed Woodpecker	Existing Data • ONHP. Additional Data • Map potential habitat types along all proposed routes based on ReGAP.	• Concurrent ground survey (same timeframe as great gray owl and goshawk) of potential nesting habitat along the Proposed Route and associated project features in April – July 2011.	• Follow-up surveys of modifications to all project features.

Table 1. Phased Biological Surveys Approach (continued)

Resource Category	Phase 1 Data Collection Provides the basis for the Draft EIS analysis and for ODOE-EFSC to deem the ASC complete and issued Draft Proposed Order.	Phase 2 Data Collection Supplements the Draft EIS analysis and provides protocol level information about the Agency preferred alternative and Applicants Proposed Route filed with ODOE-EFSC that are presented in the Final EIS and Proposed Order.	Phase 3 Data Collection Provides detailed site specific data for resources that could be affected at the time of construction as well as information on any changed conditions.
Raptor Nest Survey	Existing Data • ONHP and INHP data. • Agency historical records. Additional Data • none.	• Aerial raptor nest surveys of all routes in 2011.	• Preconstruction aerial survey to map active nests for construction avoidance and/or spatial and temporal restrictions.
Ferruginous Hawk	Existing Data • ONHP and INHP data. • Agency historical records. Additional Data • None.	• Aerial raptor nest surveys of all routes in 2011.	• Preconstruction aerial survey to map active nests for construction avoidance and/or spatial and temporal restrictions.
Swainson's Hawk	Existing Data • ONHP and INHP data. • Agency historical records. Additional Data • None.	• Aerial raptor nest surveys of all routes in 2011.	• Preconstruction aerial survey to map active nests for construction avoidance and/or spatial and temporal restrictions.
Golden Eagle	Existing Data • ONHP and INHP data. • Agency historical records. Additional Data • None.	• Aerial raptor nest surveys of all routes in 2011.	• Preconstruction aerial survey to map active nests for construction avoidance and/or spatial and temporal restrictions.
Bald Eagle	Existing Data • ONHP and INHP data. • Agency historical records where available. Additional Data • None.	• Aerial raptor nest surveys of all routes in 2011.	• Preconstruction aerial survey to map active nests for construction avoidance and/or spatial and temporal restrictions.
Peregrine Falcon	Existing Data • ONHP and INHP data • agency historical records Additional Data • none	• Aerial raptor nest surveys of all routes in 2011.	• Preconstruction aerial survey to map active nests for construction avoidance and/or spatial and temporal restrictions.
Pygmy Rabbit	Existing Data • ONHP and INHP data. • ReGAP. • High-quality aerial photos. Additional Data • None.	• Ground surveys in potential habitat along the Proposed Route where right of entry granted. • Protocol surveys will be conducted in suitable habitat (as defined by protocols) on BLM managed lands, or if rabbits or their sign are documented during TVES or other protocol species surveys project-wide.	• Follow-up surveys of modifications to all project features.

Table 1. Phased Biological Surveys Approach (continued)

Resource Category	Phase 1 Data Collection Provides the basis for the Draft EIS analysis and for ODOE-EFSC to deem the ASC complete and issued Draft Proposed Order.	Phase 2 Data Collection Supplements the Draft EIS analysis and provides protocol level information about the Agency preferred alternative and Applicants Proposed Route filed with ODOE-EFSC that are presented in the Final EIS and Proposed Order.	Phase 3 Data Collection Provides detailed site specific data for resources that could be affected at the time of construction as well as information on any changed conditions.
Sensitive Fish Species	Existing Data • StreamNet. • USFWS, ONHP, and INHP data. • GIS waterflow data. Additional Data • None.	• Sensitive fish species will be assumed to be present based on existing data and no species-specific surveys will be performed.	• Sensitive fish species will be assumed to be present based on existing data and no species-specific surveys will be performed.
Columbia spotted Frog	Existing Data • ONHP. • INHP data. • USFWS data. • Potential habitat based on vegetation mapping Additional Data • None.	• Amphibian surveys of wetlands suspected to contain Columbia spotted frog within 250 feet of proposed project features (e.g., tower footprints, road footprints, fly yards).	• Follow-up surveys of modifications to all project features.

Table 1. Phased Biological Surveys Approach (continued)

Resource Category	Phase 1 Data Collection Provides the basis for the Draft EIS analysis and for ODOE-EFSC to deem the ASC complete and issued Draft Proposed Order.	Phase 2 Data Collection Supplements the Draft EIS analysis and provides protocol level information about the Agency preferred alternative and Applicants Proposed Route filed with ODOE-EFSC that are presented in the Final EIS and Proposed Order.	Phase 3 Data Collection Provides detailed site specific data for resources that could be affected at the time of construction as well as information on any changed conditions.
• Terrestrial Visual Encounter Surveys (All wildlife species observed would be recorded; however, target species include: black-throated sparrow, Brewer's sparrow, grasshopper sparrow, loggerhead shrike, long-billed curlew, Mojave black-collard lizard, northern waterthrush, pygmy rabbit,[1/] burrowing owl, sage sparrow, sage thrasher, sagebrush lizard, western ground snake, and white tailed jackrabbit. Any observations of special status plant species and/or their habitats would also be recorded)	Existing Data • ONHP and INHP data. • ReGAP. • Species range information. • High-quality aerial photos. Additional Data • None.	• Terrestrial visual encounter survey of the Proposed Route and associated project features to record special status species observations or sign.	• Follow-up surveys of modifications to route access roads, or lay down area prior to construction.

Table 1. Phased Biological Surveys Approach (continued)

Resource Category	Phase 1 Data Collection Provides the basis for the Draft EIS analysis and for ODOE-EFSC to deem the ASC complete and issued Draft Proposed Order.	Phase 2 Data Collection Supplements the Draft EIS analysis and provides protocol level information about the Agency preferred alternative and Applicants Proposed Route filed with ODOE-EFSC that are presented in the Final EIS and Proposed Order.	Phase 3 Data Collection Provides detailed site specific data for resources that could be affected at the time of construction as well as information on any changed conditions.
VEGETATION			
Threatened or Endangered Plant Species	<u>Existing Data</u> • Oregon Department of Agriculture, ONHP, IFWIS Database, BLM and USFS data. <u>Additional Data</u> • Map potential habitat types along routes based on ReGAP and ONHP data. • Ground surveys for federally listed Howell's spectacular thelypody (candidate) and slickspot peppergrass (listed species).	• Survey for all state listed threatened or endangered species as well as BLM/USFS Sensitive plants with the potential to occur along the Proposed Route and associated project features.	• Clearance surveys in potential habitat of tower footprints, access road footprints and other disturbance areas.
HABITAT SURVEYS			
Vegetation Mapping Pre-field desktop vegetation maps will be used to coordinate and support all biological field surveys; and to focus avoidance, minimization, and mitigation measures appropriately.	<u>Existing Data</u> • ReGAP. • Aerial photography. <u>Additional Data</u> • Refine ReGAP classifications using aerial photography.	• Refine mapping of the Proposed Route based on ground truthing, rangeland health evaluations, unique habitat surveys, and information gathered in TVES. • Will be used, along with all survey results, to begin preparation of a habitat mitigation plan.	• Preconstruction inventory to be used for reclamation planning and quantification of impacts relative to mitigation.

Table 1. Phased Biological Surveys Approach (continued)

Resource Category	Phase 1 Data Collection Provides the basis for the Draft EIS analysis and for ODOE-EFSC to deem the ASC complete and issued Draft Proposed Order.	Phase 2 Data Collection Supplements the Draft EIS analysis and provides protocol level information about the Agency preferred alternative and Applicants Proposed Route filed with ODOE-EFSC that are presented in the Final EIS and Proposed Order.	Phase 3 Data Collection Provides detailed site specific data for resources that could be affected at the time of construction as well as information on any changed conditions.
Unique Habitats (rock outcroppings, talus slopes, cliffs, caves, riparian zones, large snags, mature timber stands, permanent and seasonal ponds, lakes, wetlands, and springs)	<u>Existing Data</u> • ReGAP. • High-quality aerial imagery. • USFS stand data. • Forest Inventory Analysis. • National Hydrography Dataset . • Pacific Northwest (PNW) Hydrography Data. • National Wetlands Inventory (NWI) mapping. • Known locations of mines, adits, and caves. <u>Additional Data</u> • None.	• Unique habitats will be identified concurrently with other pedestrian survey of the Proposed Route and associated project features.	• Follow-up surveys where changes have occurred in the location of project facilities and where disturbance is expected.
Wetlands	<u>Existing Data</u> • Hydric soils mapping. • PNW Hydrography Clearinghouse data. • NWI mapping. • National Hydrography Data. <u>Additional Data</u> • None.	• Wetland determinations and mapping for the Proposed Route and associated project features.	• Delineation of all wetlands that would be affected by the approved ROW and approved permit applications from USACE and Oregon and Idaho state agencies.
Noxious Weeds	<u>Existing Data</u> • Photo interpretation of broad vegetation types. • BLM and USFS GIS data on weeds. • State noxious weeds list and maps. • County weed databases or maps. • Weeds will be documented during other plant surveys.	• Noxious weeds (species, relative density, and existing land uses that may contribute to their spread, persistence, and establishment) will be documented during other plant surveys.	• Preconstruction weed inventory of areas to be disturbed to develop treatment and monitoring plan.

Note:

1/ Protocol surveys will be conducted for pygmy rabbit if individuals or their sign are documented during other protocol surveys or TVES and could occur during any phase of the project; on BLM-managed lands, protocol-level surveys for pygmy rabbits will be conducted in all areas with deep soil that contains big sagebrush species (including Mountain, Basin, and Wyoming sage) with more than 5 percent canopy cover.

1.2 Survey Area

This section describes the survey area that will be used for all species unless otherwise indicated in specific protocols. The survey area will consist of a 250-foot buffer on both sides of IPC's proposed transmission line centerline (500-foot total width corridor). There are, however, currently five exceptions listed in Table 2 where IPC has requested a wider corridor to be surveyed due to the need for flexibility in line movement within these areas.

Other project features that extend beyond IPC's Proposed Route and alternative routes centerline would also be surveyed. These include all service and access roads, staging areas, and fly yards (Table 2). Service and access roads would be surveyed within a 100-foot-wide corridor, 50 feet on either side of the road centerline. This is sufficient to allow for some movement of the service road alignment and to allow for documentation of resources adjacent to the road. Staging yards and fly yards will be surveyed without a buffer. Survey buffers will be modified where necessary to reflect species-specific protocols.

Table 2. Project Features Associated with the B2H Transmission Line

Facility	Facility Size	Site Boundary Definition[1/]
Transmission Line Route		
500-kV	250' ROW	Mapped centerline plus 250-foot buffer along either side of centerline
DC 138/69-kV	100' ROW	Mapped centerline plus 250-foot buffer along either side of centerline
Relocated 138-kV	100' ROW	Mapped centerline plus 250-foot buffer along either side of centerline
New Access Roads	14' width	Mapped road plus 100-foot buffer along either side of road centerline
Improved Access Roads	14' width	Mapped road plus 50-foot buffer along either side of road centerline
Staging Area	20 acres	Mapped site (no buffer)
Fly Yard	15 acres	Mapped site (no buffer)
Off-ROW Pulling-Tensioning	5.5 acres	Mapped site (no buffer)
Regeneration Site	0.2 acres	Mapped site within surrounding 1-acre buffer

Notes:
1/ Expanded Site Boundary in the following locations:

1. Glass Hill (milepost 106–115) because of routing changes that could occur-- survey a 2,000-foot-wide corridor for both the main route and the alternative at this location
2. Weatherby area (milepost 184-190) to cover both the 69 and 138 kV line routes because of the existing transmission lines being double circuited and the 500 kV line being placed along the existing 138 kV line route -- survey 250 feet either side of existing ROWs.
3. I-84 route towards Brogan (milepost 193–199) because of the potential of BLM moving the line completely away from the leks--survey a 1,000-foot- wide corridor.
4. Milepost 270–275 because of the potential of moving the route further to the south because of landowner issues -- survey a 1,000-foot-wide corridor.
5. Milepost 286–289 because of the potential of moving the route further to the south because of landowner issues -- survey a 1,000-foot-wide corridor.

The survey area has been divided by milepost and starts at the proposed Boardman Substation near the existing Boardman Power Plant near Boardman, Oregon, and continues southeast to the planned Hemingway Substation, approximately 20 miles southwest of Boise, Idaho. The mileposting describe where resources occur on the ground. Maps used to display survey areas show the survey extent by species based on suitable habitat relative to mile posts.

The survey areas are based on vegetation mapping, Special status species habitat requirements, and avoidance and/or spatial and temporal restriction recommendations documented in the survey protocols. Survey areas for the species-specific protocol surveys outlined in Appendices B-1 through B-11 are graphically displayed on their respective map sets found in Volume II.

1.3 Data Collection and Reporting

Appendix A describes how data will be collected in the field for all resource surveys. Field crews will use GPS technology for data collection activities. Trimble GeoXT survey grade receivers loaded with ESRI ArcPAD 10 software will be used by crews conducting field surveys. All GPS data will be collected in ArcPAD using digital forms derived from a personal geodatabase provided by the BLM that will include set data fields and field domains that can be used for all species. Field staff will upload collected data as an .AXF file at the end of each day to a dedicated B2H SharePoint site that will be managed and maintained by Tetra Tech in the project GIS geodatabase.

Using the BLM-provided personal geodatabase will allow the BLM to directly input the collected data into Geographic Biotic Observations (GeoBOB). All data will be double-checked during entry, and any issues resolved with the persons who gathered the data.

In the event of equipment failure or poor GPS coverage, field data collectors will complete paper data sheets (standard flora and fauna data forms) to be entered into the personal geodatabase on a later date. All data will be double-checked during entry, and any issues will be resolved with the persons who gathered the data.

If needed, specific training by BLM personnel on the use of ArcPAD and the personal geodatabase collection, uploading data files, and data transfer would be conducted prior to field crews departing for surveys. Appendix A describes data collection methods, example flora and fauna data forms and field inputs, GPS equipment and software, QA/QC procedures, and data sharing with cooperating resource agencies.

1.4 Right of Entry for Private Lands

Right of entry for B2H biological surveys refers to obtaining land owner permission for survey crews to access private property. IPC is making a good faith effort to obtain right of entry to conduct biological surveys on private lands. One of the objectives of the Phased Study, as discussed in Section 1, is to allow the biological surveys and permitting processes to move forward in the event that IPC does not obtain access to all private property within typical timeframes. Where ROW entry has been denied, IPC will rely on existing information, except where aerial surveys are appropriate to supplement the data. Appropriate field surveys to close data gaps where access was previously denied will be conducted in Phase 3. This ensures that necessary data are collected prior to ground-disturbing activities and allows IPC time to obtain access to private property.

2.0 PHASE 1 DATA COLLECTION AND ANALYSIS

Consistent with the Phased Biological Survey Approach described in Table 1, Phase 1 provides the basis for the Draft EIS analysis and for ODOE-EFSC to deem the Application for Site Certification (ASC) as complete and issue the Draft Proposed Order. The focus of Phase 1 will be to gather existing data to create vegetation maps that identify the potential for occurrence of special status plant and animal species within the survey areas of the NEPA alternatives and IPC's Proposed Route contained in the ASC. Phase 2 data collection (Section 3) will focus on BLM's "Preferred Alternative" and IPC's Proposed Route contained in the ASC [2].

2.1 Existing Resource Data

This section describes the existing data gathered to implement Phase 1. Existing data include literature reviews, agency management plans, and technical reports. A significant portion of existing data are in Geographic Information Systems (GIS) format, which contains information such as species observations, species distribution, wildlife habitat models, vegetation and land cover data, hydrology, aerial photography, land ownership, and political and municipal data. Table 3 lists the spatial data that has been collected to date, as well as the data that has been requested, but to date, has not been provided by the resource agency.

Existing data will be used to determine habitat types, occurrence of special status plant and wildlife species, and the potential for the occurrence of special status plant and wildlife species. By using existing data, an equal comparison can be made between IPC's Proposed Route and route alternatives regarding their current biological resources.

Existing data also consists of special status species lists. The comprehensive lists of federal and state listed species, those designated as Sensitive by the BLM and Forest Service, as well as Forest Service Management Indicator Species (MIS) have been reviewed, and state and federal biologists were contacted regarding which species from these lists could potentially occur near the project (Appendix E). Continued coordination with state and federal biologist will occur; particularly if there is a change in a species listing status or changes to the location of IPC's Proposed Route or route alternatives that are not currently documented in this Work Plan.

Plant and wildlife species data gathered for this project will be provided to the regulatory agencies as part of the permitting process. Agencies may release data to the public and/or keep it confidential. Data that are obtained as a GIS layer will be handled in accordance with any applicable data sharing agreements.

[2] IPC assumes that if the BLM Preferred Alternative and IPC Proposed Route under EFSC review differ, IPC, BLM and ODOE would engage in a collaborative process to reconcile route differences and allow the NEPA and EFSC processes to continue concurrently.

Table 3. Flora and Fauna Occurrence and Habitat Data

Data Name/Type	Data Source	Obtained/ Available
Aerial Photos	NAIP	Yes
Soil Types	NRCS SSURGO soil map	Yes
Site Condition Classes (e.g. gradient, aspect, primary community vegetation)	NatureServe	Yes
Elevation	USGS National Elevation Dataset	Yes
Current land use	GAP	Yes
	BLM	Yes
	Forest Service	Yes
Historic wildland fires	BLM	Yes
Existing roads	Oregon Department of Transportation	Yes
	Idaho Transportation Department	Yes
	ESRI	Yes
Existing canals, rivers, streams and water bodies	National Hydrologic Dataset	Yes
Existing wetlands	National Wetlands Inventory (NWI)	Yes
Irrigated agricultural lands	Agriculture Census of the United States	Yes
Mine, adit, and cave locations	BLM	--[1/]
Personal geodatabase for data collection	BLM	--[2/]
Wildlife occurrence and habitat data	ODFW	--[3/]
	IDFG	Yes
	Oregon Natural Heritage Program Database	Yes
	Idaho Fish and Wildlife Information System	Yes
	BLM	Yes
	BLM	--[4/]
	The Nature Conservancy	Yes
	Boardman Bombing Range data	Yes
	StreamNet	Yes

Notes:
1/ Locational data on mine, adit, and caves, to date, have not been provided.
2/ Anticipate agreement on data fields, etc. prior to or at the next biological survey work group meeting.
3/ Additional data on sage-grouse lek information has not yet been provided; however, this information is anticipated during review of the survey maps.
4/ Additional data for western burrowing owl has not yet been provided; however, this information is anticipated during review of the survey maps.

2.1.1 Wildlife

Existing wildlife literature and data will be gathered, reviewed, and incorporated into the vegetation mapping in order to identify appropriate survey areas (literature related to survey protocols can be found in Appendices B-1 through B-11). Species-specific habitat requirements, known distributions, and confirmed occurrences will help identify the likelihood of each species occurring along IPC's Proposed Route and route alternatives, and all NEPA alternatives. Coordination with agency specialists will help refine survey areas, based on the agencies expertise within these resources. Wildlife data gathered for this project will be provided to the regulatory agencies as part of the permitting process. Agencies may release data to the public and/or keep it confidential. Data that are obtained as a GIS layer will be handled in accordance with any applicable data sharing agreements.

2.1.2 Fish

No surveys for fish species will be performed. Listed or sensitive fish species will be assumed present in all watersheds that agency data and the Federal Register for listed species indicate presence. Sensitive fish species that could potentially occur within the water bodies crossed by the project include the following:

- bull trout (*Salvelinus confluentus*; federally listed as threatened),
- coho salmon (*Oncorhynchus kisutch*; federally listed as threatened),
- sockeye salmon (*Oncorhynchus nerka*; federally listed as endangered),
- Snake River Chinook (*Oncorhynchus tshwatscha*; federally listed as threatened), and
- steelhead (*Oncorhynchus mykiss*; state listed as threatened).

Additional non-listed fish species could also be present in these water bodies (see Appendix E for a list of special status fish species potentially present within the project area).

In addition, streams containing special status fish will be mapped for the purpose of data collection in Phase 2. Note that the Pacific Anadromous Fish Strategy (PACFISH)/Inland Native Fish Strategy (INFISH), and applicable federal resource management plan recommendations for stream buffers will be implemented during vegetation mapping on federal lands (each of these documents/plans will have varying buffers that are used to determine stream and riparian buffer widths, often dependent on whether or not the stream is fish bearing).

The INFISH (USFS 1995) provides interim direction to protect habitat and populations of resident native fish in eastern Oregon, eastern Washington, Idaho, western Montana, and portions of Nevada with the focus on managing Riparian Habitat Conservation Areas (RHCAs). The INFISH is implemented by the USFS through its field offices and applied to proposed or new projects or activities which must also comply with requirements of the ESA, the NEPA, the National Forest Management Act, and other applicable laws (USFS 1995). Implementation of the INFISH includes screening projects to determine their potential habitat effects and whether they will need to be modified to reduce risk to inland native fish habitat.

The Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California under PACFISH (USFS and BLM 1995) provides interim direction for the management of anadromous fish-producing watersheds on lands the USFS and BLM manage, with the focus on managing RHCAs. The PACFISH is implemented by the USFS and BLM through its field offices and applied to proposed or new projects or activities which must also comply with requirements of the ESA, the NEPA, the National Forest Management Act, the Federal Land Policy and Management Act, and other applicable laws (USFS and BLM 1995). Implementation of the PACFISH includes screening projects to determine their potential habitat effects and whether they will need to be modified to reduce risk to anadromous fish-producing habitat.

2.1.3 Bats

Data regarding known locations of mines, adits, and caves (which could serve as habitat for bat species) has been requested from state and federal agencies so that these unique habitats can be identified and, if possible, avoided during construction of the project. Areas that have significant cave formations which occur on federal lands are protected under the Federal Cave Resources Protection Act (16 U.S.C. §§ 4301-4310, November 18, 1988, as amended 1990), and resource agencies may not be able to release this information in its entirety. These areas, as well as any large snags that could serve as bat habitats, would be avoided were possible,; therefore, potential impacts to roosting, maternity, and hibernacula sites would be considered low. The special status bats species that could occur near the project are listed in Appendix E.

2.1.4 Plants

Available literature and data will be gathered, reviewed, and used to prepare vegetation maps prior to conducting field surveys as outlined in Section 2.2. In addition to the mapping effort, ORNHIC, GeoBOB, and IDFG Natural Heritage Program data records will be queried for all special status species located within five miles of the survey area. Occurrence data and species specific habitat requirements will aid in the identification of survey areas within each alternative. Appropriate staff at ODA, BLM, USFS, and Oregon Department of Transportation districts/ regions will also be contacted to obtain any additional species-specific information such as local blooming periods, identification tips, and the location of reference communities. All data regarding special status plant species locations will be provided to the regulatory agencies as part of the permitting process. Agencies may release data to the public and/or keep it confidential. Data that are obtained as a GIS layer will be handled in accordance with any applicable data sharing agreements.

2.1.5 Waters of the United States

Once a set of alternatives has been developed, the survey team will begin a more detailed investigation into the identification of Waters of the U.S. In preparation for the fieldwork in Phase 2, Tetra Tech will collect available background data and prepare field maps to be used for identifying the locations of probable water resources. This information will include the presence of hydric soils from the Natural Resources Conservation Service (NRCS) soil maps, hydrography data from the PNW Hydrography Clearinghouse, NWI mapping, climate data, and any other pertinent data**.**

2.2 Vegetation Mapping

This section describes the process used to generate vegetative maps for the biological survey area. Land cover mapping will occur in three steps: 1) creation of pre-field desktop vegetation maps created from existing data, 2) pre-field survey maps created from existing plant and wildlife data and aerial photo interpretation (API) of habitat condition, and 3) incorporation of all survey data into finalized project vegetation maps. Pre-field desktop vegetation maps will be used to coordinate and support all biological field surveys and focus on avoidance, minimization, and mitigation measures appropriately. The primary goal of this effort is to develop vegetative cover and habitat maps that provide a land cover dataset that is accepted by the appropriate agencies and is applied across the entire survey area, including both public and private lands. This will be achieved through these objectives:

- Incorporating elements of GIS modeling and classification in combination with API of 1-foot color imagery (3Di West) to identify NVCS vegetation community types;
- Providing a mechanism for identifying suitable habitat for special status plant and animal species;
- Evaluating the quality of habitat for special status wildlife species using remote sensed data to the extent possible and supplementing that evaluation with substantial agency input and limited systematic field verification sampling; and
- Providing baseline information to categorize B2H habitats in accordance with ODFW Fish and Wildlife Habitat Mitigation Policy (OAR 635-415-0000 through -0025).

A meeting was held with ODFW on January 16, 2009, to present the vegetation mapping methods described in this section. ODFW representatives agreed that the B2H vegetation mapping approach would meet the level of precision needed for compliance with ODFW Fish and Wildlife Habitat Mitigation Policy (OAR 635-415-0000 through -0025).

2.2.1 Land Cover and Vegetation Classification

This section describes existing land cover and vegetation classification systems that will form the foundation of the vegetation mapping. The Northwest Regional Gap Analysis Project (ReGAP; OSU 2007) is the most current and accurate spatial land cover dataset that encompasses the entire survey area. Ecological Systems (ES), as defined under the NVCS, are a regionally consistent meso-scale land cover classification used by ReGAP. Much of the information in this section will come directly from the final reports on land cover mapping of zones that contain the B2H project area.

2.2.1.1 Northwest Regional Gap Analysis Project

The land cover map developed by ReGAP in the region containing B2H is an integration of four largely independent mapping and modeling efforts. The first is the Southwest ReGAP project (1999) which provided the methods for subsequent ReGAP mapping in Idaho and Oregon. The second is the SageMap project, which used the Southwest ReGAP methods to develop a land cover map for non-forested habitats in eastern Oregon, eastern Washington, and southern Idaho. The third was a Gradient Nearest Neighbor modeling project to map most of the forests of the U.S. Geological Survey (USGS) Map Zones to add forests types to the SageMap products. The fourth project was LandFire, which provides comprehensive maps and data describing vegetation, wildland fuel, and fire regimes across the United States. All four of these efforts used the NVCS, and the ES was the unit for which all of the natural land cover classes were attributed. ReGAP integrates information from each of these four projects to create a current and seamless land cover dataset. Complete final reports for the ReGAP land cover mapping process are available in the project file or at http://www.gap.uidaho.edu/Northwest/data.htm.

2.2.1.2 The National Vegetation Classification System and Ecological Systems

The NVCS has been adopted by the Federal Geographic Data Committee as the classification standard for all federal mapping projects (FGDC 2008, FGDC 1997). A six-level nested hierarchical structure of the NVCS defines classification units at the highest levels as heterogeneous units based solely on vegetative physiognomy and at the lower levels as more narrow and homogenous floristic units. The lower floristic levels (e.g., Alliance and Association) are based on both structural and compositional characteristics of vegetation derived by Mueller-Dombois and Ellenberg (1974).

The original ReGAP thematic mapping unit was the NVCS Alliance; however, too many alliances occurred in large project areas, and a mid-scale classification was needed. In response, NatureServe developed the Terrestrial Ecological Systems Classification framework for the conterminous United States (Comer et al. 2003). ESs are defined as “groups of plant community types that tend to co-occur within landscapes with similar ecological processes, substrates and/or environmental gradients” (Comer et al. 2003). Although distinct from the NVCS, the vegetation component of an ES is described by one or more NVCS alliances or associations. While the ecological system concept emphasizes existing dominant vegetation types, it also incorporates physical components such as landform position, substrates, hydrology, and climate. The ES classification complies with Federal Geographic Data Committee standards, and each ES is defined by the respective NVCS alliances found therein.

2.2.2 Mapping Methods

This section will describe the mapping methods that will be performed by GIS specialists under the direction of ecologists. The goal of the mapping process is to aid resource specialists in delineation of potential survey areas and to create a database that will be the basis for determining ODFW habitat categories as required under the ODFW Habitat Mitigation Policy (OAR 635-415-000).

2.2.2.1 Data Conversion to Project Area

ReGAP data will initially be clipped to a 3-mile corridor surrounding alternatives and all access roads, as well as other project features. A 3-mile corridor was chosen to account for minor adjustments to the alternatives that may occur. This data will be converted from a raster data type (row and column pixels) to vector data (polygons) using non-simplified polygons and will represent baseline vegetation data. All other data layers described in Section 2.2.2.2 will be clipped to this same 3-mile corridor.

2.2.2.2 Vegetation Mapping Methods

A GIS specialist will use ArcGIS 9.3 (ESRI, Inc.) to overlay existing data with the vegetation layer. Unique habitat types (e.g., ACECs, wetlands, talus slopes and cliffs, mature forest stands) will be identified during this mapping phase if detection is possible with existing data. The data layers listed in Table 3 will be used to assist ecologists in delineating survey areas. The vegetation dataset will be overlapped using the following map layers in ArcGIS in order to avoid misclassification of these land cover types:

- Existing roads buffered according to road type – Oregon Department of Transportation and Idaho Transportation Department;
- Existing canals, rivers, streams and water bodies – National Hydrologic Dataset;
- Existing wetlands – NWI and,
- Irrigated agricultural – Agriculture Census of the United States.

After refinement of the ReGAP data has been completed, the 3-mile dataset will be clipped down to the appropriate survey area for targeted species.

2.2.2.3 Phase 1 Mapping Quality Assessment

Assessing land cover map quality is an important concern for land cover mapping projects. Map quality assessment provides useful information to map users about the reliability of the map product. This section explains the mapping quality assessment for Phase 1.

ReGAP Quality Assessment

The assessment of ReGAP map quality followed the same methods as described in Lowry et al. 2005; refer to that document for a detailed description of map validation methods. In summary, ReGAP conducted an internal assessment of map quality on an intermediate land cover map generated with a subset of samples, rather than the final land cover map. This internal validation involved randomly selecting 20 percent of available samples stratified by land cover class, and withholding them from the decision tree model generation. The intermediate map (generated with 80 percent of the available samples) was assessed with the 20 percent withheld dataset, producing an error matrix and kappa statistic. The land cover modeling process concluded with the generation of the final map using 100 percent of the available data. Validation results therefore represent an assessment of land cover maps created using 80 percent of the training data. No assessment of the final map produced from 100 percent of the data will be made. ReGAP estimated total accuracy within Oregon and Idaho to be at 92 percent for the Columbia Basin, 89 percent in Basin and Range (Malheur region), 73 percent in the Owyhee Uplands, and 97 percent for non-vegetated areas (Kagan et al. 2008).

Habitat surveys will be composed of review of Phase 1 vegetation mapping (see Volume II—Land Cover Classifications Map Book), including identification of unique wildlife habitats, ground verification of vegetation cover and species dominance, and the preparation of final habitat category maps based ground surveys. These activities will be conducted concurrently along IPC's Proposed Route and route alternatives corridors (500 feet total width survey area), and associated project features. An assessment of habitat quality will be ground-truthed during Phase II and is further discussed in Section 3.4.

2.2.2.4 Vegetation Maps

Completed vegetation maps will be utilized by wildlife biologists, botanists, ecologists, and wetland biologists to identify species-specific and project-specific survey areas. Survey areas identified in this Work Plan are based on habitat associations and known occurrences of wildlife species. This data was used as an aid in determining the extent of species-specific survey areas. The compiled map sets are contained in Volume II and include:

- Section 1 Land Cover Classifications Map Book
- Section 2 Washington Ground Squirrel Survey Map Book
- Section 3 Northern Goshawk and Three-toed Woodpecker Survey Map Book
- Section 4 Great Gray and Flammulated Owl Survey Map Book
- Section 5 Sage-Grouse Survey Map Book
- Section 6 Special Status Plant Survey Map Book
- Section 7 Raptor Aerial Survey Area Map Book

Vegetation maps will also identify unique wildlife habitats (rock outcroppings, talus slopes, cliffs, caves, riparian zones, mature timber stands and permanent and seasonal ponds, lakes, wetlands, and springs). Agency personnel will be sent a complete 11-inch by 17-inch 1:32,000-scale vegetation map book.

2.2.3 ODFW Habitat Categories

The ODFW Fish and Wildlife Habitat Mitigation Policy (OAR 635-415-000) provides a framework for assigning one of six category types to habitats based on the relative importance of these habitats to fish and wildlife species. The policy establishes consistent goals and standards to mitigate the impacts of a project on fish and wildlife habitats. The final step of the vegetation mapping process will be to categorize vegetation/habitats using the ODFW habitat category types. A preliminary list of the habitat types and the applicable ODFW habitat categories crossed by the project has been completed (Appendix F).

3.0 PHASE 2 DATA COLLECTION AND ANALYSIS

Phase 2 supplements the Draft EIS analysis and provides protocol level information about BLM's Preferred Alternative and IPC's Proposed Route contained in the ASC. The focus of Phase 2 will be specific wildlife and plant surveys that will identify, in detail, the biological resources that occur within the survey areas described in this work plan. These surveys will be the basis for final vegetation mapping, wetland delineations, habitat mapping and categorization as described herein.

3.1 Wildlife Field Surveys

The following field surveys will be completed for IPC's Proposed Route and route alternatives, and NEPA alternatives. Data gathered through Phase 2 surveys will assist in micro-siting of the Proposed Route to avoid and/or minimize disturbance of sensitive habitats where practicable. Table 4 lists the survey timeframe and mileposts identified for field surveys along the B2H routes.

Table 4. Wildlife Species, Survey Timeframe, and Mileposts Identified for Field Surveys along the B2H Routes

Common name (*scientific*)	Survey Timeframe	Survey Distance from 500-ft corridor	Mileposts[2/]
Burrowing Owl[1/]	March-May	Within the 500-ft corridor	0-80; 120-297
Columbian Spotted Frog	June-September	Within the 500-ft corridor	80-297
Flammulated Owl	May-July	0.25 mile	85-125
Great Grey Owl	March-July	0.25 mile	85-125
Pygmy Rabbit[1/]	March-June	Within the 500-ft corridor	200-297
Northern Goshawk	June-August	0.5 mile	85-125
Sage-Grouse / Sharp-Tailed Grouse	March-May	3 miles	124-267
Three-Toed Woodpecker	April-July	0.25 mile	85-125
Washington Ground Squirrel	March-May	Within the 500-ft corridor + 1,035 feet on either side of the corridor	0-55
Raptor Nest Surveys – Bald Eagle	April-June	0.5 mile	0-297 [3/]
Raptor Nest Surveys – Ferruginous Hawk	April-June	1 mile	0-297 [3/]
Raptor Nest Surveys – Golden Eagle	April-June	2 miles	0-297 [3/]
Raptor Nest Surveys – Swainson's Hawk	May-June	0.5 mile	0-297 [3/]
Raptor Nest Surveys – Peregrine Falcon	April-June	1 mile	0-297 [3/]
Terrestrial Visual Encounter Surveys	March-August	Within the 500-ft corridor	0-297

Notes:
1/ Protocol level surveys will be conducted if species is documented during other protocol surveys or TVES within the ROW corridor.
2/ Denotes areas that contain suitable habitat.
3/ Suitable habitat for this species occurs in multiple locations within the survey corridor and displayed on the raptor survey mapset.

This section of the Work Plan describes the proposed methodology for wildlife surveys during Phase 2. Field data collectors will use personal geodatabases with ArcPAD 10 software in which the required fields from the flora and fauna data forms created by the BLM will be filled in. This data collection method will allow the data to be transferred to the BLM for input directly into GeoBOB. This method will be used in accordance with BLM protocols to collect data in both Oregon and Idaho (Appendix A).

3.1.1 Washington Ground Squirrel

The Washington ground squirrel is a small ground squirrel occurring in grassland and shrubland habitats of the Columbia Plateau in Washington and Oregon. Washington ground squirrels are most common in native grassland and shrub-steppe habitats over silty loam soils, particularly Warden and Sagehill soils. Washington ground squirrels can also be found in some areas replanted to grassland under the Conservation Reserve Program (CRP), if these sites are planted to native grassland species and adjacent or very near to undisturbed native grasslands.

Concern for the long-term viability of Washington ground squirrel populations led to their listing by ODFW as endangered in January of 2000. The Washington ground squirrel is currently considered a candidate species for listing under the Endangered Species Act by the USFWS.

Washington ground squirrel habitat, as it relates to the survey area, occurs south of the Columbia River in Morrow, and Umatilla counties of Oregon.

Survey Methods

Surveys will assess the area of potentially suitable habitat within 250 feet either side of the proposed centerlines (500 feet total) and 1,035 feet on either side of the corridor boundaries. Details of the field survey protocol are provided in Appendix B-1 (Stateline 3 2001; Morgan and Nugent 1999).

Areas containing potential habitat for Washington ground squirrel, as identified during Phase 1 vegetation mapping efforts, will be surveyed late March through May. This survey window corresponds to the highest activity of Washington ground squirrel and is compliant with the survey protocol. Active burrows and colonies will be identified through a combination of visual and audible confirmations and fresh fecal material around burrow entrances. Each area of potential habitat will be surveyed twice.

Surveys will be conducted by crews of eight. Each crew will consist of at least four experienced observers. Prior to conducting any surveys, all field crew members will be refreshed or trained in the survey protocol by visiting an occupied Washington ground squirrel colony. Prior to conducting surveys, all field crew members will have their hearing tested to ensure that they can detect the high pitched call of a Washington ground squirrel.

3.1.2 Greater Sage-Grouse and Columbian Sharp-Tailed Grouse

Greater sage-grouse surveys would take place in areas that did not get surveyed in 2010, areas that did get surveyed but require further investigation, or new survey areas that come about through project changes or new information regarding the known distribution of the species. As noted earlier, IPC's Proposed Route and route alternatives are not expected to be within known sharp-tailed grouse distribution, but occurrence is possible and will be noted during sage-grouse surveys.

Greater sage-grouse occur in quality sagebrush habitat throughout eastern Oregon and southern Idaho and will be addressed if the alternatives occur within this habitat. Columbian sharp-tailed grouse occurrence will also be noted during these aerial surveys. Columbian sharp-tailed grouse have been extirpated from Oregon since the 1960s; the only known population was reintroduced into Wallowa County in the 1990s. Columbian sharp-tailed grouse occur in Washington County in western Idaho. The project area is not expected to be within known sharp-tailed grouse distribution, but occurrence is possible and will be noted during sage-grouse surveys.

The greater sage-grouse relies on sagebrush habitats throughout the year (Wallestad 1975). Sagebrush is used for nesting and hiding cover during breeding and brood rearing, and for hiding and thermal cover in winter (Wallestad et al. 1975). More importantly, sagebrush leaves are the major food item in late fall, winter, and early spring (Wallestad et al. 1975). During early spring, sage-grouse assemble at traditional lek sites, where males display to attract females. Leks are located on areas that are relatively clear of vegetation, particularly of shrubs (Connelly et al. 1981); however, the proximity of sagebrush for protection from predators is also essential (Hanf et al. 1994).

Sage-grouse populations can be resident or migratory. For resident populations, the lek area tends to be the center of activity, whereas migratory populations move between breeding, brood rearing, fall, and winter habitats (Connelly et al. 2000). Although sagebrush is the common feature in all seasonal habitats, migration habits are generally influenced by elevation and the distribution and juxtaposition of quality habitats (IPC 2003).

The Columbian sharp-tailed grouse is one of six existing subspecies of sharp-tailed grouse in North America, and are endemic to big sagebrush, shrubsteppe, mountain shrub, and riparian shrub plant communities of the west. The subspecies currently occupies less than 10 percent of its historic range, with only three metapopulations remaining in central British Columbia, southeastern Idaho, northern Utah, northwestern Colorado, and south-central Wyoming (Hoffman and Thomas 2007).

The objective of the greater sage-grouse surveys is to identify previously unknown leks and to verify attendance at specific lek sites identified by ODFW and IDFG biologists.

Survey Methods

The survey area will include IPC's Proposed Route and route alternative corridors. Surveys will be conducted out to 3 miles on either side of the Project's corridors in Oregon and 4 miles on either side of the Project's corridors in Idaho, within areas that the ODFW and IDFG biologists have identified as areas that could potentially support greater sage-grouse. Areas surveyed in 2010 will not need to be surveyed in 2011. Details of the field survey protocol are provided in Appendix B-2 (Hagan 2005).

Depending on survey area and weather conditions, sage-grouse within the project area will start attending leks anywhere from early March (lower elevations in a warm year) and can remain there until mid-May (higher elevations after a long winter). The protocol notes that there may be local variation between districts that may dictate minor survey modifications. Helicopter surveys of greater sage-grouse leks will be conducted between March and April; however, due to weather constraints and survey schedule restrictions, some surveys may extend into early May. Best efforts will be made to reschedule if communication with ODFW and IDFG's greater sage-grouse specialists identifies a need.

Aerial surveys will be flown between 30 and 100 feet above ground surface. Distance between transects will be 0.5 mile. Helicopter surveys will ideally be conducted within the first 2 hours after sunrise but, due to flight time and survey window restrictions, some surveys may extend to 2.5 hours after sunrise; however, no surveys would extend beyond 3 hours. If any leks are observed, the location will be confirmed and documented with the appropriate resource agency.

3.1.3 Ferruginous Hawk, Bald Eagle, Golden Eagle, Swainson's Hawk, Peregrine Falcon, and Other Raptor Nests

Golden eagles inhabit open habitat types that range from arctic to desert conditions (Kochert 1986). This species typically nests on along cliff faces but will also utilize large trees where available and in close proximity to foraging grounds (Menkens and Anderson 1987).

Bald eagles typically nest in large trees near coastlines, lakes, or rivers that contain an adequate fishery to sustain a breeding pair. Nests are large and typically made of woody debris. Eagles will often reuse and add debris to nests each year, resulting in very large nest structures.

Ferruginous hawks inhabit open grasslands and shrub-steppe communities in rolling or rugged terrain. They use native and domesticated grasslands, pastures, hayland, cropland, and shrub-steppe (Dechant et al. 1999). High elevations, forest interiors, and narrow canyons are avoided by Ferruginous hawks (Black 1992). Nests are built in trees, shrubs, rock outcrops, cliffs, and on the ground (Dechant et al. 1999).

Swainson's hawks inhabit grassland, shrubland, and agricultural fields where open areas provide visibility of small prey and roost sites are available nearby (National Audubon Society 2008). Swainson's hawks nest in trees, usually trees bordering agricultural fields, in wetland borders, and on abandoned farms (National Audubon Society 2008). Because Swainson's hawks are generally the latest migratory hawk to arrive in the spring, their nests can be found in smaller trees.

The peregrine falcon inhabits various landscapes including mountains, river corridors, marshes, lakes, coastlines, and cities. In a natural setting, peregrines breed on cliffs, cut banks, and in trees. They scrape a depression or cup in the nest substrate in which they lay their eggs. Peregrines will use abandoned nests of other birds as well as man-made structures like buildings, transmission line towers, bridges, and silos (NatureServe 2011).

Survey Methods

Golden eagle, bald eagle, ferruginous hawk, Swainson's hawk, peregrine falcon, and all other raptor nest locations will be surveyed from a helicopter. The objective of the raptor nest survey is to locate all raptor nests that may be subject to disturbance and/or displacement effects from transmission line construction or operation and maintenance. The survey area for most raptor nests is 0.5 mile from the corridor; except for in areas that could support golden eagle (where a survey width of 2 miles would be used), and in areas that could support the ferruginous hawk or peregrine falcon (where a survey width of 1 mile would be used). Details of the field survey protocol are provided in Appendix B-3.

The initial survey will take place in early April with a second survey late May and/or early June to confirm previous observations and locate later nesting raptors.

Staffing will include a helicopter pilot along with two trained observers. Both the pilot and observers will have experience in conducting aerial surveys for raptor nests and identifying raptors. The helicopter will fly parallel transects at a distance of 0.25 mile from the 500-foot-wide project corridor to allow observers to see out to the 0.5-mile buffer distance and back. In ferruginous hawk and peregrine falcon habitat another transect will be flown out to 0.75 mile so observers can see to the 1-mile buffer distance and back to the 0.5-mile buffer distance. In golden eagle habitats two more transects will be flown at 1.25 miles and 1.75 miles from the 500-foot-wide project corridor to ensure complete coverage out to 2 miles. However, in golden eagle habitat this transect method may be abandoned for an intuitive search method (i.e., flying canyons or identifying cliff faces in steep terrain) to improve efficiency. Both sides of the project will be surveyed in this manner. Aerial nest searches are conducted by flying habitat suitable for most aboveground nesting species, such as cottonwood, ponderosa pine, tall shrubs, and cliffs or rocky outcrops.

3.1.4 Northern Goshawk

Northern goshawks occupy coniferous and deciduous forests. During their nesting period, they prefer mature forests consisting of a combination of old, tall trees with intermediate canopy coverage and open areas within the forest for foraging (Woodbridge and Hargis 2006).

Survey Methods

The objective of the northern goshawk survey is to identify occupied territories within or overlapping the survey area of the proposed alternative and to identify all northern goshawk nests. The survey area for northern goshawks is the proposed corridor (500 feet) and all areas within 0.5 mile of the corridor that meet habitat requirements for the species. Details of the field survey protocol are provided in Appendix B-4 (Woodbridge and Hargis 2006).

Northern goshawks will be surveyed twice throughout the field season using the broadcast acoustical survey method. Surveys are conducted during the nesting and fledgling stages, including early post-fledging dependency, which runs June 1 to August 15 (Woodbridge and Hargis 2006). Crews will broadcast goshawk calls at predetermined calling stations to elicit responses from goshawks that have territories within or overlapping the survey area.

Potential northern goshawk habitat is categorized in three types: 1) primary habitat, 2) marginal habitat, and 3) unsuitable habitat. Northern goshawks most often nest in primary habitat. The process of defining primary habitat within the survey area will be identified using a GIS model that selects forest canopy coverage of 40 percent or greater for a continuous area of at least 8 hectares (Sisk 2005) and is explained in more detail in Appendix B-4. Marginal habitats are forested areas adjacent to primary habitat. Aerial photographs can identify marginal habitat that is adjacent to primary northern goshawk habitat in the survey area. Unsuitable habitat that will not be surveyed include open grasslands and shrublands, lakes and ponds, areas near highways, and sparsely forested areas that are not adjacent to primary habitat.

A transect grid, as described by Woodbridge and Hargis was overlaid over initial forested habitat. Using the above criteria, the final suitable habitat layer was developed and used to define the survey area. Call stations are located in, and cover all suitable habitat within the survey area. Adjustments to calling station placement were reviewed while conducting the detailed habitat mapping to determine survey area, and efforts to optimize survey effort and cost, and to minimize surveyor exposure to hazards associated with walking transects in forested habitat and potential access issues were taken into account. Within the survey area, roads and trails are common and provide access to a majority of the suitable habitat. Detailed maps of survey routes and station locations will be used by survey crews and provided in Volume II—Northern Goshawk and Three-toed woodpecker Survey Map Book.

3.1.5 Great Gray Owl

The great gray owl is the largest owl in North America. It inhabits coniferous and hardwood forests, pine and spruce in particular, and utilizes older seral stages of forest and second growth, especially those near the water. The great gray owl nests in broken-top snags or uses abandoned stick nests of other species such as goshawks. It usually forages in open areas where scattered trees or forest margins provide suitable sites for visual searching. When the owl is nesting, it hunts during the day or night (Quintana-Coyer et al. 2004).

Survey Methods

The objective of the great gray owl survey is to identify territories within or overlapping the proposed alternative and to identify all nesting pairs of owls. The broadcast acoustical survey method will be used to identify occupied territories and nest locations. The survey area for great gray owls is the proposed alternative corridor and all areas within 0.25 mile of the NEPA alternatives and IPC's Proposed Route and alternative route corridors that meet habitat requirements for the species. Details of the field survey protocol are provided in Appendix B-5 (Quintana-Coyer et al. 2004).

Great gray owls will be surveyed twice throughout the field season. The first survey will correspond with the nesting stage and occurs in late April to early May. The second survey will occur from late June to early July, corresponding to the great gray owl fledging period. Crews will be broadcasting great gray owl calls at night along predetermined calling stations to elicit responses from owls that have territories within or overlapping the survey area. Night surveys will be performed only along roads, trails, or portions of the survey area that can be safely traversed with a flashlight or headlamp.

Great gray owl nesting habitat in the Blue Mountains has been identified as having a minimum of 60 percent canopy cover (Bull and Henjum 1990). This habitat layer is included in the GIS model to identify potential nesting areas. Forested areas adjacent to potential nesting habitat are considered part of the survey area. An important consideration when identifying great gray owl habitat is locating open spaces or meadows used for foraging near identified nesting habitat. Forest and meadow boundaries adjacent to nesting habitat are included in the survey area. Detailed maps of survey routes and station locations will be used by survey crews and provided in Volume II— Great Gray and Flammulated Owl Survey Map Book.

3.1.6 Flammulated Owl

The flammulated owl is North America's smallest eared owl. They are generally associated with montane forests with brushy understory. They prefer aspen and ponderosa pine and can occur in mixed conifer forests of oak, Douglas fir, white fir, incense cedar, or sugar pine. Flammulated owls typically nest in cavities made by northern flickers and similar-sized woodpeckers. They are almost exclusively insectivorous, foraging at dawn and dusk (USDI BLM 1997).

Flammulated owls are one of the most migratory owls in North America, leaving for Central Mexico to Guatemala each year. Even with such lengthy migrations, breeding site fidelity is high and nests are used for multiple years.

Survey Methods

The survey area for flammulated owls is the route corridor and all areas within 0.25 mile of the corridor that meet habitat requirements for the species. Details of the field survey protocol are provided in Appendix B-6 (Smucker et al. 2008) has been used as supplements in the field information and guidance.

A nocturnal broadcast acoustical survey method will be used to illicit responses from flammulated owl in order to identify territories and nesting locations. Two surveys will be conducted concurrently with great gray owl surveys during early May and late June described above. Detailed maps of survey routes and station locations will be used by survey crews and provided in Volume II— Great Gray and Flammulated Owl Survey Map Book.

3.1.7 Three-toed Woodpecker

American three-toed woodpeckers are largely restricted to high elevation conifer forests and are therefore distributed in a mosaic pattern (mirroring the pattern of high elevation mountains). They occur in dense coniferous forests, and are associated with subalpine fir and Engelmann spruce at higher elevations; they occur mainly in lodgepole pine forests or in mixed-conifer forests with a lodgepole component at lower elevations (Leonard 2001), and seem to prefer disturbed coniferous forests with trees that exhibit thin, flaky bark such as spruce and lodgepole pine. They are a relatively specialized species, feeding primarily on beetles within decaying and dead trees and occurring in low densities throughout their range. Seventy-five percent of its diet consists of wood-boring beetles and caterpillars that attack dead or dying conifers (Wiggins

2004). However, areas of disturbed forests (e.g., recent burns, beetle infestations) have also been widely cited as important habitat.

Survey Methods

The survey for three-toed woodpecker will occur in portions of the route corridor that meet habitat and survey requirements. Details of the field survey protocol are provided in Appendix B-7 (Dudley and Saab 2003) has been used as supplements in the field information and guidance.

Surveys will include broadcast acoustical methods and visual and aural identification. Playbacks are particularly effective for locating nests early in the nesting season, especially before the onset of incubation. Three surveys will be conducted concurrently with northern goshawk surveys during late April, late May, and late June as described above under northern goshawk. Detailed maps of survey routes and concurrent station locations will be used by survey crews and provided in Volume II—Northern Goshawk and Three-toed woodpecker Survey Map Book.

3.1.8 Columbia Spotted Frog

Columbia spotted frogs are found in areas where permanent, quiet water is present, such as marshy edges of ponds or lakes, algae-grown overflow pools of streams, emergent wetlands, and near springs. Emergent and submergent vegetation are considered important habitat features. Following the spring breeding season they may move considerable distances from water, often frequenting mixed-conifer and subalpine forests, grasslands, and brushlands of sage and rabbitbrush if puddles, seeps or other water is available. Adult spotted frogs feed on invertebrates, generally within 1.6 feet from shore on dry days. During and immediately after rains, they may move away from permanent water to feed in wet vegetation or ephemeral puddles (Licht 1986). Spotted frogs hibernate during winter and emerge to breed when open water becomes available, generally during spring thaw.

Spotted frogs will be surveyed for in ponds, streams, emergent wetlands and springs along the route corridor. The exact location of potential spotted frog habitat is not entirely known at this time. Once the location of wetlands and other water resources has been identified, the location of spotted frog surveys will be determined.

Survey Methods

The survey area will include IPC's Proposed Route and route alternative corridors (500 feet) and 250 feet around any project features. The visual encounter survey method will be used, see Appendix B-8 for survey protocol (USGS 2009; Scarlett 2008).

Surveys will occur between mid-June and mid-September in suitable habitats.

Dip nets can be used in addition to visual surveys to positively identify tadpoles, juvenile and adult amphibians. Where spotted frogs (or other non-target amphibians) are found, the following information will be collected: date, time, location (UTM), water temperature, description of site and habitat, observation method, observer, species, number of individuals detected and their stage of development, comments, and a sketch of the site.

3.1.9 Terrestrial Visual Encounter Surveys

The survey area will include IPC's Proposed Route and route alternative corridors (500 feet) and 250 feet around any project features. The sensitive species listed below will be surveyed concurrent with other surveys using the Terrestrial Visual Encounter Survey (TVES) method (Manley et al. 2006) and is a walking survey that identifies presence through evidence of species use (Appendix B-9).

Surveys will be conducted beginning in mid-March through mid-July.

TVES includes visual and aural confirmation of a species, evidence of sign such as burrows, nests, feathers, fecal material, or tracks. The focus of the TVES will be the following sensitive species and their habitat; however, all species encountered will be identified to the extent possible.

Black-throated Sparrow

The black-throated sparrow inhabits dry sagebrush and rocky desert habitats with widely spaced sage brush. Black-throated sparrows are very rare east of the Cascades with the exception of southern portions of Harney, Lake, and Malheur counties in Oregon and southwestern Owyhee County in Idaho where they are uncommon residents during the breeding season. This species migrates south by September of each year.

Brewer's Sparrow

In the breeding season, this sparrow could be found within the survey area in any area supporting native shrub-steppe habitat, particularly in extensive stands of big-sagebrush. Brewer's sparrow migrates south by mid-September to winter in the southern U.S. and Mexico.

Grasshopper Sparrow

In the breeding season, this sparrow could be found in within the survey area in native grassland and shrub-steppe habitat, and possibly CRP grasslands. It is only a summer resident within the survey area migrating south each year.

Loggerhead Shrike

Loggerhead shrikes could be found within the survey area in short-grass pastures, weedy fields, grasslands, agricultural areas, swampy thickets, orchards, and shrublands.. This species migrates south in the winter by late September, and is only occasionally seen in the winter in northern Oregon and Idaho.

Long-billed Curlew

The long-billed curlew breeds in the grasslands of the Great Plains and Great Basin. Nesting habitat for long-billed curlew is common throughout the survey area in grassland, dry-land wheat fields, and lands in CRP. This species migrates south wintering in California, Texas, and Mexico.

Northern Waterthrush

The northern waterthrush generally inhabits wooded areas adjacent to slow moving water. It is a more northern breeding species generally occurring in Canada and Alaska. In eastern Oregon, this species maintains a small breeding population in Klamath County over 150 miles southwest of the survey area. It is a vagrant elsewhere in Oregon with only a few observations occurring each year. This species migrates south by October of each year wintering in southern Mexico.

Sage Thrasher

In the breeding season, the sage thrasher could inhabit sagebrush and greasewood habitats within the survey area. Within the survey area it is a summer resident, migrating south by September of each year to winter in the southern U.S. and Mexico.

Sage Sparrow

The sage sparrow could be found in sagebrush shrub-steppe habitats within the survey area. This species migrates south by mid-September to winter in the southern U.S. and Mexico.

Burrowing Owl

The western burrowing owl is a grassland specialist found in open areas with short vegetation such as desert, grassland, and shrub-steppe environments. They have been documented nesting in within the proposed survey area in the small areas of grassland between center-pivot irrigation circles. Burrowing owls are ground nesters. They rely on the presence of fossorial mammals, such as ground squirrels and badgers, whose abandoned burrows are used. If any burrowing owls, signs, or burrows are identified during TVES surveys, surveyors would conduct protocol level burrowing owl surveys (Conway and Simon 2003; Appendix B-10) in the immediate area.

Mojave Black-collard Lizard

Mojave black-collard lizard could be found within the survey area in desert habitats that contain sparse vegetation and small rocks or boulders. In Idaho, habitat for this species within the survey area is limited to the Snake River Plain and the Owyhee foothills. In Oregon, habitat for this lizard within the survey area is limited to Malheur County.

Sagebrush Lizard

Sagebrush lizards within the survey area could be found in sagebrush shrub-steppe, greasewood, and other desert shrubs and sometimes on small rocky outcrops. In Idaho, habitat for this species is present throughout the survey area. In Oregon, habitat for this lizard within the survey area occurs in Malheur, Baker, Umatilla, and Morrow counties.

Western Ground Snake

Western ground snake within the survey area could be found in arid habitats that contain loose or sandy soil, which range from rocky areas to low desert shrub habitats. In Idaho, habitat for this species within the survey area is limited to the Snake River Plain and the Owyhee foothills.

In Oregon, habitat for this snake within the survey area is limited to Malheur County and the southern portion of Baker County.

White-tailed Jack Rabbit

White-tailed jackrabbits within the survey area could be found in open grasslands and shrub-steppe but also occupy pastures and fields. This species can also be found in forested areas. In Idaho, habitat for this species within the survey area is limited to the Owyhee foothills. In Oregon, habitat for this species is present throughout the survey area.

Pygmy Rabbit

Pygmy rabbits are the smallest rabbit in North America. They dig their own burrows in tall, dense, sagebrush habitats and are highly dependent on sagebrush for food and shelter throughout their lives (Ulmschneider 2004, 2008). A habitat suitability model (Hagar and Lienkaemper 2007) will be conducted to identify where pygmy rabbit habitat exists along IPC's Proposed Route and alternative route corridors; this model with aid in determining areas that could support pygmy rabbits as well as guide survey efforts.

On lands not managed by the BLM, surveyors will perform pygmy rabbit protocol-level surveys (Appendix B-11) if any pygmy rabbits or evidence of pygmy rabbit activity (rabbit burrows or pellets) are identified during any resource surveys.

On BLM-administered lands, protocol-level surveys for pygmy rabbits will be conducted in all areas with deep soil that contains big sagebrush species (including Mountain, Basin, and Wyoming sage) with more than 5 percent canopy cover. Surveys will be conducted on BLM-administered lands, regardless of whether or not surveyors identify rabbit activity. Pygmy rabbit surveys will be performed exclusively for the species and will not be conducted concurrent with other survey efforts.

3.2 Plant Field Surveys

The Phase 2 survey will focus on the following: Oregon state listed threatened or endangered species, and BLM/Forest Service species considered Sensitive Species (collectively referred to as special status species). There are multiple non-federally listed special status species that occur or have the potential to occur in the project area (plus two federally listed species as discussed in Sections 2.2.3 and 2.2.4). A description of these species and explanation of their ranking are presented in Appendix C-2. Methods for documenting presence/absence of special status plant species within the survey area are described in this section. The plant survey maps (Volume II) display where surveys would be conducted for each special status plant species.

3.2.1 Agency Survey Requirements

The ODA Native Plant Conservation Program administers and manages sensitive plants on all non-federal public lands. The ODA requires that state-listed threatened and endangered species, which appear on ORNHIC List 1 and have the potential to occur in the project area, be considered for survey on public lands. ODOE-EFSC mirrors ODA requirements on private lands. Species considered Sensitive by the BLM and occur, or have the potential to occur, on

BLM lands within the project area, must also be considered for survey. Similarly, Idaho BLM Type 1, 2, 3, and 4 special status plants known to occur, or with the potential to occur, on federal lands must be considered. Regardless of land ownership, suitable habitat for sensitive plants will be identified during the pre-survey vegetation mapping phase and refined during the species-specific surveys. Appendix C-2 provides information on sensitive species with the potential to occur within the project area.

3.2.2 Vegetation Survey Timing

Listed plant surveys will be conducted during the highest likelihood of blooming to ensure positive identification. As blooming periods span May to September, multiple surveys will be required to capture all of the species during their appropriate blooming periods. In a few cases, plants that are easily identifiable in fruit may extend the survey time for those species.

3.2.3 Howell's Spectacular Thelypody

Howell's spectacular thelypody, a biennial herb that flowers in May and June, is a federally listed species and an Oregon state endangered species. It occurs in moist valley bottoms and prefers alluvial outwashes with seasonal moisture. Refer to Appendix C-1 for more detail. Botanists will determine the appropriate survey period (i.e., the time frame when surveys would be conducted) based on site conditions during plant surveys. Portions of IPC's Proposed Route or route alternatives where suitable habitat has been identified may need to be surveyed a second time if based on plant phenology.

3.2.4 Slickspot Peppergrass

Slickspot peppergrass is a federally listed species. It is an herbaceous annual or biennial mustard that flowers from May to June. It is located in sagebrush-steppe habitats in distinct "slickspots" or mini-playas. Refer to Appendix C-1 for more detail. Botanists will determine the appropriate survey period based on site conditions during plant surveys. Portions of IPC's Proposed Route or route alternatives, where suitable habitat has been identified, may need to be surveyed a second time if based on plant phenology.

3.2.5 Survey Methods

The BLM "intuitive controlled survey" (USDA/USDI 1998) method will be used to survey for special status plants.

Areas with potential suitable habitat for one or more target species will be identified based upon the following: 1) pre-survey vegetation mapping efforts; and 2) consultation with knowledgeable local botanists. If federal or state resource agencies identify known and easily accessible reference communities, botanists will visit the locations to create search images of these species, habitats, and associated plant communities.

Two to four botanists will form a search line to traverse through the project area until a representative cross-section of all major habitats and topographic features has been surveyed. Botanists will be looking for target species while enroute to different areas. When an area with high potential for habitat as defined in the previous paragraph is identified or encountered during the rare plant survey, a "complete survey" will be executed. Botanists will walk parallel to each other at distances appropriate for the size of the target species and the height and density of the surrounding vegetation to conduct a 100-percent visual exam of the high potential area. Detailed surveys will also occur in areas with known target plant populations.

In areas where multiple transects are required, surveyors will place a flag at the beginning of each transect and meander toward a transect endpoint identified by a compass bearing taken at the beginning flag. A flag will then be placed at the opposite end of the transect. The placement of flags helps identify areas that have been covered in one transect and new areas that need to be covered in the next.

To ensure special status species are not overlooked, botanists will maintain a list of all vascular plant species and their habitat associations observed during the survey. This list will be included with the botanical survey summary report as an appendix.

Species information to be collected includes, but is not limited to, population dynamics, associated species, habitat conditions, and potential threats. These parameters reflect the ORNHIC rare plant field survey form, GeoBOB database fields, and Idaho IFWIS rare plant observation report form (Appendix C-4).

3.2.6 Noxious Weeds Surveys

Noxious weeds are nonnative, invasive species that threaten agriculture, rangelands, waterways, parks, wildlife, property values, public health and safety, and general ecological health and diversity of native ecosystems. These plants are highly competitive and persistent, germinate under a wide variety of conditions, and often show fast seedling growth. Because these species are introduced, they lack natural control agents and frequently escape herbivory, factors that typically regulate native species (Keane and Crawley 2002).

Noxious weeds (Appendix C-3) will be recorded during all plant surveys. All noxious weed observations will be mapped using GPS. Relative abundance and size of the infestations (i.e., less than 0.1 acre, 0.1 to 1 acre, less than 1 acre) will be recorded. Existing site-specific disturbances and land uses (e.g., grazing, grading, etc.) that may be contributing to the introduction, spread, or viability of weed populations will be recorded.

Approximately 100 Oregon and Idaho noxious weed species potentially occur within the B2H survey area. The ODA categorizes noxious weeds into two primary groups: List A and List B. List A contains weeds of known economic importance which occur in the state in small enough infestations to make eradication or containment possible, or weeds that are not known to currently occur in Oregon, but whose presence in neighboring states make future occurrence in Oregon likely. Weeds on List B are considered weeds of economic importance that are regionally abundant, but may have limited distribution in some counties. Idaho noxious weeds are grouped into one of three lists maintained by the Idaho State Department of Agriculture: Statewide Early Detection and Rapid Response, Statewide Control, and Statewide Containment. See Appendix C-3 for a listing of Oregon and Idaho noxious weeds that may occur along a 500-foot survey corridor.

3.3 Waters of the United States

This section describes the methodology for identifying, documenting, and delineating wetlands and other Waters of the U.S. that may be affected by the project, as required by the USACE, ODSL, and IDWR. A physical delineation and survey would occur only if a project component (i.e., substation, tower, or access road) was sited within 100 feet of an identified wetland.

3.3.1 Field Surveys to Determine Presence of Wetlands and other Waters of the U.S.

During all terrestrial surveys (e.g., TVES, species specific, or rare plant surveys), Waters of the U.S. will be identified. The boundary of all water resources will be hand-drawn on field maps and mapped with sub-meter accuracy hand-held GPS units. If GPS reception is unavailable, hand-drawn maps will be digitized into GIS and refined using topographic data. A GIS wetland data layer will be created and overlaid on the project layout maps to identify areas of potential impact by the project and where specific wetland delineations will be required.

Under Section 404 of the Clean Water Act (CWA), the USACE and the United States Environmental Protection Agency (USEPA) regulate the discharge of dredge and fill material into "waters of the United States." The jurisdictional status of wetlands and other Waters of the U.S. is generally based on the USACE Jurisdictional Determination Form Instructional Guidebook (USACE 2007) and USACE guidance resulting from the Clean Water Act Jurisdiction following the U.S. Supreme Court's Decision in *Rapanos v. United States* and *Carabell v. United States* (USACE 2008). In order for an aquatic feature to be considered a "Water of the U.S." it must be at least one of the following:

- A traditional navigable water
- A wetland adjacent to a traditional navigable water
- A relatively permanent water, including tributaries that typically flow year-round or have a continuous flow at least seasonally (typically three consecutive months depending on the region)
- A wetland that directly abuts a relatively permanent water
- A wetland adjacent (proximal but not abutting) to a relatively permanent water, but only if it can be shown that the feature has a "significant nexus" with a traditional navigable water

Isolated wetlands that do not meet one of these requirements, however, can still be a state jurisdictional wetland. In order to assess the likelihood of state and federal jurisdiction, key data will be collected for each wetland (or group of small wetlands in mosaic situations) in an attempt to determine the following:

1) Does the feature appear to meet the definition of a wetland (hydrophytic vegetation, hydric soil criteria, and wetland hydrology criteria)?
2) Is the wetland isolated and located outside of a 100-year floodplain?
3) Was the wetland artificially created from upland?

4) Does the wetland receive irrigation? If so, would the area meet wetland criteria without artificial water input?

5) Does the drainage feature meet the definition of a stream channel? If so, does the stream exhibit indicators of perennial, intermittent, or ephemeral flow?

Wetland presence will be determined as per the 1987 Wetland Delineation Manual methods and the regional supplements, as appropriate. The USACE Arid West Regional Supplement will be used in the majority of the study area with the exception of higher elevation areas around the Wallowa-Whitman National Forest. In these higher elevation areas, the Western Mountains, Valleys, and Coast Regional Supplement will be used.

To assess potential impacts to wetlands, a 100-foot buffer of all proposed ground-disturbing activities will be developed. Where disturbance would be located within 100 feet of an approximate wetland boundary, wetland delineations will be conducted. Delineations will use the Routine Approach, as described in the 1987 USACE Wetlands Delineation Manual and amended by the applicable regional supplement. For potentially jurisdictional water resources, the new USACE "Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the United States" (Lichvar and McColley 2008) will be used. As described above, the Applicant and its consultant will coordinate with the ODSL, IDWR, and USACE early in the process to reach agreement on protocols for wetland determination and delineation. Specific wetland delineation protocols to be agreed upon include the following:

- Use of alternate forms to facilitate electronic data collection (versus use of the regional supplement data forms);
- Number of upland data plots in large tracts of land without wetland presence;
- Ordinary High Water Mark protocols, specifically for dry drainage areas; and
- Determination of hydrophytic vegetation in farmed areas.

3.3.2 Wetland Functions and Value Assessment

A meeting with the USACE and Oregon Department of State Lands (ODSL) staff in Bend and La Grande will be scheduled to discuss which functional assessment method is appropriate for the project. ODSL requested the use of the Oregon Rapid Wetland Assessment Protocol (ORWAP) in April 2009 (Adamus et al. 2010) (Appendix D-3). ODSL and USACE staff may agree to a different functional assessment method once they review the project.

The assessment will focus on areas that are likely to have water resources present. Focus areas will include topographic depressions, valley bottoms, areas with surface water signatures on aerial photography, riparian areas associated with perennial and intermittent streams, areas mapped as springs, wetlands, and streams on USGS topographic and NWI maps. Developed areas, non-irrigated plateaus lacking hydric soils, or steep slope areas will not be evaluated, except where drainage features are noted. Field maps will identify priority search areas.

Wetland field maps will be prepared concurrently and will be shown on vegetation maps, as described in Section 2.2.

The USACE and ODSL will require a wetland functional assessment of all wetlands affected by the project. Wetland functions and values will be assessed using the ORWAP; the details and method of the ORWAP can be found in Appendix D-3. Only wetlands that would be directly affected by the construction of the project would have a function and value assessment completed. The assessment will be used to determine mitigation requirements.

3.3.3 Sensitive Fish Habitat

As discussed in Section 2.1.1.1, fish presence will be assumed in all waterbodies that could potentially support these species (Appendix E), as indicated via agency data and stream classifications. No fish surveys would be conducted. Stream data will be collected at all locations where the project has the potential to adversely impact fish habitats. This will include crossing of streams by access roads, ROW clearing, or other project-related activities that may impact stream morphology, riparian vegetation, or substrate characteristics. Data collected on stream morphology will include:

- approximate flowing and bank full widths,
- channel slope,
- bank slope, and
- incision depth.

Data collected on riparian vegetation characteristics will include:

- vegetation type,
- approximate age, and
- riparian width from bank.

Data collected on substrate characteristics will include visual assessment of:

- dominant and subdominant substrates,
- relative cobble embeddedness, and
- percent of fines in riffle-run areas.

Additional data will be recorded when appropriate, such as the location of existing developments near the crossing that may impede fish passage.

3.4 Habitat Surveys

Phase 2 habitat surveys will be completed in three concurrent parts: 1) identification of unique wildlife habitats during Phase 1 and ground surveys conducted during Phase 2, 2) estimating vegetation cover and species dominance during Phase 2 ground surveys, and 3) preparation of final habitat category maps based on photo interpretation and ground surveys. These concurrent activities will be completed along IPC's Proposed Route and route alternatives (500 feet total width survey area) and associated project features. The components of these habitat surveys are discussed below.

3.4.1 Unique Habitats

Unique habitats within IPC's Proposed Route, route alternatives, and associated project features will be identified concurrently during TVES ground surveys for wildlife as described in Section 3.1.9 and Appendix B-9, and for plants as described in Section 3.2.5.

Unique habitats within IPC's Proposed Route and route alternative corridor area will be identified concurrently during ground surveys for plants and TVES. Ground surveys will identify any unique habitats that were not identified during Phase 1 vegetation mapping efforts. Previously undocumented rock-ash-calcareous outcroppings, talus slopes, cliffs, caves, riparian zones, snags, sand inclusions, mature timber stands, permanent and seasonal ponds, lakes, wetlands, and springs will be recorded along with a narrative describing the extent and condition of the habitat. These habitats will be documented in the field using GPS Trimble units, uploaded to the central geodatabase repository.

Data regarding known locations of mines, adits, and caves will be requested from state and federal agencies so that these sensitive areas can be avoided. In order to further protect these sensitive areas, field staff will record and map any suitable bat habitat (e.g., cliffs, mines, adits, caves, as well as large snags) found within the survey area during Phase 2 and 3 surveys. These areas would be avoided during project design and construction; therefore, potential impacts to roosting, maternity, and hibernacula sites would be considered low. No mines, adits, or caves will be entered by field staff.

3.4.2 Vegetation Cover and Species Dominance

Canopy cover and species dominance worksheets (Appendix C-4) will be completed concurrently with Phase 2 plant surveys and terrestrial visual encounter surveys for wildlife.

This information will be used to assign a qualitative attribute to the habitat mapping and ecological systems classifications compiled for IPC's Proposed Route and route alternatives. The quality of habitat attribute will assist in categorizing habitats in accordance with ODFW's Habitat Mitigation Policy framework.

The habitat mapping process will be to categorize survey areas within the framework of the ODFW habitat mitigation categories and will be rated based on the category characteristics presented in Appendix F for each ecological system surveyed. The characteristics used to determine the appropriate mitigation category for an ecological system (e.g., weed-infested and/or highly disturbed habitat where less than 25 percent ground cover is native) will be recorded using ocular estimates in all representative ecological systems (see Appendix C-4). In areas with high mitigation category ratings (i.e., low quality), additional comments will be provided to better define the cause or influences on the ecological system resulting in the low-quality rating. These field-defined ODFW mitigation categories will then be overlaid with all existing wildlife spatial data to further refine the habitat categories map.

3.4.3 Final Habitat Category Maps

Based on field data collection efforts during ground surveys, changes to the vegetation maps may be needed and will be evaluated using "heads-up" digitizing in ArcGIS 9.3 or 10 (ESRI, Inc.) to verify the accuracy and correct any misclassified ES polygons within the survey area. API will be performed at a 1:5,000 scale, and the minimum mapping unit will be 0.2 acre (the area of a single ReGAP 98-foot [30-meter pixel]). The minimum mapping unit may be adjusted to account for unique habitat types, such as wetlands (i.e., the minimum mapping unit may be reduced to account for wetlands smaller than 98 feet wide).

The final habitat category maps will be based on field surveys, updated vegetation mapping within IPC's Proposed Route and route alternatives, and consultation with ODFW. Vegetation maps will be presented in a map book that contains 11-inch by 17-inch inch maps, at a scale of 1:24,000, for IPC's Proposed Route and route alternatives. These will be accompanied by a summary table showing the acres of each habitat type, ODFW habitat category, and a rationale for the assigned ODFW habitat category. The vegetation maps will be refined and finalized based on feedback from ODFW.

4.0 PHASE 3 – PRECONSTRUCTION SURVEYS AND MODIFICATIONS TO PROJECT FEATURES

Preconstruction surveys will be implemented for state and federally listed species and species of concern during Phase 3. It is the intent that all vegetation clearing and grubbing will be performed prior to nesting and would negate the need to conduct nest surveys for most migratory birds. In the event that clearing would be needed during the nesting season, nesting surveys would be performed within 10 days of clearing, grubbing, grading or excavation activities.

In the event that the Proposed Route alternatives or associated infrastructure change after Phase 2 surveys have been conducted, or where previously denied access has be granted, additional wildlife or plant surveys or wetland delineations will also be required during Phase 3 (Table 1).

4.1 Active Raptor Nest Survey

Active raptor nests will be identified through focused preconstruction surveys of the approved route and project features. Because construction will take more than 1 year, surveys will be focused on areas of active construction for that year. Identification of active nests will trigger implementation of temporal and spatial restrictions. Preconstruction raptor nest surveys will be conducted following the same protocol as described in Section 3.1.3 and Appendix B-3 of this document.

4.2 General Avian Species

The nests of most avian species are protected under the Migratory Bird Treaty Act of 1918 (as amended in 16 USC 703-712). In order to ensure compliance with the Migratory Bird Treaty Act, all ground clearing would occur outside of the avian breeding season, which should reduce the risk of removing or damaging active nests. The presence of avian species would be determined during protocol-level surveys and TVES surveys discussed for Phase 2 and the preconstruction surveys that would occur during Phase 3. Therefore, no targeted avian point count surveys or avian nest surveys (with the exception of the raptor nest surveys) would be conducted.

4.3 Waters of the United States

Phase 3 will utilize the results of the wetland mapping and field work conducted during Phase 1 and 2 to avoid and delineate water resources. This task will document and permit project changes that occur as the Proposed Route is refined, project structures are located, and micro-siting adjustments are made.

4.4 Surveys of Modifications to the Proposed Alternative or Project Features

Any modifications to the preferred route or changes to the location of any project features that result in construction being located outside of the surveyed area will be assessed and documented according to the protocols and timing described in this Work Plan.

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APPENDIX A

DATA COLLECTION AND REPORTING FOR ALL SURVEYS

APPENDIX A

DATA COLLECTION AND REPORTING FOR ALL SURVEYS

Data Compilation and Storage

Field crews will use GPS technology for data collection activities. Trimble GeoXT survey grade receivers loaded with ESRI ArcPad 10 software will be used by crews conducting field surveys. All GPS data will be collected in ArcPad, differentially corrected via Trimble Pathfinder, exported to and refined in the latest version of ArcGIS 10.x, and maintained in the project GIS geodatabase.

Where feasible, GPS forms derived from Geographic Biotic Observations (GeoBOB) will be used in accordance with BLM protocols to collect data for flora and fauna. Field data collectors will either enter data directly into the GeoBOB derived GPS forms (see attached examples of the flora and fauna data forms), or complete paper data forms to be entered into GeoBOB at a later date using species-specific data forms used for biological surveys (e.g., goshawk data form), all data will be double-checked during entry, and any issues will be resolved with the persons who gathered the data. GeoBOB training with BLM personnel would be conducted prior to field crews departing for surveys.

If GeoBOB is not feasible, Trimble TerraSync software will be used to facilitate data collection and data maintenance. To help maintain data integrity, data will be automatically validated and restricted to the domains and subtypes defined in the central geodatabase. Domains will provide the user with controlled and standardized data entry choices and along with real-time map display, will facilitate data collection.

Pathfinder Pro will be used in post processing to differentially correct GPS survey data for improved positional accuracy. Unique Base Provider Integrity Index will be used to automatically select and download the best quality base data available for differential correction. Automated routines will be used for data transfer, differential correction, and data export for quality control before being viewed and/or edited in ESRI ArcMap, then synchronized with the local geodatabase.

After collected data have been downloaded, a standard quality assurance assessment will be performed to ensure the collected data meet the requirements of this project. Data validation procedures (ensuring measures are logical and within normal ranges) will be detailed in each task protocol and will generally include domain and validation checks. All data will meet the Quality Assurance Project Plan developed for B2H. All Quality Assurance/Quality Control procedures will be in accordance with applicable professional standards, government regulations and guidelines and specific project goals and requirements. Any problems or comments related to a specific GIS or GPS data issue will be documented as appropriate. Any corrective actions necessary to insure that data integrity is maintained will be documented.

All collected field data (physical forms, pictures, GPS files (.axf, .ssf and .cor files) will be delivered to the BLM Vale District Office and the ODFW data steward.

Rare Plant Site Documentation

All target plant species will be surveyed using survey-grade GPS equipment with sub-meter positional accuracy. Individual points will be taken for lone plants or small populations. Polygons will be surveyed around large populations[1]. Multiple parameters for each listed plant location will be documented using a GPS data dictionary established for the survey effort. This data dictionary will store information on population dynamics, associated species, habitat conditions, potential threats, etc. consistent with the Geographic Biotic Observations (GeoBOB) database (ORNHIC rare plant field survey form and Idaho CDC rare plant observation report form) (Appendix C-4). Data will be exported to individual site records consistent with these forms. Site forms will be included with the botanical survey summary report as an appendix.

Sensitive and Strategic species sites located on OR BLM lands during any survey efforts will be entered into the agency corporate database, Geographic Biotic Observations (GeoBOB).

Comprehensive Baseline Technical Reports

The comprehensive baseline technical reports will be based on the results of field reconnaissance, project related species-specific surveys, and previously collected data (e.g., data provided by ODFW). The table of contents for the baseline technical reports is as follows:

BASELINE TECHNICAL REPORT

TABLE OF CONTENTS

SUMMARY *(Resource specific)*

INTRODUCTION

- Purpose and Objectives
- Physical Setting of Project Area (Figure 1)
- Resource Study Area (Figure 2)

DATA REVIEW

- Literature reviewed
- Existing Data (unpublished) reviewed

DATA COLLECTION AND METHODS

- Descriptions of survey dates, methods, and personnel

RESULTS AND DISCUSSION

- Description of special-status species distributions or habitat identified during surveys

REFERENCES

LIST OF TABLES

- Tables will be incorporated into the text as they are referenced.

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[1] A large population would be defined in the field by either total area of population or by total number of individuals, depending on the species. Number of stems may be counted for some plant species or, if extensive, the area will be estimated or delineated using a Trimble unit and post-processed to determine extent and acreage.

LIST OF FIGURES

Figures will be incorporated into the text as they are referenced.

APPENDICES

Appendices will be presented at the end of the document

Completed state special status species observation forms

Representative photographs of the biological resources present

Any other information determined to be required by local, state, and Federal agencies

Example of BLM Flora and Fauna Data Forms

The follow data forms (flora and fauna) contain data cells that require input and would be entered using a survey grade Trimble GPS unit using ArcPad and an agency provided personal geodatabase. The example forms will be revised to include only data fields where input is necessary.

OR / WA BLM GeoBOB v 1.4 SITE & OBSERVATIONS FORM – FLORA, pg 1.
(*Circle* appropriate option when a list is provided, **Bold** items are required fields, *key to codes on cheat sheet. See data dictionary for Field Name and List of Value definitions.)

SITES

SITE ID: ________________________________ SITE NAME: ____
SITE ALT. ID: ____
SPECIES CODE: ____________ SCIENTIFIC NAME: _________________ COMMON NAME: ________________
UTM: _____________________E, ___________________N ZONE: ________________ DATUM: _______________
LAT: _____ _____ ______ W, LONG: ______ _____ _____N GPS model / software: ___________________________
LEGAL DESCRIPTION: T_______R________ S _______ ¼_______ 1/16______ 1/64______ MERIDIAN: W H D
USGS QUAD: _______________________________
ADMIN UNIT: ______________________________ SUB ADMIN UNIT: _____________________________________
***LOCATION ACCURACY**: _____________________________
SPECIES SITE STATUS (locally): Extirpated (sp. & habitat), Occupied, Undetected, Unknown, Unoccupied
TOTAL QUANTITY: ___________ QUANT. ESTIMATED?: Y / N
DISTRIBUTION: Clumpy, Linear, Scattered- Even, Scattered- Patchy
ABUNDANCE: Abundant, Common, Uncommon, Unknown, Very Uncommon AREA OCCUPIED (acres): ____________
OBSERVERS: ____
VISIT PURPOSE: Incidental, Inventory, Treatment (specify in notes), Monitoring – Annual/ Fed. Listed, Monitoring – Grazing, Monitoring – Long-Term, Monitoring – Unspecified, Monitoring – Fire, Research, Revisit, Resurvey, Unspecified
DATE: _______________ **DATE ACCURACY**: Day, Month, Year, Unknown
REVISIT NEEDED: Y / N REVISIT SCHEDULED DATE: ____
NOTES: ____
____
____

PHENOLOGY

^Phenology	% Phenology		*Phenology	% Phenology

All (A), Bud (B), Dead (DE), Dormant (DO), Flower (F), Fruit (FR), Juvenile (J), Multiple (M), Re-growth (RG), Senescent (S), Sporocarp (SP), Vegetative (V), w/o Sporophyte (WOS), w/ Sporophyte (WS),

HABITAT/ENVIRONMENTAL CONDITIONS (Optional data)

Slope (%): _______ Slope – min.: _______ Slope – max.: _______ Slope source: _______
Aspect (deg): _______ Aspect – min. _______ Aspect – max. _______ Aspect source: _______
Elevation (ft): _______ Elevation – min.: ________ Elevation – max.: _______ Elevation source _______
Source: C = Calculated, M = Measured, E = Estimated, G = GPS generated (for elevation only)
*Landform: _________________________ Stand Age: ___________
Stand Structure: Multiple Canopies, Single Canopy, Two Canopies, Even/Live Resid, Unspecified
*Seral Stage: _________________ *Substrate: __________________
Percent Cover: 1) Overstory: _________ Overstory min.: _________ Overstory max:________
2) Understory: _________ Understory min.: __________ Understory max:________
~Fire Presence: Absent, Burned, Completely Burned, High Scorch, Mod Scorch, Partial Scorch, Very High Scorch
Topographic Position (rel. to overall slope): Bottom, Lower, Mid, Ridge, Upper.
Soil Texture Class: Clay, Clay Loam, Loam, Sand, Silt, Silt Loam, Sandy Loam, Other
Air Temperature (F): _________ Relative Humidity (%): _________ Soil Temperature (F): ___________
Soil Moisture: Dry, Moist, Wet, Inundated/Flooded Light Index: Full Shade, Full Sun, Part Shade
Precip: Dry, Fog, Misty Rain, Rain, Sleet/Hail, Snow Wind: Calm, Gusty, Light, Moderate, Windy (15+ mph)
Notes: ____
____
____

~If fire was present within the last 5 years

OR / WA BLM GeoBOB v 1.2 SITE & OBSERVATIONS FORM – FLORA, pg 2.

ASSOCIATED OBS

Create a list below of non-target species found in the same geographic location as the target species Site / Observation. If needed, indicate percent cover, abundance and/or quantity for each species. Enter data into GeoBOB Add_Obs table (use Associated Species tab in Flora Sites or Fauna Obs data entry forms).

Species Code	Scientific Name	*Abundance	Quantity	% Cover

THREATS

***THREAT TYPES(S)**: ____
NOTES:____
____
____

OBSERVATION POINTS

OBS ID: ______________________ ***LOCATION ACCURACY**: ____________
QUANTITY: ________ QUANTITY ESTIMATED Y / N ?
UTM: _______________ E, ______________N DATUM: __________
LAT: _____ _____ ______ W, LONG: ______ _____ _____N GPS Unit used: ______________________

PHENOLOGY:

FLORA SITE PHENOLOGY					
^Phenology	% Phenology	Quantity	*Phenology	% Phenology	Quantity

All (A), Bud (B), Dead (DE), Dormant (DO), Flower (F), Fruit (FR), Juvenile (J), Multiple (M), Re-growth (RG), Senescent (S), Sporocarp (SP), Vegetative (V), w/o Sporophyte (WOS), w/ Sporophyte (WS),

NOTES: ____
____
____

OR / WA BLM GeoBOB v 1.2 SITE & OBSERVATIONS FORM – FLORA, pg 3.
(*key to codes on cheat sheet, *Circle* appropriate option when a list is provided, **Bold** items are required fields)

ADDITIONAL OBSERVATION LOCATIONS

If more than one observation is found in the survey area and that is within the survey site, record the location, Obs ID, and notes here. If specifics about the additional observations need to be recorded, such as feature, detail observation or collection information, complete a separate Obs form.

Latitude/UTM E	Longitude/UTM N	Obs ID	Notes

PLEASE ATTACH MAPS of Observation or Site when helpful.

COLLECTIONS

COLLECTION ID: ____
COLLECTION TYPE: Commercial, DNA, ID Tag, Museum, None, Other, Photo, Seedbank, Voucher
DATE: __________________ **COLLECTOR**: ________________________________
REPOSITORY: __________________________________ IDENTIFIER: __________________
Photo ID: ____
VERIFIER**:** ________________________Verification Date: __________________________
VERIFIED SPECIES CODE: ______________________
COLLECTION NOTES: ____
____
____

OR / WA BLM GeoBOB v 1.4 OBSERVATIONS & SITE FORM – FAUNA, pg 1.
(*Circle* appropriate option when a list is provided, **Bold** items are required fields, *key to codes on cheat sheet. See data dictionary for Field Name and List of Value definitions.)

OBSERVATIONS

OBS ID: ____________________________ **SPECIES CODE**: _______________
SCIENTIFIC NAME: __________________________ COMMON NAME: ____________________________
UTM: _____________________ E, ___________________N ZONE: _______________ DATUM: ______________
LAT: _______________ W, LONG:______________N GPS model & software used: __________________________
***OBSERVATION TYPE**: _________________________________ **DATE**: ___________________________
DATE ACCURACY: Day, Month, Year
RELIABILITY: Excellent, Good, Fair, Poor, Unknown ***LOCATION ACCURACY**: _______________
TOTAL QUANTITY: __________ QUANTITY ESTIMATED?**:** Y / N
DISTRIBUTION: Clumpy, Linear, Scattered-Even, Scattered-Patchy
ABUNDANCE: Unknown, Abundant, Common, Uncommon, Very Uncommon
OBSERVERS: ____
Notes: ____
____

DETAIL OBS

QUANTITY: _______ GENDER: Female, Male, Hermaphrodite, Unknown *AGE: __________
*ACTIVITY: ________________ CONDITION: Dead, Excellent, Fair, Good, Injured, Live, Poor, Shell, Sick, Unknown.
REPRO-STATUS: Non-repro, Repro, Unknown, Not Applicable. [BATS] Lactating, Null Parous, Parous, Post-lactating, Pregnant, (bats) Testes/epididymides enlarged & visible .
NOTES: ____
____

HABITAT/ENVIRONMENTAL CONDITIONS (Optional data)

SLOPE (%): _______ SLOPE – MIN. (%): _______ SLOPE – MAX. (%): ________ SLOPE SOURCE: ________
Aspect (deg): _______ Aspect – min. (deg):_______ Aspect – max. (deg):_______ Aspect source: _______
Elevation (ft): _______ Elevation – min. (ft): ________ Elevation – max. (ft): _______ Elevation source _______
Source: C = Calculated, M = Measured, E = Estimated, G = GPS generated (for elevation only)
*Landform: ________________________ Stand Age: ___________
Stand Structure: Multiple Canopies, Single Canopy, Two Canopies, Even/Live Resid, Unspecified
*Seral Stage: _________________ *Substrate: __________________
Percent Cover: 1) Overstory: _________ Overstory min.: _________ Overstory max:________
2) Understory: _________ Understory min.: __________ Understory max:________
~Fire Presence: Absent, Burned, Completely Burned, High Scorch, Mod Scorch, Partial Scorch, Very High Scorch
Topographic Position (rel. to overall slope): Bottom, Lower, Mid, Ridge, Upper.
Soil Texture Class: Clay, Clay Loam, Loam, Sand, Silt, Silt Loam, Sandy Loam, Other
Air Temperature (F): _________ Relative Humidity (%): __________ Soil Temperature (F): ___________
Soil Moisture: Dry, Moist, Wet, Inundated/Flooded Light Index: Full Shade, Full Sun, Part Shade
Precip: Dry, Fog, Misty Rain, Rain, Sleet/Hail, Snow Wind: Calm, Gusty, Light, Moderate, Windy (15+ mph)
Notes: ____
____
~If fire was present within the last 5 years

ADDITIONAL OBSERVATION LOCATIONS

If more than one observation is found in the survey area and that is within the survey site, record the location, Obs ID, and notes here. If specifics about the additional observations need to be recorded (feature, detail observation, or collection information) complete a separate Obs form.

Latitude/UTM E	Longitude/UTM N	Obs ID	Notes

PLEASE ATTACH MAPS of Observation or Site when helpful.

THREATS

***THREAT TYPE(S):** ____
NOTES:____
____

OR / WA BLM GeoBOB v 1.4 OBSERVATIONS & SITE FORM – FAUNA, pg 2.
(*key to codes on cheat sheet, *Circle* appropriate option when a list is provided, **Bold** items are required fields)

ASSOCIATED OBS

Create a list below of non-target species found in the same geographic location as the observation. If needed, indicate percent cover, abundance and/or quantity for each species.

Species Code	Scientific Name	Abundance (Abundant, Common, Uncommon, Unknown, Very Uncommon)	Quantity	% Cover

COLLECTIONS

COLLECTION ID: ____
COLLECTION TYPE: Cast, Commercial, Depredation, DNA, Hair, ID Tag, Museum, Necropsy, None, Other, Pellets/Scat, Photo, Salvage, Voucher
DATE: ___________________ **COLLECTOR**: ____
REPOSITORY: ________________________________ IDENTIFIER: ___________________
Photo ID: ____
VERIFIER: __________________________ Verification Date: ___________________________
VERIFIED SPECIES CODE: ________________________
COLLECTION NOTES: ____
____
____

FAUNA SITES

SITE ID: ________________________________ SITE NAME: _________________________________
SITE ALT. ID: ___________________ **SITE SPECIES CODE**: _____________
ADMIN UNIT____________ SUB-ADMIN UNIT_______ ***LOCATION ACCURACY**: __________
SITE STATUS: (locally): Extirpated (sp. & habitat), Occupied, Undetected, Unknown, Unoccupied
TOTAL QUANTITY: __________ QUANT. ESTIMATED?: Y / N AREA OCCUPIED (ac): ________________
VISIT PURPOSE: Incidental, Inventory, Monitoring – Annual/ Fed. Listed, Monitoring – Fire, Monitoring – Grazing, Monitoring – Long-Term, Monitoring – Unspecified, Research, Resurvey, Revisit, Treatment (specify in notes), Unspecified
DATE: _______________ **DATE ACCURACY**: Day, Month, Year
REVISIT NEEDED: Y / N REVISIT SCHEDULED DATE: ____________________________________
NOTES: ____
____
____
PLEASE ATTACH MAPS of Observation or Site when helpful.

Example of Equipment Lists and Species-Specific Data Forms

The following includes a list of equipment and data forms that may be used for data collection and will be used in conjunction with or in place of an agency provided personal geodatabase if needed.

2011 Great Gray Owl Field Equipment List

1. Broadcast Caller Unit (Digital or Megaphone)
2. Flashlight and/or headlamp
3. GPS Unit (loaded with calling station locations)
4. 2-way radio
5. Extra batteries
6. Maps
7. Watch
8. Data sheets (rite in the rain paper is helpful)
9. Sharpies/Pens/Pencils
10. Binoculars
11. Field Compass
12. Survey Vest
13. Rain gear
14. Bug repellent
15. Gallon-sized plastic bags (ziplocks) for feather molts or prey remains
16. First Aid and other safety equipment

2011 B2H Great Gray Owl Survey Form

Date (mo/day):__________ Page___ of___ **Surveyor(s):**____
GGO Survey Grid Number: __________
Weather: Sunny Partly Cloudy Cloudy Rain
Temp Range:___**-**___ F
Survey Start Time:__________ **Survey Method:**____
End Time:__________

Wind:
1 smoke rises (<1 mph)
2 smoke drifts (1-3 mph)
3 leaves rustle, breeze felt on face (4-7 mph)
4 leaves and small twigs in constant motion (8-12 mph
5 raises dust, small branches in motion (>12 mph)

Cloud Cover:
1 <5%
2 5-20%
3 21-40%
4 41-60%
5 61-80%
6 81-100%

Presence? Y N

Calling Station#	Start Time (24 hr)	Raptor Detection	Age	Comments and Location Descriptions	UTM Coordinates

2011 B2H Northern Goshawk Field Equipment List

1. Broadcast Caller Unit (Digital or Megaphone)
2. GPS Unit (loaded with calling station locations)
3. 2-way radio
4. Extra batteries for GPS and radio
5. Maps
6. Watch
7. Data sheets (rite in the rain paper is helpful)
8. Sharpies/Pens/Pencils
9. Binoculars
10. Field Compass
11. Survey Vest (blaze orange a good idea during turkey seasons)
12. Rain gear
13. Bug repellent
14. Gallon-sized plastic bags (ziplocks) for feather molts or prey remains
15. First Aid and other safety equipment

2011 B2H Northern Goshawk Survey Form

Date (mo/day):__________ Page___ of___ **Surveyor(s):**____
NOGO Survey Grid Number: ___________
Weather: Sunny Partly Cloudy Cloudy Rain
Temp Range:___**-**___ F
Survey Start Time:__________
End Time:__________

Wind: 1 smoke rises (<1 mph)
2 smoke drifts (1-3 mph)
3 leaves rustle, breeze felt on face (4-7 mph)
4 leaves and small twigs in constant motion (8-12 mph
5 raises dust, small branches in motion (>12 mph)

Cloud Cover: 1 <5%
2 5-20%
3 21-40%
4 41-60%
5 61-80%
6 81-100%

Presence? Y N

Calling Station#	Start Time (24 hr)	Raptor Detection	Age	Comments and Location Descriptions	UTM Coordinates

B2H Washington Ground Squirrel Colony Datasheet
Spring 2011

Date: ______________________ **Surveyor(s):** ______________________
Parcel#:

Revisited potential burrows from previous survey? Yes/No ________ **Revisit #**________

Wind: Direction from (circle one): N NE E SE S SW W NW n/a **Wind Speed (mph):**

Precipitation(circle one) none light rain rain snow sleet hail other **Temp (F):**_____**Cloud Cover:**______

____

Site Occupancy:	**Activity Confirmation (check all that apply):**	**How was first colony discovered?:**
[ ] Confirmed Active (1)	[ ] Visual(1)	[ ] Visual(1)
[ ] Confirmed Inactive (2)	[ ] Alarm call (2)	[ ] Alarm call (2)
[ ] Possible Activity (3)	[ ] Scat (3)	[ ] Scat (3)

Habitat Characteristics

Soil Type:	**Shrub Cover:**	**Shrub Distribution:**	**Plant Species Composition:**
[ ] Sandy (1)	[ ] <1%(1)	[ ] Patchy (1)	[ ] native species dominant (>60%)
[ ] Silty (2)	[ ] 1-10% (2)	[ ] Homogenous (2)	[ ] exotic species dominant (>60%)
[ ] Silty Sand (3)	[ ] 11-20% (3)	[ ] Unknown or N/A (0)	[ ] neither native or exotics dominate
[ ] Silty loam (4)	[ ] 21-40% (4)		[ ] native species present (percent ____)
[ ] Silty Sand or loam w/ Gravel (5)	[ ] 41-60% (5)		
[ ] Rocky (6)	[ ] 61-80% (6)		
	[ ] 81-100% (7)		

General habitat type: (circle one) bunchgrass, sagebrush steppe, annual grassland, other______________

Grazing Intensity:
[ ] 0-25% Lightly Grazed (1)
[ ] 25-50% Moderately Grazed (2)
[ ] 50-75% Heavily Grazed (3)
[ ] 75-100% Overgrazed (4)

Dominant Plant Species:______________________________
____
____
____

Disturbances (circle all that apply): Anthropogenic Off Road Vehicles Wind Fire Erosion None

Activity Center Information

Number of Burrows:___________ Photo Number(s):______________
Number of Burrows with scat (approximate): ______________________
Number of scat found (approximate): _______________________________ scat collected ? circle one: Yes/No _____________________

Waypoint Name in GPS:____
Activity Center Boundary Waypoint UTMs:

N: E:
N: E:
N: E:
N: E:
N: E:
N: E:
N: E:
N: E:
N: E:
N: E:

Notes:____

APPENDIX B-1

2011 PROTOCOL FOR WASHINGTON GROUND SQUIRREL SURVEYS

APPENDIX B-1

2011 PROTOCOL FOR WASHINGTON GROUND SQUIRREL SURVEYS

Adapted from Stateline 3 Part A and Part B Pre-Construction Wildlife Investigation, October 12, 2001; and *Status and Habitat Use of the Washington Ground Squirrel (*Spermophilus washingtonii*) on State of Oregon Lands, South Boeing, Oregon* (Morgan and Nugent 1999).

Objective

The primary objective for 2011 surveys is to survey known and/or historical Washington ground squirrel (*Spermophilus washingtoni*) colony sites within the project area to confirm occupancy. Secondly, areas identified as suitable habitat for Washington ground squirrels (WAGS) will be surveyed within the project area. The protocol described below outlines a method to identify presence or absence of WAGS.

Methods

Meandering Walking Transects

Two pre-construction walking transect surveys will be conducted between late March or April 1 and June 3 which correspond with the highest activity period. The period of highest activity occurs when juvenile ground squirrels are most active and alarm calls are most frequent. If the spring season is early, surveys may be initiated in March. We will contact local experts who are monitoring ground squirrel colonies to determine when the best time to begin surveys is in 2011.

Prior to conducting any surveys, all field crew members will be trained in the survey protocol during a reference visit to an occupied Washington ground squirrel colony. The surveys will be conducted in the morning (between approximately 6:00 a.m. and noon) but may be extended into the afternoon if weather conditions allow. Surveys will generally not be conducted when wind conditions are above 15 miles per hour (best judgment will be used when wind speeds are greater than 6 miles per hour [Morgan and Nugent 1999]) or when visibility is poor. All surveyors will have their hearing tested prior to going into the field to ensure that they can hear the very high-frequency calls of this species.

Surveys will cover all land within the preferred route corridor and within 1,000 feet of the outer boundaries of the corridor in native grassland, shrub-steppe and where native species were planted in CRP habitats and those CRP habitats are adjacent to native habitats. We will not survey areas where landowner access is not obtained and where recently seeded CRP lands provide little or no cover for wildlife. During all walking transects conducted within the survey corridors, surveyors walk as a group at similar paces, meandering through the habitat while progressing forward. Up to eight surveyors (depending on the width of habitat to be surveyed) will walk meandering transects no more than 195 feet apart (except where conditions were hazardous). Most surveys will be conducted 165 feet apart. Surveyors can share observations by talking quietly, using hand signals, or contacting each other with hand-held radios. This aids in insuring double-recording species of concern is not taking place. Surveyors can occasionally clap hands or gently kick large shrubs in an attempt to flush animals out of shrub patches or to stimulate a response from animals. The observers will scan ahead and periodically behind, looking for animal activity. GPS Coordinates will be recorded for active or suspected Washington ground squirrel sites.

While conducting the walking transects, surveyors will look for potentially suitable holes/burrows while looking for squirrels and listening for their calls. When potential holes are located, surveyors will notify each other and slow their walking pace or stop near the area to listen and scan. Intensive searches will then be conducted to locate the animal(s) or droppings in the immediate area. Presence is confirmed when the animal(s) is visually detected, when squirrel calls are heard or droppings are found. The area will be further searched to identify the outside perimeter of the active site. Although Washington ground squirrels are expected to be the only small squirrel present in the area, there is a remote possibility that a similar species, the Townsend's ground squirrel, may occur. All squirrels seen will be identified when possible.

Active burrows and colonies will be identified through a combination of visual and audible confirmations (hearing alarm calls) and presence of characteristic Washington ground squirrel scat around burrow entrances. Scat samples will be collected or photographed for confirmation of squirrel presence. Areas where presence is confirmed will be mapped with a GPS unit. In places where only potentially suitable holes (similar size and shape of hole) are located, the area will be searched for confirmation of presence by looking for droppings on the soil surface or by using a sifter to sift through dirt within 1 foot of the holes. In areas where questionable holes are found and no sign of squirrels is noted, surveyors will note the location on maps and flag the site for further investigation at the next possible opportunity or during the second survey. High-use areas (likely the primary natal site) and/or groups of holes will be mapped and the GPS coordinates recorded. These high-use areas are defined as sites with numerous holes containing recent sign of activity and/or where animals are detected. Locations of old holes will be also mapped if it is strongly suspected that they belong to squirrels. These are defined as holes/burrows with characteristics of ground squirrel holes (size) but not showing any sign of use in recent months or weeks. Old holes are defined by the presence of recent vegetation growth obscuring the hole, spiders nesting in the burrow (black widows primarily), fresh pocket gopher or other non-squirrel droppings, and no "mowed' vegetation near the entrance or recent rubbing of vegetation roots exposed on the hole edge. Similar-sized, very old holes will not be mapped.

Morgan, R.L., and M. Nugent. 1999. Final Report: Status and Habitat Use of the Washington Ground Squirrel (*Spermophilus washingtoni*) on State of Oregon Lands, South Boeing, Oregon, in 1999. Oregon Department of Fish and Wildlife. November.

Stateline 3. 2001. 2010 Boardman to Hemingway Protocol for Washington Ground Squirrel Surveys. 2001. Adapted from Stateline 3 Part A and Part B Pre-Construction Wildlife Investigation. October 12, 2001.

APPENDIX B-2

SAGE-GROUSE LEK MONITORING

APPENDIX B-2

GREATER SAGE-GROUSE LEK SURVEY PROTOCOL

Adapted from:

Hagen, C. A. 2005. Greater sage-grouse conservation assessment and strategy for Oregon: a plan to maintain and enhance populations and habitat. Oregon Department of Fish and Wildlife. Salem, Oregon.

Lek/Lek Complex Searches: Lek searches consist primarily of determining the location of all leks using a helicopter. This allows us to identify the breeding distribution of sage-grouse within the survey area.

The following lek count procedures are based on the premise that once lek attendance begins, a high proportion of the males that attend any given lek do so each day.

Timing of Surveys

1. Surveys should be conducted between March 15 and April 30 each year. (Note: There may be local variation between districts that will dictate minor modifications to these dates).

2. Surveys ideally should be done within the first 2 hours after daybreak under clear, calm, and dry weather conditions.

3. All survey areas should be counted at least 2 times at 7 to 10 day intervals.

Lek Search Procedures

This type of survey is necessary to identify the entire breeding range of sage-grouse in the project area. Location of new leks and status (active or inactive) of known leks, which are not counted regularly can be determined from locating with aircraft.

The survey area should be flown in a transect pattern so that the entire area is systematically covered. The distance between transects will vary depending on light conditions (sunny vs. cloudy), ground vegetation structure (extensive sagebrush stands vs. juniper/sagebrush mixes), and topography (rolling vs. flat). However, a distance of 1/4 to 1/2 mile between transects is generally recommended.

Recommended flight level is 23 to 30 feet above ground although 50 to 100 feet will increase the margin of safety and may improve sighting distance. Past experience has shown that under optimal flying conditions, approximately one township can be surveyed in a 2 to 3 hour flight with a helicopter.

Note: for aerial lek searches, the following information should be recorded on the provided Aerial Observer Field Data Form

1. Date, observer name, and county/management unit where survey is being conducted.

2. Time when flying begins and ends, and the time when the survey begins and ends.

3. Lek name and/or designated number. Lek names may be derived from a nearby landmark or geographic feature.

4. Time lek is observed (hh:mm).

5. UTM coordinate of lek (using GPS unit).

6. Sky conditions (i.e. sunny, cloudy, raining or snowing).

7. Ground conditions (i.e. bare ground vs. snow covered).

8. Number of males, females, unclassified birds, and total number observed.

9. Directions to lek – If possible, a detailed description of the location and the best way to access each lek/lek complex should be recorded. This should include mileage from nearest town to junctions or crossroads, and directions to the lek location to the nearest 1/10th mile.

APPENDIX B-3

RAPTOR NEST SURVEY PROTOCOL

APPENDIX B-3

RAPTOR NEST SURVEY PROTOCOL

Adapted from:

Jeffrey, *et al*. Post-Construction 2008 Aerial Raptor Nest and Greater Sage-Grouse Lek Surveys for the Wild Horse Wind Facility. Western EcoSystems Technology, Inc. Walla Walla, WA. April, 2008.

Ministry of Sustainable Research Management, 2001. Inventory Methods for Raptors. Resources Inventory Committee. The Provence of British Columbia, Canada. October 2001, version 2.0. pp 37-41.

Aerial Raptor Nest Survey

The objective of the raptor nest survey is to locate all raptor nests that may be subjected to disturbance and/or displacement effects from transmission line construction.

Protocol

1. **Pre-survey Habitat Suitability Analysis.** A GIS analysis was conducted to identify areas containing suitable golden eagle nesting habitat. Typically, golden eagles nest in cliff and canyon areas and rock outcrops. In order to identify these areas, a digital elevation model was analyzed to show landforms with a minimum angle of inclination of 45 degrees.

2. **Establishment of survey areas.** The raptor nest survey area is broken into three categories according to the sensitivity of nesting raptors to disturbance from construction and human presence, or according to recommendations from the US Fish and Wildlife Service (USFWS). These nest buffers are seasonal in nature and correspond to sensitive nesting periods for each species.. Please refer to Table 1 below for exact USFWS recommendations (Whittington and Allen, 2008). For most species occurring within the project area, the USFWS recommends a nest buffer of 0.5 mile or less from construction related disturbances. Therefore the entire route will be surveyed out 0.5 mile from either side of the 500-foot corridor. Ferruginous hawks are more sensitive to disturbance and human presence and the USFWS recommends and 1-mile nest buffer from these activities. In ferruginous hawk habitat (non-forested, sagebrush and grassland areas) the survey area will extend out to 1 mile on either side of the 500-foot corridor. Recent concern over declining population trends of golden eagles in the west has prompted greater scrutiny of the potential impacts that projects, especially energy development, may have on these populations. USFWS guidelines recommend a 0.5 mile nest buffer for golden eagles, however the survey area for this project is extended to 2 miles in areas identified as potential nesting habitat to address the current concerns for this species.

3. **Timing of surveys.** The initial raptor nest survey is conducted via helicopter in April to early May when buteos (ferruginous hawk, red-tailed hawk), golden eagles, and prairie falcons should be actively establishing nests, incubating eggs or brooding/attending young. During greater sage-grouse surveys, raptor nests will be identified and therefore dedicated raptor

nest surveys will not take place within sage-grouse survey areas for the initial nest survey. A second aerial survey is conducted in late May or early June to look for evidence of nest success (e.g., fledged young nearby, large grown chicks in the nest) and to gather data on late-nesting species (e.g., Swainson's hawk).

4. **Survey approach.** The helicopter will fly parallel transects at a distance of .25 miles from the centerline to allow observers to see out to the 0.5-mile buffer distance and back to the centerline. In ferruginous hawk habitat another transect will be flown out to 0.75 miles so observers can see to the 1-mile buffer distance and back to the 0.5-mile buffer distance. In golden eagle habitats two more transects will be flown at 1.25 miles and 1.75 miles from the centerline to ensure complete coverage out to 2 miles. However, in golden eagle habitat this transect method may be abandoned for an intuitive search method (i.e. flying up canyons or identifying cliff faces in steep terrain) to improve efficiency. Both sides of the centerline will be surveyed in this manner. Aerial nest searches are conducted by flying habitat suitable for most aboveground nesting species, such as cottonwood, ponderosa pine, tall shrubs, and cliffs or rocky outcrops. During surveys, the helicopter is flown at an altitude of tree-top level to approximately 250 ft (76 m) aboveground. If a nest is observed, the helicopter moves into a position where nest status and species present can be determined. Efforts must be taken to minimize disturbance to breeding raptors, including keeping the helicopter a maximum distance from the nest at which the species could be identified, with distances varying depending upon nest location and wind conditions.

   Observers record as much information as possible during the brief investigation of nest sites. At a minimum, a GPS location is attributed to every nest identified in the survey area. When possible, the species associated with the nest is recorded as well as age classification (adult or juvenile) along with nest activity (active or inactive). Site description is noted as well. This would include the nest substrate (pine, poplar, cottonwood, juniper, shrub, rocky outcrop, cliff or man-made structure), the nest type (stick, scrape, eyrie), and other general descriptors such as aspect, approximate height, and surrounding terrain.

   Active Nests are defined as those nests which are repaired or tended in the current year by a pair of raptors. Presence of raptors (adults, eggs, or young), evidence of nest repair or nest marking, freshly molted feathers or plucked down, or current year's mute remains (whitewash) suggest site occupancy. Additionally, all nest sites within a nesting territory are deemed occupied while raptors are demonstrating pair bonding activities and developing an affinity for a given area. Once a specific nest is selected for use by a breeding pair, other nests in the nesting territory will no longer be considered occupied for the current breeding season. A nest site remains occupied throughout the periods of initial courtship and pair bonding, egg laying, incubation, brooding, fledging, and post-fledging dependency of the young.

   Inactive Nests are defined as those nests not selected by raptors for use in the current year. Nests would also be considered unoccupied for the non-breeding period of the year. The exact point in time when a nest becomes unoccupied should be determined by a qualified wildlife biologist based upon knowledge that the breeding season has advanced such that nesting is not expected. Inactivity at a nest site or territory does not necessarily indicate permanent abandonment.

Table 1. Raptor Nest Spatial Buffers.

Species	**Spatial Buffer in Non-Urban Areas**
Bald eagle	0.5 to 1.0 mile
Northern goshawk	0.5 mile
Ferruginous hawk	1.0 mile
Golden eagle	0.5 mile
Peregrine falcon	1.0 mile
Red-tailed hawk	0.33 mile
Prairie falcon	0.5 mile
Swainson's hawk	0.25 mile
Burrowing owl	0.25 mile
Great gray owl	0.25 mile
Flammulated owl	0.25 mile

Whittington, D. M. and Allen, G. T. 2008. Draft guidelines for raptor conservation in the western United States. U.S. Fish and Wildlife Service, Region 9. Division of Migratory Bird Management. Washington, D.C.

Sample Data Form

Date: ____________________ Survey Segment: _____ Mileposts Surveyed: ______

Weather (wind intensity, temp, and cloud cover): _____________________________

Observer's Name: _______________________ Observer's Name: __________________________

TIME START:	
TIME END:	

SPECIES	Number of Birds	Age (A/J)	Nest (Active/Inactive)	GPS Location/Waypoint	Site Description

Additional Notes:

APPENDIX B-4

NORTHERN GOSHAWK SURVEY PROTOCOL

APPENDIX B-4

NORTHERN GOSHAWK SURVEY PROTOCOL

Adapted from:

Woodbridge, B.; Hargis, C.D. 2006. Northern goshawk inventory and monitoring technical guide. Gen. Tech. Rep. WO-71. Washington, DC: U.S. Department of Agriculture, Forest Service. 80 p.

Broadcast Acoustical Survey

Acoustical surveys consist of broadcasting taped goshawk calls along transect routes to elicit responses from territorial adult goshawks and their young. This is currently the standard method used by the USDA Forest Service and many others. The efficacy of this method has been evaluated in terms of response rates at known successful nests and recently at territories occupied by non-breeding goshawks.

Protocol

1. **Pre-survey Habitat Suitability Analysis.** A GIS analysis was conducted to identify habitats containing suitable goshawk nesting habitat based on spatial data obtained from the National Land Cover Dataset of 2001 for canopy cover. The following forest attributes will be used to identify nesting habitat: 1) canopy coverage of 40 percent or greater, and 2) a patch size of 8 hectares or greater. Because of the age of the NLCD canopy cover, NAIP imagery was used to make any modifications to reflect recent landscape changes.

2. **Establishment of survey area and call stations.** The survey area will include the transmission line corridor (500ft), new roads and existing roads requiring reconstruction, and other project features (laydown yards, pulling stations, etc.), plus an additional 0.5 mile beyond these features. Aerial photographs and topographic maps are used to determine placement of calling stations. A transect grid, as described by Woodbridge and Hargis, was overlaid over initial forested habitat. Using the above criteria to identify potential habitat, the final suitable habitat layer was developed and used to define the survey area. Call stations are located in and cover all suitable habitat within the survey area. Adjustments to calling station placement were reviewed while conducting the detailed habitat mapping to determine survey area, and efforts to optimize survey effort and cost, and to minimize surveyor exposure to hazards associated with walking transects in forested habitat, as well as potential access issues were taken into account. Within the survey area, roads and trails are common and provide access to a majority of the suitable habitat. Detailed maps of survey routes and station locations will be provided to survey crews.

3. **Timing of surveys.** Surveys should be conducted during the nestling and fledgling stages, including early postfledging dependency: June 1 to August 15 over much of the range of the northern goshawk. After August 15, many fledgling goshawks will have moved out of the immediate vicinity of the nest stand, making location of the actual nest

more difficult. Surveys may begin half an hour before sunrise and should cease half an hour before sunset.

4. **Calling procedure.** At each calling station, the surveyor will broadcast calls for 10 seconds, then listen and watch for 30 seconds. During the nestling stage, surveyors will broadcast the adult alarm call. During the late nestling and fledgling stages, the juvenile begging or wail call will be used. The call sequence will be repeated twice, each time rotating 120 degrees from the last broadcast. After the last sequence, surveyors will walk to the next station or back to their vehicle at an easy pace, listening and watching carefully for goshawk calls and signs. While calling stations are placed near roads and trails, surveyors should walk a reasonable distance (i.e. 100m) into forested habitat away from the road to perform broadcast calls. Surveyors should also walk to adjacent call stations that are within reasonable proximity to avoid driving whenever possible. Use of two observers will likely enhance the probability of visual detections of goshawks and is required by the field safety plan. To avoid misidentifying broadcasts of coworkers, simultaneous surveys should be spaced apart by approximately 0.5 miles.

   Weather conditions will be recorded at the beginning of the survey. Surveys will not be conducted under conditions such as high winds (greater than 15 mph) or rain that could reduce ability to detect goshawk responses (see datasheet, page 6).

   Detection type, compass bearing, station number, and distance from station of any responses will be recorded. Surveyors will attempt to locate the goshawk visually and determine the sex and age (adult versus juvenile/fledgling) of the responding individual. All data will be entered on a field data form and into an agency approved standardized database within a field GPS device.

5. **Equipment.** Effective coverage of a survey area depends on the surveyor’s ability to broadcast sound that can be detected at least 200 m from the source. Equipment producing at least 80 to 110 dB output at 1 m from the source should be used. MP3 players are used to store and play the goshawk calls. The call will be transmitted over a megaphone or digital amplifier/speaker setup that can be easily carried in the field.

6. **Preparation for survey.** Surveyors must be familiar with the appearance, typical flight patterns and vocalizations of goshawks and similar species before conducting surveys. Recent field guides should be consulted to review the field marks of male, female, and juvenile goshawks, as well as those of Cooper’s hawks and red-tailed hawks.

   Identification of goshawk nests, plucking posts, feathers, whitewash patterns, and typical prey remains are important aspects of survey preparation. The USDA Forest Service guide, *Feathers of Western Forest Raptors and Look-Alikes,* may be useful in identification of feathers collected during surveys. Examples of high-quality recordings of goshawks and sound-a-likes are available from the Cornell Laboratory of Ornithology program, *Birds in Forested Landscapes,* and from the USDA Forest Service recording, *Voices of Western Forest Raptors*

   Field experience is important in learning to distinguish the vocalizations of goshawks from those of mimics such as gray jays and Steller’s jays. These species are capable of producing excellent imitations of goshawk calls, particularly the female wail and juvenile begging call, and often respond to broadcast calls. Pileated woodpeckers, northern flickers, sapsuckers, and Cooper’s hawks also have calls similar to those of goshawks.

7. **Interpretation of goshawk responses.** Surveyors must be aware of different types of responses likely to be encountered during surveys. Responses are classified into three categories: vocal non-approach, silent approach, and vocal approach. The frequency of each response type varies between sexes, ages, nesting stage, and vocalization broadcasted.

    - Vocal non-approach—goshawks may respond by perching away from the surveyor, often at the nest, and vocalizing. This response is commonly elicited from older nestlings and juveniles as begging calls, in response to broadcast of either alarm or food-begging calls.

    - Silent approach—goshawks, particularly adult males, will frequently fly silently in the direction of the surveyor to investigate and may be visible only briefly. Silent approach by female goshawks during the nestling and fledgling stages typically indicates an active nest within 200 m, but male responses may be long distances from the nest. Failure to detect this common response is a likely cause of false negative survey results.

    - Vocal approach—commonly in response to broadcast of alarm calls, adult female goshawks (and, less often, males) frequently fly toward the surveyor while vocalizing alarm calls. This response typically indicates the active nest is within 200 m, particularly if the adult goshawk remains in the vicinity of the surveyor.

8. **Locating active nests.** Searches for active nests may be conducted immediately following goshawk detections (particularly vocal approaches or attacks); however, it is often necessary to review the results from multiple surveys and stations from a larger area to approximate the likely nest location. Response type, distance, and direction from transect, and distribution of habitat will be plotted on aerial photographs, and the Intensive Search Survey method will be employed.

APPENDIX B-5

GREAT GRAY OWL SURVEY PROTOCOL

APPENDIX B-5

GREAT GRAY OWL SURVEY PROTOCOL

Adapted from:

Quintana-Coyer et al. 2004. Survey Protocol for the Great Gray Owl Within the Range of the Northwest Forest Plan. USDA Forest Service and USDI Bureau of Land Management. Version 3.0, January 12, 2004.

Broadcast Acoustical Survey

Acoustical surveys consist of broadcasting taped great gray owl calls at calling stations to elicit responses from territorial adult great gray owls and their young. This is currently the standard method used by the USDA Forest Service and many others.

Survey Period

March 15 - May 15 (approximately the incubation and brooding periods)
May 15 – July 15 (approximately the late nestling and fledging periods)

Survey Methods

The following are options for conducting Great Gray Owl surveys:

a. *Nighttime Survey Using Roads*: Survey areas that have accessible roads for establishing stations from which to call should be called at night.

b. *Nighttime Survey Using Trails or Easily Traversed Landscape*: In habitat without roads, nighttime calling stations will only be established in survey areas that can be traversed safely. Calling stations may be established on well-maintained trails where there is little danger to a caller equipped with only a flashlight or headlamp.

c. *Daytime Surveys Using Roads and Trails*: Survey areas that cannot be effectively and safely surveyed from the roads or trails at night will be surveyed during the daytime. Midday surveys should be avoided in favor of evening or early-morning surveys.

Great Gray Owls may not call or respond to calls during the day, so calling may be ineffective. Be cognizant of stick nests, broken-topped snags, mistletoe brooms, whitewash, owl feathers, pellets, movements by birds, and mobbing behavior by Common Ravens, crows, jays, and small birds. These signs may help in visually locating Great Gray Owls or their nests.

Calls used primarily to meet protocol:

- Male territorial call (Early Season/Late Season)
- Female begging/contact call (Early Season/Late Season)
- Juvenile begging call (Late Season)

Additional, sometimes useful calls:

- Female w/nest chatter (Late Season)
- Adult agitated call

Conducting Surveys

March 15-May 15 (Early Season)

1. After arriving at the call station, the surveyor should listen silently for one minute before playing the CD call track (silently means focus time, not eating, moving around or gathering gear). Track #1 on the CD issued with this protocol should be used.
2. If there is a night response, triangulate the location, move a sufficient distance to avoid disturbing the owls, and re-start the survey in an area out of earshot of the owls. If the response is in the day, immediately try to find the bird/nest and continue surveys when you are done with the follow up survey.
3. Continue to the remaining stations until the visit is complete.

May 15-July 15 (Late Season)

1. After arriving at the call station, the surveyor should listen silently for one minute before playing the CD call track (silently means focus time, not eating, moving around or gathering gear). Track #2 on the CD issued with this protocol should be used.
2. If there is a night response, triangulate the location, skip a sufficient number of stations, and re-start the survey in an area out of earshot of the owls. If the response is in the day, immediately try to find the bird/nest and continue surveys when you are done with the follow up survey.
3. Continue to the remaining stations until the visit is complete or there is a response.

Locating Great Gray Owls After a Response

1. If a response to the calls is detected, estimate the owl's location by getting a compass bearing and estimating the distance from the station to the response. In order to get a better location, use triangulation by taking compass bearings from two to three locations, mark these locations with a GPS point. Make sure the compass bearings are taken as soon as possible after a response.
2. Record the location and compass bearing(s) on a map or aerial photo and the field visit form. Attach a map to the field visit form, and include the compass bearing(s) and estimated distance from the station to the response.
3. Flag and GPS the response location to establish a start point for the follow-up survey.
4. Continue to the next calling station beyond audible distance of the responding owl (two to three stations) and continue surveying the remaining stations.
5. Once occupancy status is determined, calling stations within audible distance (two to three stations) may be dropped on subsequent visits.
6. Conduct a follow-up visit preferably within 48 hours of the response. If the response is during the day, immediately try and find the Great Gray Owl/nest and continue surveys when you are done with the follow-up visit.

7. The night survey visit and follow-up visit will be considered a complete visit. If there is no response during a night visit, it will be considered a complete visit.

Follow-up Visits

The goal of a follow-up visit is to visually confirm or infer the presence of a pair of Great Gray Owls and to locate a nest tree. Use the field form to record results in locating a pair or single owl and the nest tree information.

1. Starting from the station where a response was heard, and using compass bearing(s) obtained when a response was noted, begin a search by moving toward the approximate response location. Once a Great Gray Owl has responded, and after walking into the general area of the response, it is often helpful to softly broadcast a call toward the area from which the observer came, or toward the ground, in order to make the call softer and more diffuse. Midday visits should be avoided in favor of evening or early-morning visits.
2. Do a systematic search, looking for:
   - Live or dead trees with broken tops or mistletoe brooms
   - Abandoned Northern Goshawk, Common Raven, or Red-Tailed Hawk stick nests
   - Whitewash, feathers, and/or pellets around the base of possible nest and/or roost sites (E. Bull, pers. comm. 1995)
   - Movement in the canopy
   - Mobbing behavior by other birds
3. Keep the original location of the owl response in mind, and try to visually locate them. Great Gray Owls tend to fly away from intruders, so search for other visual clues as suggested above. Whitewash and pellets are often found near nest sites, but not actually under the nest until a week before young leave the nest. Whitewash and pellets are generally associated with roost sites. Calling may help to elicit responses from Great Gray Owls, but they may not respond to calls during the day. A technique that may be helpful is to broadcast the call softly and point the speaker downward when calling to avoid startling the owl as one walks in the direction of the original response.
4. Use the CD call track appropriate for the season of survey.
5. If a Great Gray Owl is not located after two hours of effort, note the negative results on the field form and the visit is complete.
6. If an owl is located, allow up to two hours to establish pair status. Use visual observation to help determine status. Observe and note behavior. Document all behavior noted, for example agitated calls, continuous responses (males often look toward the nest area), movements, roosting, preening or other behavior.
7. Once visual contact is established, evaluate the situation before moving closer. The surveyor may only be able to get within 27 m (90 ft) or so of an adult without causing it to flush. Do not call or stimulate owls any more than is necessary to determine status. By stimulating owls to move around during the day, one may increase their risk of predation. Be cognizant of predators in the area. For example, calling may attract Common Ravens. Great Gray Owl chicks and fledglings are very susceptible to avian and mammalian predation. If predators are attracted, leave the area and try a follow-up at another time.
8. If the owl is located, but is observed roosting/sleeping and there are no signs indicating a pair status within the two-hour follow-up visit, the visit is over.

9. The follow-up survey may take up to four hours: two hours searching for an owl and two hours trying to determine pair status. Additional time may be used, as the time constraints are minimums.

Requirements for All Great Gray Owl Surveying

1. Complete a field visit form for all outings, regardless if an owl was detected or not.
2. Surveyors must be outside their vehicle and use a projection device that can project the call so it can be heard at least 0.16 km (0.10 mi).
3. Do not survey under inclement weather conditions, such as high winds (> 10 mph), moderate to heavy rain or high noise levels (e.g., stream noise, machinery), which would prevent surveyor from hearing a Great Gray Owl response. Additionally, research has shown that owls are not likely to respond to calls during inclement weather.
4. The responsiveness of owls depends on many factors, which may include:
    a. Time of day. Great Gray Owls are more likely to be detected at night, near sunrise, and after sunset. During the middle of the day, they are relatively inactive and less likely to respond.
    b. Temperature. Air temperature will affect an owl's responsiveness. In hot weather, owls may be less likely to respond.
    c. Individual variation. Owls vary greatly in their responsiveness to broadcast calls.
5. Record observations of other species of interest that are detected while surveying for Great Gray Owls.

Determining a Known Site

Known Site Status is determined by any of the following:

- A male and female are heard and/or observed in proximity (<.10 mile) to each other on the same outing during the day
- A male takes prey to a female
- A female is seen on a nest
- A Young Live or dead GGO is observed [and can be determined by the presence of an adult GGO or other means that it is a definite GGO young (yellow eyes, etc)]. Once this is determined, it is considered a "Known Site." Since no additional survey effort is required to locate Great Gray Owls in this area, adjust the area to be surveyed for the remaining visits during a given survey year to complete the survey so you do not pick up this pair again. The only survey effort required after determining pair status is to locate the nest and document in ISMS.

Determining Other Observations Status

Resident Single Status is determined by:

A Great Gray Owl that is not known to be paired with a mate. Singles may establish a territory during a breeding season. A resident single is confirmed by at least two detections made in a two-year timeframe (one each year) or three detections in one year during the breeding season.

It is desirable to conduct additional visits to determine Known Site (pair status) and reproductive success. The sex should be positively identified by call. If the sex of an individual is uncertain, it is considered an “unknown sex Great Gray Owl single.”

Status Unknown (single owl) is determined by:

The response of a male and/or female, which does not meet the pair or resident single requirements.
.

Presence is determined by:

The detection of pellets or feathers that can be identified as being from Great Gray Owl

Field Surveyors should:

- Familiarize themselves with project area boundaries prior to establishing calling stations.
- Be competent in establishing compass bearings, including triangulation.
- Able to use GPS for marking the nest tree location.
- Possess birding skills, such as ability to visually identify all the owl species that occur in their area, know their calls, as well as potential predator species such as the Northern Goshawk, Common Ravens, Red-tailed Hawk, and species that may sound similar to a Great Gray Owl such as Blue Grouse (*Dendragapus obscurus*) and Great Horned Owls.
- Locate, describe, and interpret visual signs of owl nesting, occupancy, and behavior.

APPENDIX B-6

FLAMMULATED OWL SURVEY PROTOCOL

NORTHERN REGION LANDBIRD MONITORING PROGRAM

2008 FLAMMULATED OWL SURVEYS

FINAL REPORT

Photo K. Smucker

December 2008

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A copy of this report, survey protocols, & maps of Flammulated owl occurrence are available online at: http://avianscience.dbs.umt.edu/research_landbird_flam.htm

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INTRODUCTION

Landbird Monitoring Program Overview

In 1994, the Northern Region of the USDA Forest Service (USFS) initiated a region-wide Landbird Monitoring Program (LBMP) so that managers might better understand the habitat relationships of landbirds that breed in the northern Rocky Mountains and, in the future, might be able to assess longer-term landbird population trends. The program was initiated to help the USFS meet its legal mandate (National Forest Management Act of 1976) to monitor populations of "indicator" species as a mechanism to maintain viable populations of native vertebrates. Combining data from multiple Forests permits an assessment of trends and habitat relationships over the larger Region and provides an indication of changes in relation to land management practices.

The Landbird Monitoring Program not only collects habitat data from permanent monitoring points so that correlations with land use and cover type can be determined, but also conducts short-term studies on the effects of specific management practices on selected bird species (see http://avianscience.dbs.umt.edu/research_landbird.htm). In 2008 the LBMP was asked to focus on a single species, Flammulated Owl, and follow up with surveys initiated in 2005. Our goal was to survey more intensively on those forests that we knew (as a result of initial surveys in 2005) had important Flammulated Owl populations and to obtain better location data in order to identify key habitat characteristics associated with owls in this Region.

Flammulated Owl Survey Overview

The Flammulated Owl, *Otus flammeolus*, is considered a sensitive species in USFS Region 1 and a Montana Species of Concern. Prior to 2005, there had never been a systematic survey for this migratory owl in Region 1, and the extent of its distribution was not understood. Because Flammulated Owls do not arrive on their breeding grounds until early to mid-May, they have historically been missed in nocturnal owl surveys. They also seldom vocalize, except at night, and they are rarely seen.

In 2005 the Landbird Monitoring Program initiated the first region-wide survey for Flammulated Owls. We documented owls on nine National Forests within the region, all those except three forests east of the divide: the Lewis & Clark, Gallatin, and Custer National Forests. Overall, five forests appeared to have important populations of Flammulated Owls: Nez Perce, Bitterroot, Lolo, Kootenai, and Helena.

The primary purpose of the 2008 survey effort was to re-visit those forests within Region 1 that support Flammulated Owl populations and gain a better understanding of habitat relationships. Our main goals were to:

- Document Flammulated Owl distribution in Region 1 via broadcast surveys and establish presence/non-detection.
- Locate owl territories and obtain spatial data for habitat modeling to assess specific habitat needs and determine how Flammulated Owls may be affected by land use practices, particularly thinning or logging projects.
- Continue a portion of survey routes previously established in 2005 and examine owl persistence over time.

FLAMMULATED OWL DISTRIBUTION AND HABITAT ASSOCIATIONS

Detailed compilations of Flammulated Owl distribution and ecology for this region can be found at the MT Fish Wildlife and Parks Animal Guide web site (http://fwp.mt.gov/fieldguide/detail_ABNSB01020.aspx). The Birds of North America Species Account for the Flammulated Owl also provides a detailed resource (McCallum 1994b). Finally, for an assessment of Flammulated Owls within Region 1 see http://www.fs.fed.us/r1/cohesive_strategy/integration/wildlife/R1_Flam_assessment.htm

DISTRIBUTION

During the breeding season (May-August), Flammulated Owls have been found from southern British Columbia to Oaxaca in southern Mexico (McCallum 1994). They occupy suitable habitat (see below) throughout northern Idaho and western Montana. Montana Bird Distribution notes a few confirmed Flammulated Owls near Missoula, Helena, and Bozeman (Lenard et al. 2003). Our 2005 survey efforts yielded 243 detections and revealed Flammulated Owls to be widely distributed across western Montana and north-central Idaho. The map of occurrence records below (Figure 1) is generated from our first region-wide survey efforts in 2005.

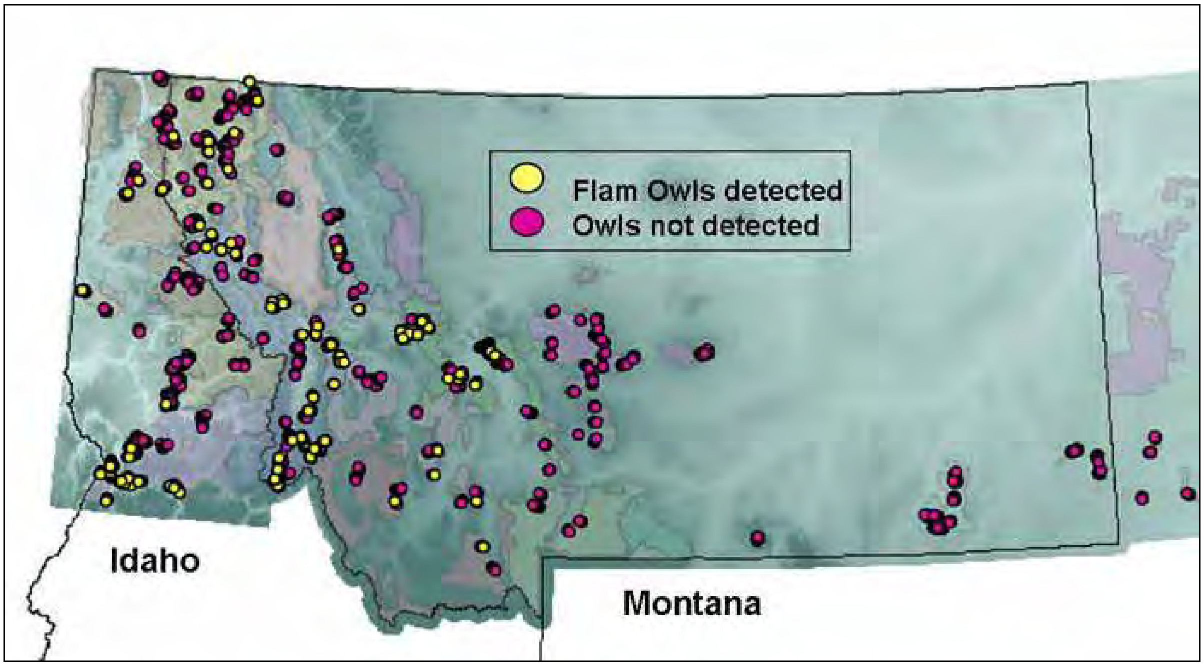


Figure 1. Region-wide map of Flammulated Owls detected/not detected May-July, 2005

In the past 15 years, there have been localized surveys for Flammulated Owls in North Idaho and Montana west of the divide. The Bitterroot, Clearwater, Kootenai, Lolo and Nez Perce National Forests have all engaged in some survey effort. Additionally, for her Master's research, Vita Wright surveyed for owls in 1994 and 1995 primarily on the Bitterroot NF (and small portions of the Lolo and Beaverhead-Deerlodge forests). Although a smattering of occurrence records exist, National Forests east of the Divide had no systematic surveys for Flammulated Owls prior to 2005. As a result of our 2005 surveys, it appears that these owls are either absent from the Lewis & Clark and Custer National Forests, or that populations are not large enough to warrant management actions. On the Gallatin NF a few areas within potential Flam habitat were inaccessible in 2005 and may be worth visiting in future years. The fact that the first Flam nest in Montana was not found until 1986 (Holt et al. 1987) is also a testament to how little historical knowledge exists regarding Flammulated Owls in this Region.

General Habitat Associations

Flammulated Owls in the Northern Rockies of the western US and Canada have been found primarily in low to mid-elevation montane forests with low to moderate canopy closure, a large tree component, and snags (McCallum 1994b) – structural characteristics associated with older forests. Although older Ponderosa Pine forests and shade intolerant Ponderosa Pine/Douglas Fir forests appear to be favored (Linkhart and Reynolds 1997), they have also been found breeding in older Douglas Fir forest types and, to lesser degree and locally, in grand fir, western larch, spruce/fir and lodgepole pine dominated habitats. Mature quaking aspen stands have also been known to harbor breeding owls (McCallum 1994b. Marti 1997), though these habitats have rarely, if ever, been surveyed in this Region.

Flammulated Owls are found where there is an abundance of nocturnal arthropod prey, specifically noctuids, which are large, cold-hardy nocturnal moths that appear more abundant in spring and summer than other arthropods (McCallum1994a). There is also evidence that these moths are more abundant in ponderosa pine/Douglas fir forests than in other western conifer forest types (Reynolds and Linkhart 1987).

Flammulated Owls require large snags with cavities (commonly Pileated Woodpecker, Northern Flicker, or sapsucker holes) for nesting, although they have been known to use nest boxes. They appear to require relatively open areas, or patches of openings for foraging, in combination with dense patches of usually younger trees or dense foliage (e.g., mistletoe) for roosting. Optimal areas may be the transition between mesic and xeric sites where large snags are found near stands of Douglas-fir regeneration and small grassy openings. Wright (1996) found that Flammulated Owls in western Montana avoided mesic old growth ponderosa pine or ponderosa pine/Douglas fir stands (i.e., those with a *Vaccinium* understory), and that landscape level habitat features influenced Flam presence (e.g., occurring in areas with a higher proportion of low/moderate canopy cover assessed at a landscape scale). A habitat modeling study in the Kamloops area of British Columbia in Douglas-fir/ponderosa pine forest type found three variables to be significant predictors for owl occupation: elevation (between 850 and 1,150 meters), age class (older stands), and canopy closure (40 to 50 percent; Christie and van Woudenberg 1997).

METHODS

There were 2 main components to the season's efforts.

- Use maps to determine survey areas, set up survey routes and schedules, and record directions to sites.
- Conduct nocturnal broadcast surveys for Flammulated Owls.

DETERMINING FLAMMULATED OWL SURVEY AREAS

Our primary site selection strategy was to start with the best available vegetation data, consistent across the west-side forests, and from this use a GIS procedure to hone in on areas of potential Flammulated Owl habitat. Although sites needed to be accessible for safety and efficiency, we did not restrict sites to road or trailside stands. Thus, we utilized what is known from previous Flammulated Owl studies in this region, and strove to use a uniform methodology and site selection procedure across the six forests of interest: the Bitterroot, Helena, Kootenai, Lolo, Idaho Panhandle, and Nez Perce National Forests.

For the west-side forests, we relied on R1VMP (2004). As these vegetation layers do not extend east of the divide, we used a different site selection process on the Helena National Forest (see below). We combined the R1VMP layers and pooled stands that met the following three criteria:

- **Tree dominance type**. Primarily shade intolerant mixed conifer (code 8200) but also included a small number of ponderosa pine (*Pinus ponderosa,* code 8010), grand fir (*Abies grandis,* code 8030) and western larch (*Larix occidentalis,* code *8040*) stands;
- **Tree canopy cover class**. Low (10-24%) or moderate (25-59%) cover; and
- **Tree diameter class**. Large (15-19.9" dbh) or very large (> 20" dbh).

These procedures yielded a refined area of potential Flammulated Owl habitat. Because potential habitat was typically small in size and patchily distributed across the region, we used "neighborhood statistics" to identify areas with a minimum habitat density. This approach allowed us to focus survey effort on areas with relatively high quantities of potential habitat. We then "clipped" to the spatial extent of individual forest boundary, overlaid the most recent road and trail layers from that forest for reference, and randomly ranked the stands. We discarded from the dataset any stands that were inaccessible. There was no hard rule for defining "inaccessible," rather we assessed travel conditions from the GIS road layer, forest travel maps, and the relevant 2005 NAIP imagery.

We created aerial view maps for each potential site. As we created the maps we assessed the overall nature of the site, and dropped sites that although classified in R1VMP as appropriate, did not appear to have sufficient "suitable Flammulated Owl" habitat. Suitable habitat was broadly defined, but if the selected stand was small and if the surrounding area consisted of visibly poor habitat (e.g., very dense forest, heavily logged or regeneration forests), these were dropped from consideration.

On the Nez Perce National Forest, Alan Dolman and Joanne Bonn obtained our suggested survey locations and created preferred sites based on their understanding of the biological and forest conditions.

For the Helena National Forest (HNF), we used the recently completed (spring 2008) USFS Flammulated Owl habitat model to select sampling locations. This model was developed based on the parameters described in Samson (2006) and applied to the Forest Inventory and Analysis (FIA) dataset. We used this model to locate potential habitat because RIVMP layers does not encompass the HNF and because sampling within areas of habitat selected using this model allows us to validate the model for accuracy. Areas of habitat selected using this model will allow us to validate the model for accuracy. We used the same neighborhood statistics procedure described above to identify areas with relatively high quantities of potential habitat, randomly select stands for survey, and discarded inaccessible stands.

Each selected stand was given a unique number, randomly ranked, and technicians were instructed to use the location of the selected stand as an approximate start point. The protocol for setting up and marking survey routes is described in detail below. Finally, if a selected stand fell in the vicinity of routes from the 2005 LBMP Flammulated Owl surveys, we repeated the previously established point locations.

GENERAL FIELD PROCEDURES

The logistics associated with this field effort were not a trivial concern. Nocturnal surveys add a particular challenge not associated with most field work. We held a four-day training at the Sula bunkhouse, Bitterroot National Forest. We reviewed and tested protocols and completed first aid and defensive driving courses. Safety related to working at night was strongly emphasized (e.g., necessary equipment, working in pairs, scheduled daily radio check-ins, bears, mountain lions, and night driving).

We relied on two paid, seasonal technicians for each National Forest. In most cases, technicians were employed by the Forest Service, but technicians that worked on the Bitterroot NF were employed by the University of Montana. We employed two technicians per forest in order to address safety concerns associated with nocturnal surveys, especially the added risks of hiking off roads and trails to conduct surveys or track down owl territories.

DETERMINING SURVEY AREAS, SCHEDULES AND DIRECTIONS TO SITES

Field technicians conducted one transect per night, the order of which was determined as instructed below. Technicians created a tentative schedule that spread surveys geographically in order to avoid relegating any one district to late-season (when detection rates may diminish). While each selected stand and corresponding survey area was randomly ranked, a truly random schedule, in which the technicians surveyed routes in order of rank, would have been logistically inefficient. Instead, geographically close surveys were lumped such that technicians spent 2-4 days in a region surveying highly ranked routes. Technicians then moved to a new area with the target of completing some surveys in each district before June 15 (~ half way through the season). This year, an added constraint on the survey schedule was that snow remained on the ground at high and even moderate elevation sites until June, and so lower elevation routes were generally surveyed earlier in the season.

Each survey area was given a unique route number and name. Sets of orthophoto maps and Transect Location Forms for each transect were organized in 3-ring binders, along with the

Forest travel maps which provided an overall index of transect locations. For all 2005 survey routes that were repeated, we used the existing route name and number. For new routes, the number began with 8 to designate that it was first surveyed in 2008. The next 1 or 2 digits were meant to represent the official forest number followed by the random survey rank (01- 99). Transect names were simply unique names based on the road or an obvious geographic feature.

ESTABLISHING SURVEY POINTS

Surveyors were instructed to travel to the general survey area and place the first point approximately 200m inside the selected stand: visible on survey maps as shaded polygons superimposed over potential Flammulated Owl habitat. Technicians were told to use these areas to focus the survey effort, but not to be concerned with always placing points within selected stands or surveying every stand.

In general, routes were established along roads and trails as these are most efficient for nocturnal surveys. However technicians were instructed to consider open ridges and other conditions where off-road routes could be safely surveyed. In other situations, roads were used to travel among points, but the actual survey stop was placed away from the road or trail in order to access selected stands or get away from stream noise.

Survey locations (stops) were established every 500 meters as long as habitat remained. Technicians walked or drove, using their GPS unit to determine this distance, marked each stop with the GPS, and recorded the GPS waypoint and location on the data form. If surveyors encountered large areas of non-habitat (clear cuts or very large grassy openings) they were instructed to continue until reentering forested conditions and then resume setting up stops. Transect length varied depending on available habitat and timing – we aimed for at least 8 points and as many as 15, depending on the amount of available habitat and time permitted.

Technicians documented the location of each route by recording directions to the survey start, distances to roads and intersections, and completing the Transect Location Form.

FILLING OUT DATA FORMS

The format and explanations for entering data in the field data forms are provided in the tables below. More information regarding data collection is available in the 2008 Methods Manual (available, along with the data forms, at http://avianscience.dbs.umt.edu/research_landbird_flam.htm)

Table 1. Instructions for recording information on top of the data forms.

VARIABLE	EXPLANATION
OBS	Observer - first 2 initials, write out last name (3 initials on subsequent pages).
FOREST	2-digit code
DATE	Use 1 column for month and 2 for day (year is given); 617 = June 17
SITE #	Record site # from map
TRANSECT NAME	Unique name you give the transect (usually based on road or other geographic feature or as it appears on the Transect Location Form).
05 TRANSECT #	For previously established transects, record the 4 or 5 digit transect # from the transect location form.

Table 2. Instructions for recording information on point location.

VARIABLE	EXPLANATION
WAYPOINT	GPS way point provided from unit (for uploading data from unit)
LATITUDE	In decimal degrees – include here even if you plan to upload info
LONGITUDE	In decimal degrees – include here even if you plan to upload info

GPS COLLECTION AND RECORDING

We obtained accurate GPS data for each point and collected these data in the same format and datum study-wide. We used Garmin eTrex Legend GPS units and recorded the GPS information in latitude/longitude decimal degrees (e.g., 47.26896 -114.58936), datum: WGS 84. We recorded the waypoint number on the data forms – we did not enter the stop point # in the unit. At season end, these waypoints and lat/longs were downloaded and matched with recorded waypoints. We left no permanent markings along the routes.

CONDUCTING NOCTURNAL SURVEYS FOR OWLS WITH BROADCAST CALLERS

Start and finish:

The first owl count of the day began ~15 min after sunset (21:45 – 22:30, Mountain Standard Time (MT), or 20:45 - 21:30 Pacific Standard Time (ID). Thus, counts began just after dark and continued until the requisite stops were completed (8-15, depending on available habitat or surveyor schedule).

Unacceptable field conditions:
Surveys were not conducted when the weather was bad enough to significantly influence the ability to hear owls (e.g., continuous rain or snow; wind that is constant and of enough strength to bend the tops of trees [Beaufort 5]). If confronted with such conditions during the survey, technicians waited up to 2 hours for conditions to improve. If that night's survey was cancelled and schedule permitted, they returned the following day. If conditions remained poor, they moved on to the next scheduled survey. Flammulated owls have been known to NOT respond to callers during inclement weather (V. Wright, pers. comm).

Data collection:
Technicians spent 10 minutes listening and calling for owls: two minutes of silent listening, followed by 1 minute of broadcast calling using FLAM call on Foxpro F48 broadcast caller (15 seconds positioned in each cardinal direction), followed by 3 minutes of post-broadcast listening, 1 minute of broadcast calling, and 3 minutes of listening. Broadcasting was still done even if owls are heard in the first 2 minutes. Surveyors recorded information on when each Flammulated Owl was detected (Table 3). If a survey point was not completed because of some disturbance or weather event, this was noted and the point not counted.

When time and terrain permitted, owl locations were tracked down by technicians. Our goal here was to get close enough to the owl to mark the location it was calling from (its presumed territory) in order to better understand habitat relationships. This was done for owls in which location was not completely known (i.e., they were not right at the calling station) but was not done for owls obviously far away (i.e., in another drainage). These locations were marked with a separate GPS point and notes taken accordingly.

Table 3. Instructions for completing the broadcast calling section of surveys.

VARIABLE	EXPLANATION
STOP	Stop (point) number, should always run from 1 to 15 (or greater)
TIME	Use the 4-digit military time-of-day the count is started; e.g., 2210.
WIND	Use the Beaufort wind scale codes (0-5) as defined in Appendix I.
SKY	Use the codes (0-4) as defined in Appendix I.
TEMP	Use thermometer to record air temperature to the nearest 2 degrees (°F)
NOISE	Use the codes (0-4) defined in Appendix I for description of stream or other CONSTANT noise (and its probable effect on bird detectability).

	Intermittent noise is NOT considered here but should be noted in the comment section.
FLAM 1 N Y	Presence of 1 FLAM – circle No or Yes. If no, DONE. If yes – continue
FLAM 2 N Y	Presences of 2nd FLAM – circle No or Yes. If no, DONE. If yes – cont.
FLAM 3 N Y	Presence of 3rd FLAM – circle No or Yes. If no, DONE. If yes – cont.
B4 call Y N	Was owl detected before the caller (i.e. within first 2 minutes)?
After call 1 Y N	Was FLAM detected after the first round of calling?
After call 2 Y N	Was FLAM detected after the second round of calling?
# MIN	# of minutes from the start that it took to first detect FLAM (if not detected until after caller used, time is at least 2 minutes).
DIRECTION	The approximate compass direction to the detected owl
DISTANCE	The approximate horizontal distance to the owl
TRACKING	Create a new waypoint if the owl was located. Record lat/longs. Draw territory relative to point
INCIDENTALS	Other owl species (or wildlife) detected and any brief info regarding these – though we call them "incidentals" they are important!
COMMENTS	Did you see the owl, find a nest, triangulate to determine distance, etc.

Data entry and season end:
Most technicians completed data entry while still employed by their respective Forests, using the excel entry form provided. One of our technicians, Winslow Hansen, completed the data entry, organized all field and data forms and maps, and checked all data. All technicians completed an exit interview with the ASC.

RESULTS & DISCUSSION

All data files, shapefiles, and reports are available for download at our website: http://avianscience.dbs.umt.edu/research_landbird_flam.htm.

SURVEY EFFORT

Surveys were conducted primarily on five Forests within Region 1 for which the 2005 region-wide surveys documented important populations of Flammulated Owls: the Nez Perce, Bitterroot, Lolo, Helena, and Kootenai National Forests. Technicians from the Kootenai NF also conducted a small number of surveys on the Idaho Panhandle NF as time permitted.

We surveyed for owls from May 15–July 27, with the majority of surveys completed May 15– July 16. Six routes surveyed after July 16 were not included in the analysis due to the concern that owls are less detectable later in the summer. It appears that cold, wet weather reduced our survey efforts on 10 survey nights or about one third of the season (Figure 2).

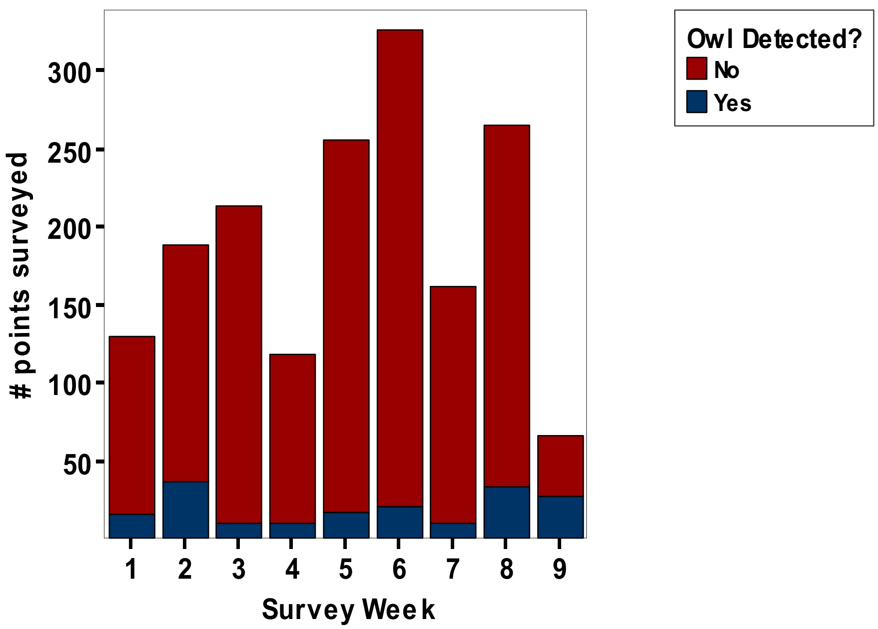


Figure 2: While survey numbers/week were variable throughout the season, it appears that weather events affected the total number of surveys conducted in week 4 and potentially in week 3 (although many technicians appear to have surveyed through the weekend to make up for missed effort in week 3). Lower effort in week 7 is presumably correlated with the 4th of July holiday.

[a] Survey Week 1: 5/15 – 5/ 25; Week 2: 5/26 – 6/1; Week 3: 6/2 – 6/8; Week 4: 6/9 – 6/15; Week 5: 6/16 – 6/22; Week 6: 6/23 – 6/29; Week 7: 6/30 – 7/6; Week 8: 7/7 – 7/13; Week 9: 7/14 – 7/20

Technicians generally set up transects and assessed the area during the day by walking, and surveyed for owls at night by walking or driving (when feasible). Most routes had 10 stops per route (a majority had 4-12 stops; range: 2-21 stops).

We surveyed 109 routes and a total of 1013 points on six forests. A majority of routes were surveyed twice: on 51% of routes, all points were visited twice and on 17% of routes a majority of points were visited twice (Table 4).

Table 4. Number of routes surveyed on 6 National Forests in Region 1 during the 2008 field season. Technicians surveyed all points twice (2 visit routes) on half of the routes (51%) and on an additional 17% of routes a majority of points were surveyed twice (2* visit routes). Approximately one third of routes were visited once (1 visit routes).

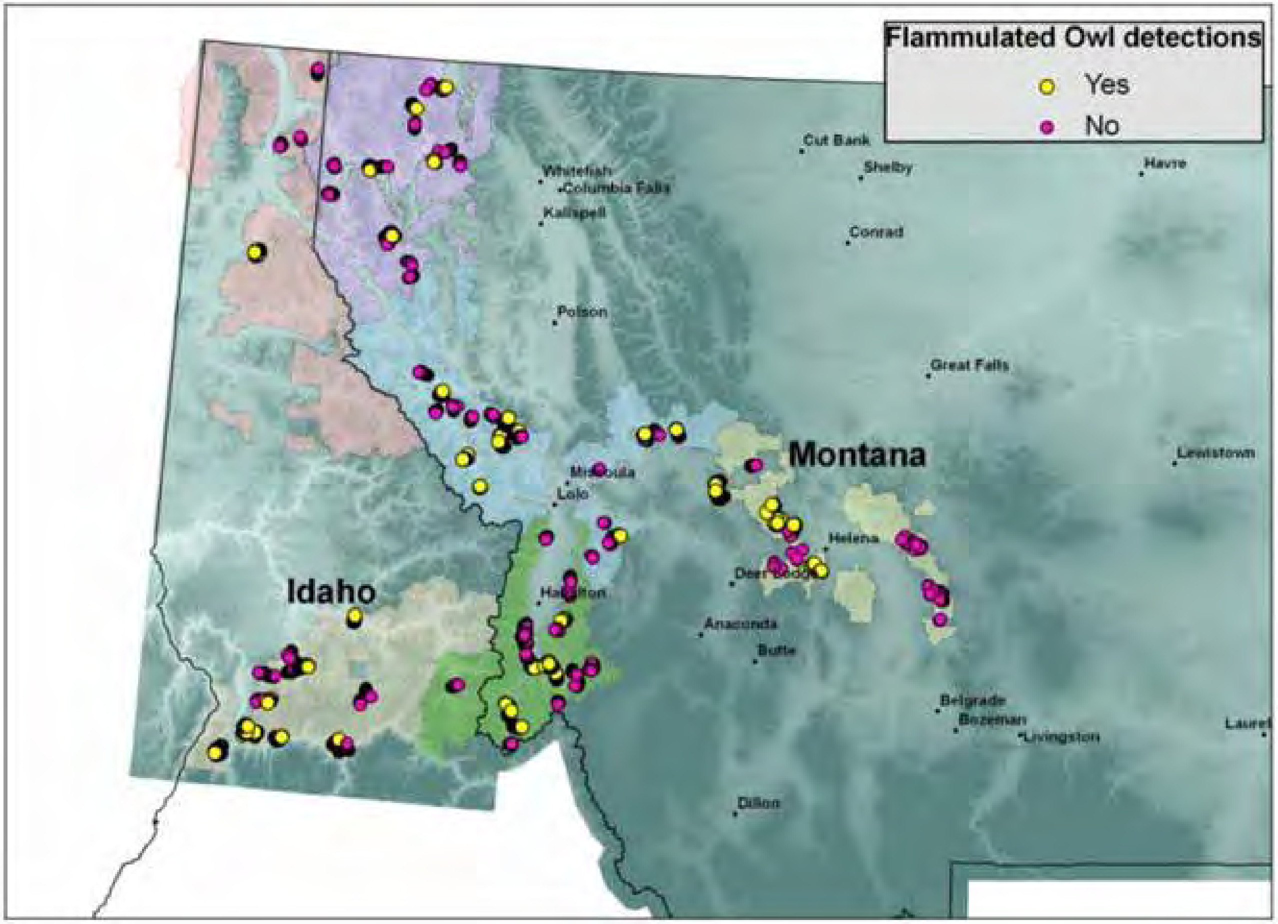
FOREST	TOTAL # ROUTES	# 1 VISIT ROUTES	# 2* VISIT ROUTES [a]	# 2 VISIT ROUTES	TOTAL # PTS
BITTERROOT	24	2	7	15	245
HELENA	19	9	4	6	138
ID PANHANDLE	4	4	0	0	38
KOOTENAI	21	2	2	17	159
LOLO	22	6	3	13	201
NEZ PERCE	19	11	3	5	232
TOTAL	**109**	**34**	**19**	**56**	**1013**

[a] 2* visit routes: Routes in which a majority of points were surveyed twice, but at least some points were only visited once.

FLAMMULATED OWL DETECTIONS

We located owls on all six of the National Forests surveyed and we have created an ArcIMS mapping site in which all survey points are displayed according to whether there was an owl detected or not. See http://avianscience.dbs.umt.edu/arcims_info.htm.

Figure 4. Map depicting each National Forest with positive Flammulated Owl detections in 2008.



We detected Flammulated Owls on a total of 142 points (14%) across 42 routes (Figure 5 and Table 5). This was similar to the results from our 2005 surveys, in which owls were detected at 9% of points region-wide and at 14% of points across the same six forests surveyed in the current year's study. At the route level, we detected an owl at one or more points on 39% of routes. The proportion of routes on which owls were detected varied among forests, and ranged from 53% on the Nez Perce to 25% on the Idaho Panhandle. The forest with the highest detection rate at the route level was different from the forest with the highest detection rate at the point level: on the Kootenai Forest, owls were detected at 19.5% of points while on the Nez Perce owls were detected on 16.4% of points.

Table 5. The proportion of routes and points at which one or more Flammulated Owls were detected. The forest with the highest detection rate at the transect level was not the same as the forest with the highest detection rate at the point level.

FOREST	% ROUTES W/ OWLS	% POINTS W/ OWLS
BITTERROOT	33%	7.8%
HELENA	37%	16.7%
IDAHO PANHANDLE	25%	2.6%
KOOTENAI	29%	***19.5%***
LOLO	45%	14.9%
NEZ PERCE	***53%***	16.4%
TOTAL	**39%**	**14.0%**

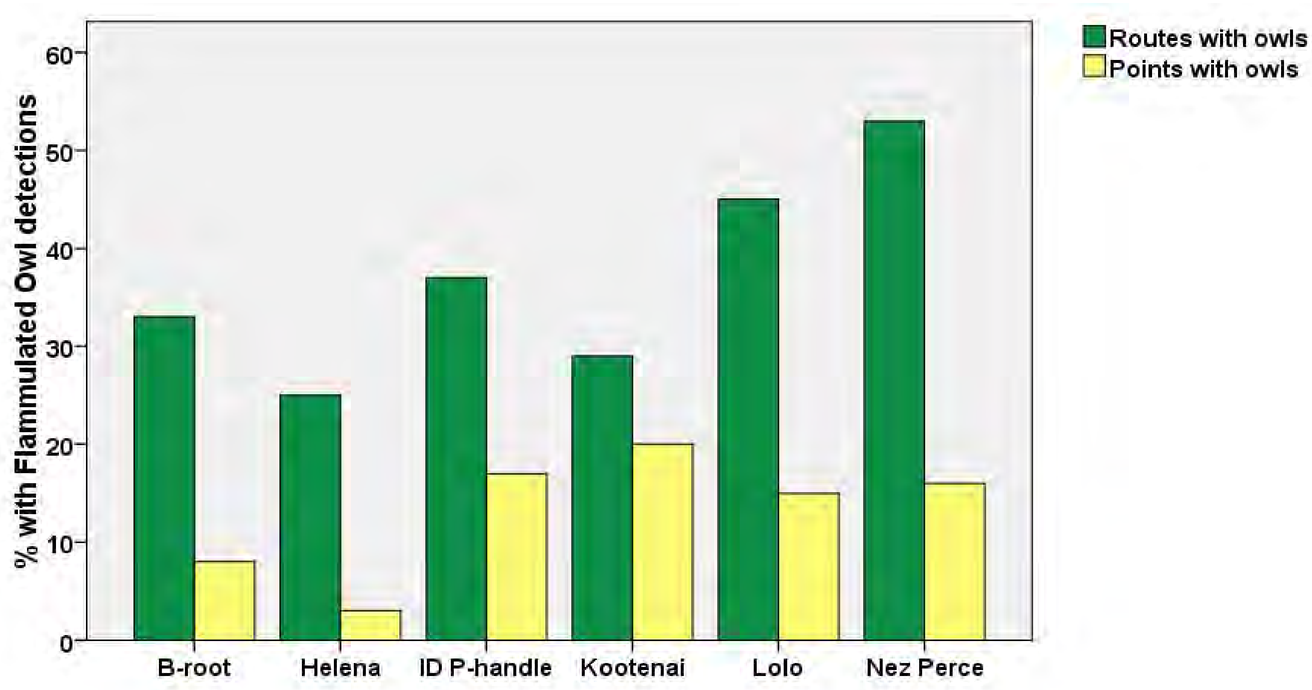


Figure 5. Flammulated Owls were detected on 14% of points overall, but the proportion of points on which owls were detected varied throughout the Region.

On routes with owls, the number of points on which owls were detected ranged from 1-10 (mean = 3.38, SD = 2.61; median = 2.0). Flammulated Owls were detected from May 15 to July 16 and we encountered owls on the same proportion of points during the first and second visits, suggesting that detection rates were fairly constant across the season. Another indication that calling rates were similar across the season is that owls were calling spontaneously (i.e. we detected them prior to the broadcast call) on similar proportions of points surveyed early and late in the season (41% and 36%, respectively).

VARIATION IN DETECTION RATES

Previous studies (Barnes and Belthoff 2008) have shown that the probability of detection for Flammulated Owls varies across the breeding season, with detection rates being quite high and consistent from mid-May through the end of June and declining steadily in July to as little as 15% in mid August. This study supports our decision to end playback surveys for Flammulated Owls in mid July, before detection rates drop precipitously. However, since Barnes and Belthoff (2008) found that the probability of detection begins to drop at the end of June, we wanted to determine whether our data showed a similar pattern. To examine how detection rates in our study might vary across the season we divided surveys into four time periods: late May, early June, late June, and early July. We then compared the proportion of points on which owls were detected in each time period to determine whether detection rates varied across the season (Figure 6).

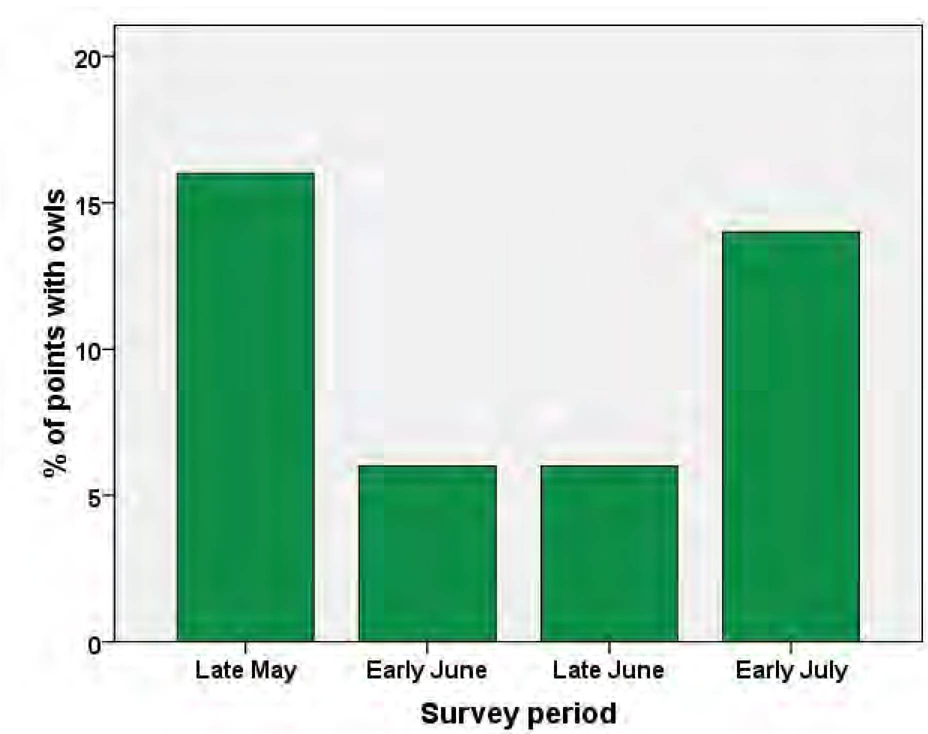


Figure 6. Percentage of points with Flammulated Owl detections by time period.

This revealed significant differences among survey periods in the proportion of points with owls, with detections ranging from 5.74% of points in the first half of June to 16.35% of points in early May. However, these differences in detection rates across the four time periods could be attributed to at least three factors: (1) differences in Flammulated Owl occupancy among routes, (2) differences in weather conditions among time periods, and (3) actual differences in detectability (e.g. calling rate, volume, etc.) among time periods. In an attempt to minimize the first factor we next excluded those transects on which an owl was never detected, and this revealed that detections were fairly consistent across all survey period except early June (Figure 7). Interestingly, we did encounter cold, wet survey conditions in early June, and this may help explain the apparently low detection rates in that survey period.

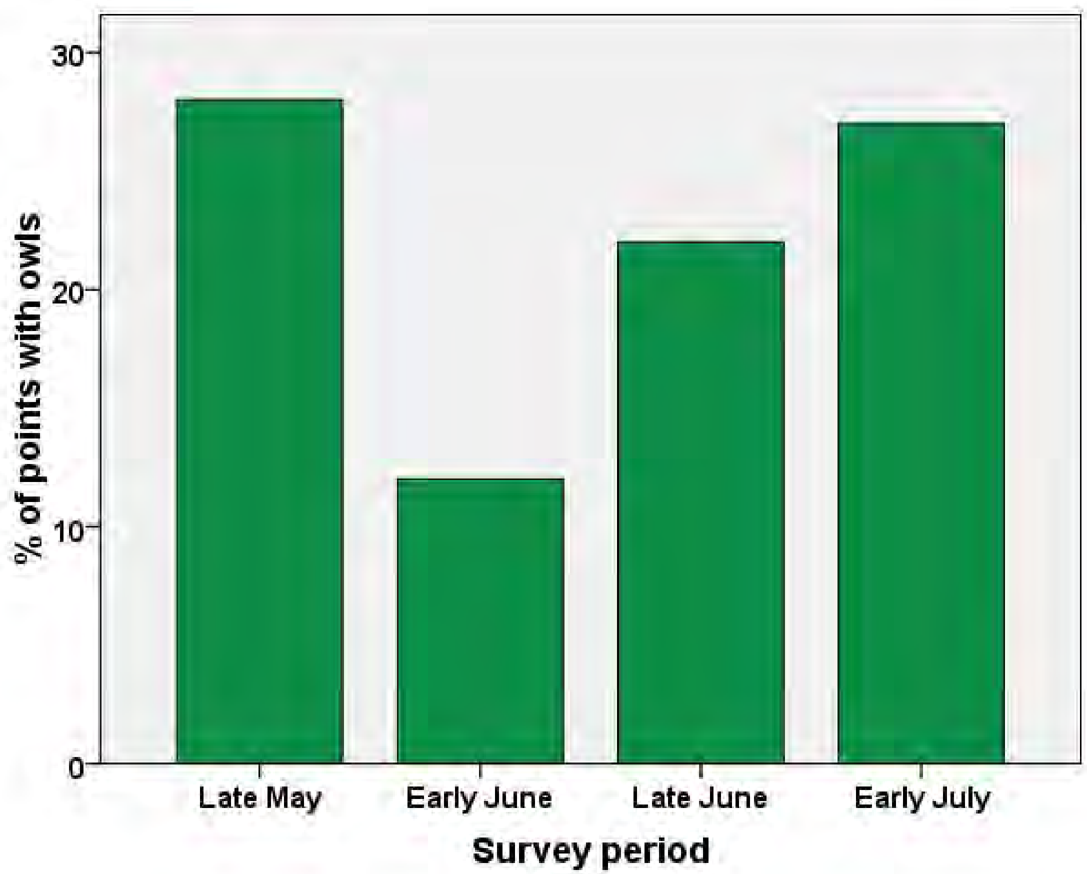


Figure 7. The percentage of points with Flammulated Owl detections by time period, excluding those routes which never produced any Flammulated Owl responses throughout the season.

In the 2005 region-wide surveys, we experimented with 6- and 10-minute count periods. That analysis revealed that 36% of the owls detected during these longer count periods were detected after the second round of broadcast calls, and thus would have been missed by the shorter 6-minute count period. We modified the protocol based on these results and this season all surveys consisted of 10-minute counts. Similar to our findings in 2005, 25% of responses were detected only after the second broadcast call, while 35% of detections were after the first broadcast call. Thus 61% of Flammulated Owl detections were recorded after the silent listening, and the use of broadcast calls clearly improves our ability to detect owls that are present. A recent study of 17 radio-tagged male Flammulated Owls revealed that probability of detecting a response to a broadcast call was 100% from June 1 through July 1, at which point proportion of marked owls that responded decreased (Barnes and Belthoff 2008). This suggests that Flammulated Owls are highly responsive during this phase of the breeding cycle (pair bonding, incubation, and nestling) and lends further evidence that broadcast calls can substantially increase our chances of detecting owls that are present.

PERSISTENCE: A COMPARISON OF 2005 AND 2008 SURVEYS

Approximately 14% of points were previously surveyed in 2005. Due to the fact that we used a different model for selecting survey sites, many routes (n = 43 or 36% of routes) surveyed in 2008 contained points that fell within 1 km of previously surveyed points. We used these routes to take a preliminary look at site fidelity and we examined whether Flammulated Owls were more likely to be detected in a both survey years. A chi-square analysis revealed that significantly fewer owls were detected in only a single survey year ($\chi^2 = 8.628$, $p = 0.035$) and that owls tended to be either absent in both years, or present in both years (Figure 8). Thus while the 2008 survey protocol was not designed to examine site fidelity, an examination of those routes within 1 km of each other suggests that Flammulated Owls are likely to return to the same general areas in subsequent years. If this is an important management question, we should consider selecting a subset of transects to monitor in subsequent years.

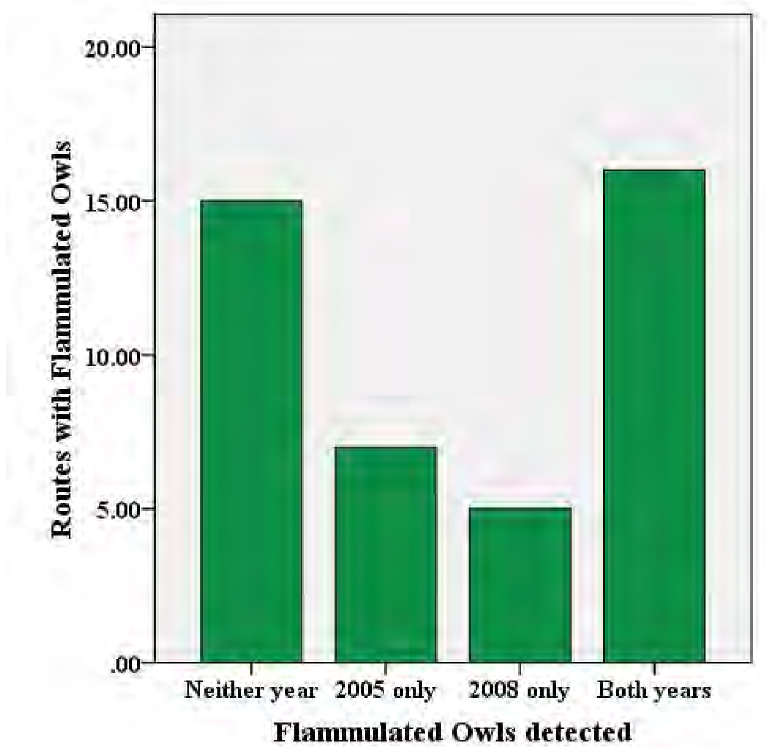


Figure 8. The pattern of Flammulated Owl detections on 43 routes in which a portion of 2005 and 2008 survey points were within 1 km of one another. Owls were more likely to either be absent from these transects in both years or present in both years.

Another difference in the pattern of Flammulated Owl detections between the 2005 and 2008 seasons was in the proportion of occupied points. For example, it appears that Flammulated Owls were detected on a much greater proportion of points on the Kootenai NF in 2008: 19.5% of points as compared to only 7% of points in 2005 (Figure 9). We detected owls on very similar proportions of points in both years (15-17%) on the Lolo and Helena Forests. The Bitterroot Forest yielded detections on fewer points this year (8%) as compared to 2005 (15%). These differences may be due to the fact that we used different procedures to select areas to survey in 2008 than in 2005. Further analysis will be needed to determine whether differences in occupancy among years are due to fluctuations in owl populations among years or to differences in the performance of site selection procedures.

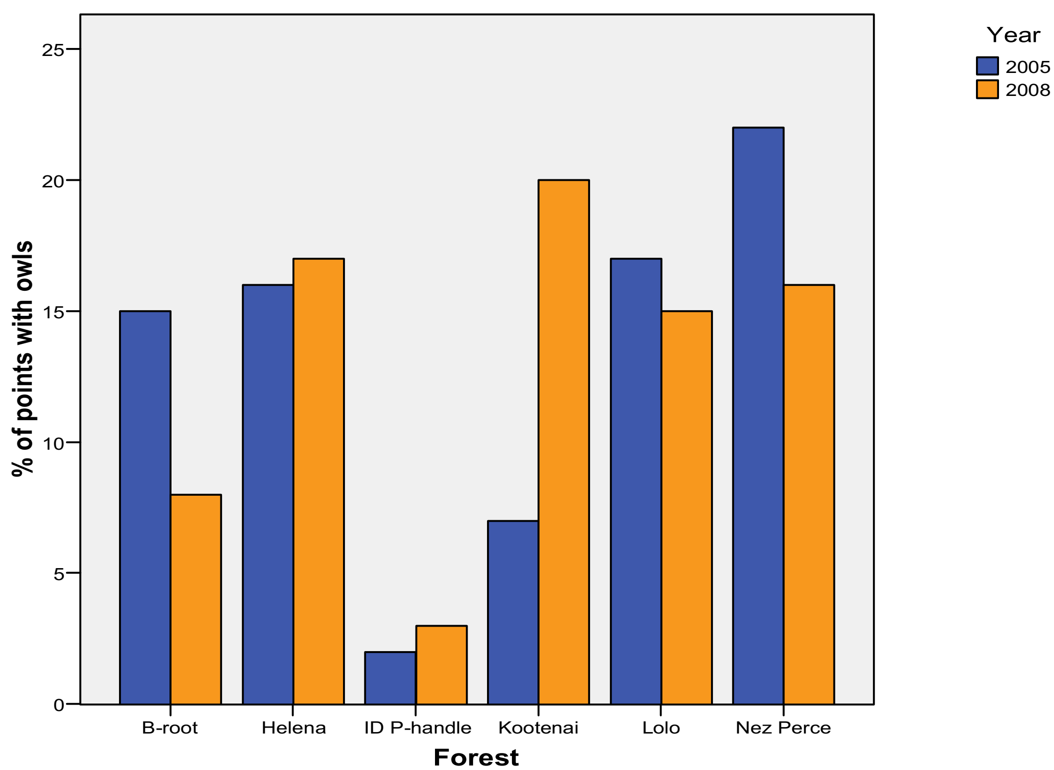


Figure 9. The percentage of points on which Flammulated Owls were detected in both 2005 and 2008 shown here by forest. Only the forests in which we repeated surveys in 2008 are represented.

OTHER OWLS:
Throughout the survey period, technicians also detected non-target owl species (see Table 6); some individuals vocalized spontaneously while others appeared to respond to the Flammulated Owl broadcast caller. Records for these incidental owls are included in the database available at http://avianscience.dbs.umt.edu/research_landbird_flam.htm.

Table 6. Owl species incidentally detected during the 2008 surveys and the number of detections recorded.

OWL SPECIES	DETECTIONS	OWL SPECIES	DETECTIONS
Great-Horned Owl	24	Western Screech-Owl	6
Barred Owl	16	Great Gray Owl	0
Northern Saw-whet Owl	8	Long-eared Owl	0
Northern Pygmy-Owl	2	Short-eared Owl	0
Boreal Owl	0		

CONCLUSIONS AND RECOMMENDATIONS

Design and Protocol: After two field seasons we have now developed and refined a very effective survey protocol for Flammulated Owls. In particular we recommend continuing the surveys in the manner as we did in both 2005 and 2008, surveying every 500m in appropriate habitat. We recommend surveying each site twice in order to help refine our detection probabilities, understand how they may vary geographically and temporally, and improve confidence in our occupancy rate estimates. Preliminary analyses suggest that detection rates are fairly constant across the survey period (late May through mid-July), but our own experience and other studies suggest that response rates decrease rapidly in late July and August. We therefore recommend that all surveys be completed by the middle of July. The methods manual and data forms are available on our web site at http://avianscience.dbs.umt.edu/research_landbird_flam.htm).

Tracking Owls: One goal for this field season was to have technicians track down Flammulated Owls that responded to the playback in order to obtain more precise location data to use for habitat modeling. To accomplish this, technicians worked in pairs and attempted to approach the responding owl, and this usually involved hiking off roads and trails. While we are confident that these tracked owl locations provide more precise location data than simply using the point location and the estimated distance and bearing to the responding owl, tracking owls down also yielded uncertainty. First, technicians often reported confusion over whether the responding owl was moving, either closer or further away in response to the continuation of broadcast calling and tracking. Second, tracking owls down was not always productive: technicians were only able to track down 49 out of 222 owls detected. The main reasons owls could not be located were: owls often stopped calling before they could be located or technicians realized they were too far away to be tracked down efficiently. Thus while tracking owls down was useful this extra effort was time consuming and often unsuccessful and we therefore recommend carefully considering the added value of these more precise location data before repeating this effort in future studies.

Long-term Monitoring: After two years of survey efforts we have established nearly 200 routes for Flammulated Owls across Region 1. However, since revisiting previously surveyed routes to examine owl persistence over time was a secondary goal, only a small number of these transects (n = 22) were visited in both years. If an important goal is to look at site fidelity across years, then we recommend selecting a subset of transects to be revisited in future years. We have had great success using citizen scientists to monitor a small number of transects near urban areas (e.g. Missoula, Helena, and the Bitterroot Valley) and this program could be expanded elsewhere in the region to track Flammulated Owl occupancy over time.

Future Analyses: Due to the combination of staff changes at the Avian Science Center and limited funds available for analysis this report contains primarily summary information. However, all data files associated with these surveys, and in particular a file in which all detections of Flammulated Owls from 2005, 2008, and two years of Citizen Monitoring efforts are available for continued analysis. In particular we hope that these data will be used to refine habitat modeling efforts for Flammulated Owls in Region 1.

ACKNOWLEDGEMENTS

The Avian Science Center would like to thank all the intrepid, nocturnal owl technicians. Additionally, many R1 biologists helped with field work or supervision. Forest GIS specialists and biologists generously supplied the necessary GIS layers. We thank Anna Noson of the ASC for help with GIS modeling, Beth Hahn and Skip Kowalski for funding and general support.

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Appendix

CODES

WIND CODES (Beaufort Wind Scale):
0 -- < 1 mph; smoke rises vertically
1 -- 1-3 mph; wind direction shown by smoke drift
2 -- 4-7 mph; wind felt on face; leaves rustle at times
3 -- 8-12 mph; leaves and small twigs in constant motion; light flag extended
4 -- 13-18 mph; raises dust and loose paper; small branches in motion
5 -- 19-24 mph; small trees sway; crested wavelets on inland waters

SKY CODES (Sky Condition): you probably shouldn't be surveying with a 4!
0 – clear or few clouds
1 – partly to all cloudy
2 – light drizzle
3 – constant snow
4 – constant rain

NOISE CODES (for constant noise, not intermittent):
0 – no noise
1 – some noise but can hear well
2 – hearing noticeably impaired
3 – cannot hear beyond immediate area; difficult to hear anything at all

APPENDIX B-7

THREE-TOED WOODPECKER SURVEY PROTOCOL

USDA

United States
Department
of Agriculture

Forest Service

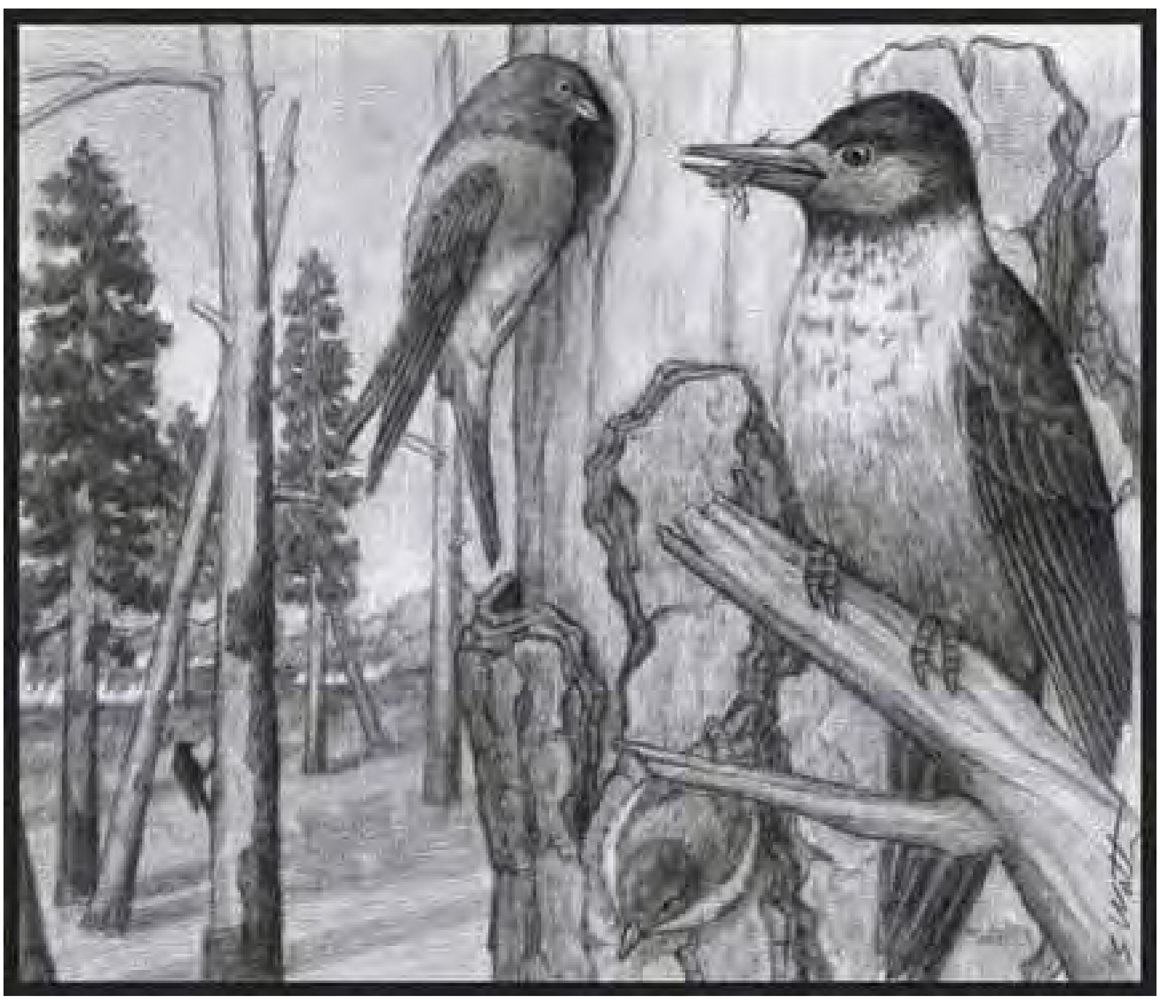
Rocky Mountain
Research Station

Research Paper
RMRS-RP-44

December 2003

A Field Protocol to Monitor Cavity-Nesting Birds

Jonathan Dudley and Victoria Saab



Dudley, J. and Saab, V. 2003. **A field protocol to monitor cavity-nesting birds.** Res. Pap. RMRS-RP-44. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 16 p.

Abstract

We developed a field protocol to monitor populations of cavity-nesting birds in burned and unburned coniferous forests of western North America. Standardized field methods are described for implementing long-term monitoring strategies and for conducting field research to evaluate the effects of habitat change on cavity-nesting birds. Key references (but not methodologies) for statistical analyses and habitat measurements are listed in our protocol. The protocol includes sections on study design, creation of field maps, conducting nest surveys, locating nest cavities by search image and bird behavior, recording data, nest monitoring, and data management.

Keywords: cavity-nesting birds, field protocol, nest survey, nest monitoring, burned and unburned coniferous forests, long-term monitoring strategies

The Authors

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cover artwork by Shelley Watters

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Contents

Introduction

Many cavity-nesting birds depend on fire-prone landscapes for dispersal, movements, and other portions of their life history (Saab and Dudley 1998). Woodpeckers, in particular, are designated as sensitive species by federal and state agencies because they are responsive to fire and timber management activities. Recent wildfires and subsequent post-fire salvage logging have heightened concern about cavity-nesting birds (Dixon and Saab 2000, Kotliar et al. 2002, Saab et al. 2002). For these reasons, we began long-term studies in 1994 to address the effects of different fire conditions on populations and habitats of cavity-nesting birds in ponderosa pine (*Pinus ponderosa*) and mixed-coniferous forests in western North America (Saab and Dudley 1998, and see http://www.rmrs.nau.edu/birdsnburns/). Our purposes here are twofold: 1) provide field instructions for surveying and monitoring cavity-nesting birds during the breeding season; and 2) assist in developing long-term monitoring strategies for cavity-nesting birds. The guidelines describe standardized methods that can be used to evaluate the effects of habitat change on cavity-nesting birds. The instructions are based primarily on our work in habitats created by stand-replacement fire but apply to studies in unburned forests as well. Statistical methods and habitat measurements are not summarized in this document. Statistical concepts and modeling that can be applied to this work are reviewed in several publications, including these key references: Burnham and Anderson (1998), Thompson et al. (1998), Zar (1998), Morrison et al. (2001), Dinsmore et al. (2002), and Williams et al. (2002).

Study Design and Field Maps

Study units must be large (250-400 ha) to obtain adequate samples of nesting birds for evaluating their responses to habitat change. Units on the smaller end of this range (250-300 ha) can be selected for burned forests where cavity-nesting birds are abundant (Saab and Dudley 1998), whereas larger units (>350 ha) are used for unburned forests where cavity nesters are relatively rare. A minimum of two replicate units is necessary for each treatment and control (e.g., salvage logged and unlogged) for assessing treatment effects.

The *BACI* (*before-after/control-impact*) design is used for impact assessments (Green 1979, Stewart-Oaten et al. 1986, Underwood 1994). Samples are taken before and after a disturbance or treatment, in each of the disturbed (impacted) units and undisturbed (control) units. If a treatment affects a population, it would appear as a statistical interaction between the difference in mean abundance of the sampled populations in the control and impacted units before the treatment and after the disturbance (for more detail on the BACI design see Ch. 5 in Morrison et al. 2001). For example, the *BACI* method can be used in a quasi-experimental design to evaluate the impacts of prescribed fire on cavity-nesting birds. Paired units are selected at random preferably, but in many cases the land manager has pre-selected (non-randomly) the units for treatment. In this case, strive to randomize which units will receive treatment. A unit (~ 250-400 ha) selected for prescribed fire (treated) is called the *impact unit*. A nearby unit that will not receive prescribed fire (untreated) serves as a *control unit*, where the vegetation, topography, and abundance of focal species are similar to the impact unit, and where the control unit is influenced in a similar way by natural disturbance (e.g., weather). These units would constitute one impact-control pair. This basic design would be extended to make inference to a larger group of impact areas by adding additional pairs of impact and control units (replication). The additional pairs need to be in similar areas with respect to the presence and habitat of the response variable of interest (e.g., a target population of cavity-nesting birds).

Once the study units are selected, an efficient tool to create field maps is a Geographic Information System (GIS). Generate a digital map from GIS at a scale of approximately 1:12,000 (figure 1). On the map, include topographic lines, elevations, streams, roads, belt transect lines, and the unit boundary. Establish belt transects that are 1-1.6 km long and positioned 200 m apart from which to survey cavity-nesting birds (see next section below). If you do not have access to GIS, then outline the study units on USGS 7.5 minute topographic maps and enlarge by photocopying. Draw 200 m-wide belt transects onto the topographic maps in a random orientation of north-south or east-west, covering each unit. If topography is steep, then sampling across the topographic gradient is recommended. Within this constraint, random selection of transect direction is encouraged. Letters are assigned to each belt transect to uniquely identify transects within each unit.

Field Personnel and Belt Transects

The required number of field biologists will depend on the size, vegetation structure, topography, and abundance of nesting birds in the sampling unit. For each sampling unit (250-400 ha), one to three full-time field

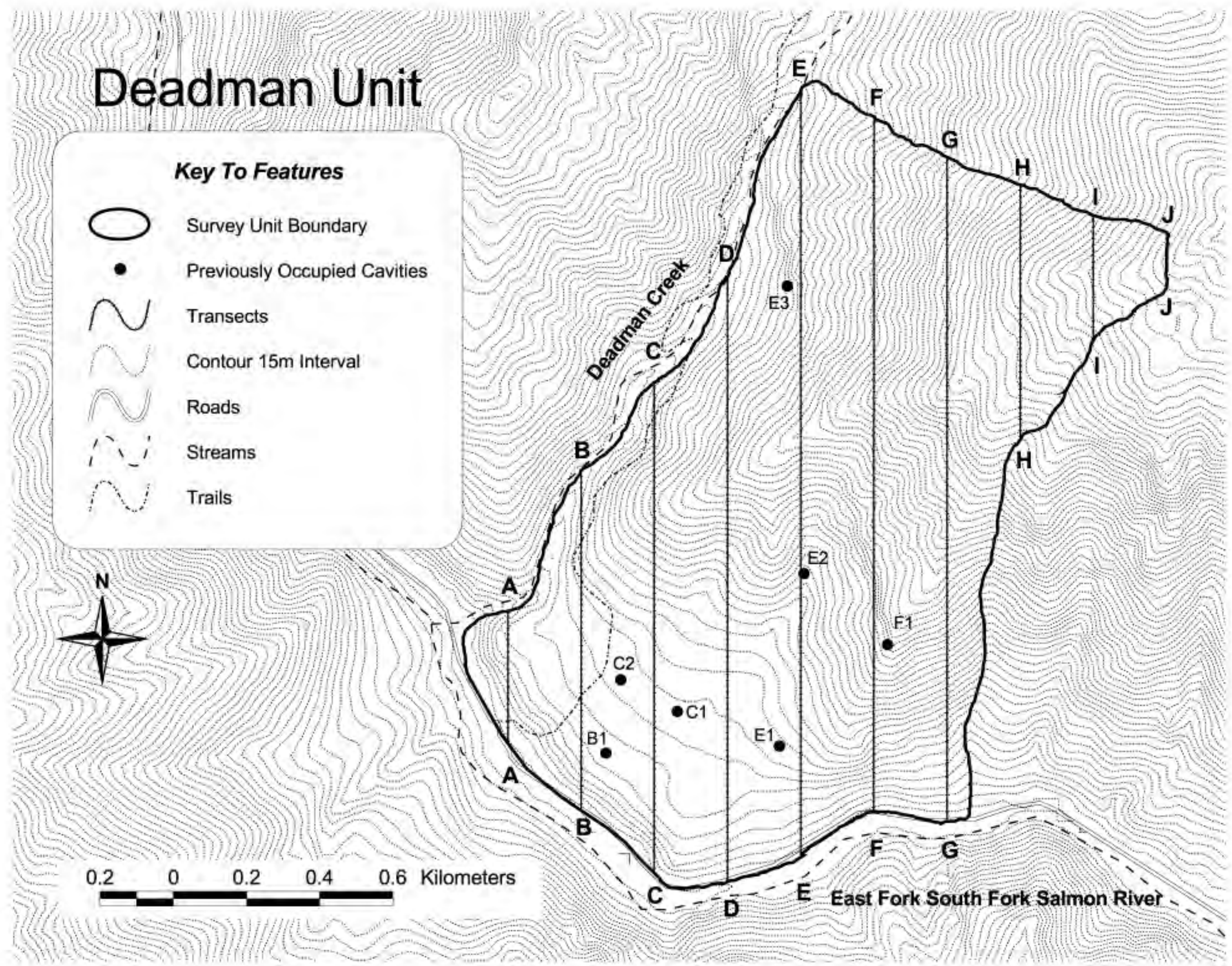

Figure 1. Example of field map generated using GIS

biologists will be sufficient to survey and monitor cavity-nesting birds throughout the breeding season. When possible, change or rotate observers between transects and units to minimize recurring bias in any segment of a survey (British Columbia Ministry of Environment, Lands & Parks 1999).

Field equipment carried by each biologist includes a field map of the unit, compass, Global Positioning System (GPS) unit, field notebook, blank nest cards, previous year's nest cards, flagging, binoculars, clinometer (optional), black permanent marker, pens, and pencils. Because woodpeckers are most active in the morning, nest surveys are conducted from a half hour after sunrise to 1200 each day from mid April to late June. Timing and length of the breeding season is species-specif c (see table 1) and varies with latitude and elevation. These differences must be considered for surveying during the breeding season. Surveys are terminated during periods of steady rain or high wind because birds are not easily detected, bird activity is reduced, and safety of the field crew is at risk due to falling trees or lightning activity. Air temperature, wind velocity, and cloud cover are estimated at the beginning of each survey period and updated periodically as conditions change.

Prior to conducting nest surveys, randomly select the order for surveying transects and for beginning surveys at transect endpoints. Nest surveys begin by assigning one transect to each field biologist. Navigate to transect endpoints by using a GPS unit. If a GPS unit is not available, interpret the field map to find the endpoint where the transect line meets the unit boundary. Find a nearby suitable tree or tall stump to act as a permanent transect center and end-point marker, called a "transect tree." The transect tree should be situated so it can be readily located for future reference. The tree should also be large in diameter so flagging is easily seen. For example, an ideal transect tree would be 50-100 cm in diameter with few, low obstructing branches that is located in a relatively open area of a lower slope or ridge. Once a transect tree is located, it is wrapped with three individual bands of flagging at approximately waist to

Table 1. Nesting chronology for cavity-nesting birds common in coniferous forests of Interior Western North America. Average median dates are based on data reported for western Idaho from 1994-2000 (Saab and Dudley, unpublished data). Number of days reported are from Ehrlich et al. (1988). See Appendix A for common and scientific names of each species' four-letter acronym.

Species	Courtship	# Eggs[a]	Laying	Incubation	Nestling	Fledgling[b]
AMKE	< 17 May	(3-7) 4-5	17 May; 4.5 d n = 59	21 May; 29-31 d	20 Jun; 30-31 d	> 20 Jul; 65 d n = 50
FLOW	---	(2-4) 3-4	---; 3.5 d	---; 26 d	---; ?	---; ?
NSWO	---	(4-7) 5-6	---; 5.5 d	---; 26-28 d	---; 27-34 d	---; 63 d
LEWO	< 30 May	(4-9) 6-7	30 May; 6.5 d n = 390	5 Jun; 13-14 d	18 Jun; 28-34 d	> 20 Jul; 51 d n = 323
RNSA	< 29 May	(3-7) 4-5	29 May; 4.5 d n = 1	2 Jun; 12-13 d	14 Jun; 25-29 d	> 12 Jul; 44 d n = 1
WISA	---	(3-7) 5-6	---; 5.5 d	---; 12-14 d	---; 21-28 d	---; 43 d
DOWO	< 24 May	(3-6) 4-5	24 May; 4.5 d n = 4	28 May; 12 d	9 Jun; 20-25 d	> 2 Jul; 39 d n = 4
HAWO	< 8 May	(3-6) 4	8 May; 4 d n = 141	11 May; 11-15 d	24 May; 28-30 d	> 24 Jun; 46 d n = 126
WHWO	< 22 May	(3-7) 4-5	22 May; 4.5 d n = 17	26 May; 14 d	9 Jun; 26 d	> 7 Jul; 44.5 d n = 15
TTWO	---	(2-6) 4	---; 4 d	---; 11-(14?) d	---; 22-26 d	---; 40.5 d
BBWO	< 6 May	(2-6) 4	6 May; 4 d n = 50	9 May; 12-14 d	22 May; 25? d	> 15 Jun; 42 d n = 46
NOFL	< 19 May	(3-12) 5-8	19 May; 6.5 d n = 134	25 May; 11-14 d	6 Jun; 25-28 d	> 3 Jul; 45.5 d n = 110
PIWO	---	(3-5) 4	---; 4 d	---; 15-18 d	---; 26-28 d	---; 47.5 d
BCCH	---	(5-10) 6-8	---; 7 d	---; 11-13 d	---; 14-18 d	---; 35 d
MOCH	---	(5-12) 5-9	---; 7 d	---; 14 d	---; 21 d	---; 42 d
RBNU	---	(4-7) 5-6	---; 5.5 d	---; 12 d	---; 14-21 d	---; 35 d
WBNU	---	(3-10) 5-8	---; 6.5 d	---; 12 d	---; 14 d	---; 32.5 d
PYNU	---	(4-9) 6-8	---; 7 d	---; 15-16 d	---; 20-22 d	---; 43.5 d
HOWR	---	(5-12) 6-8	---; 7 d	---; 13 d	---; 12-18 d	---; 35 d
WEBL[c]	< 15 May	(3-8) 4-6	15 May; 5 d n = 112	20 May; 14.5 d	3 Jun; 17.5 d	> 25 Jun; 37 d n = 89
WEBL[d]	< 22 Jun	(3-8) 4-6	22 Jun; 5 d n = 27	27 Jun; 14.5 d	12 Jul; 17.5 d	> 29 Jul; 37 d n = 17
MOBL[c]	< 20 May	(4-8) 5-6	20 May; 5.5 d n = 129	25 May; 13-14 d	7 Jun; 22-23 d	> 27 Jun; 41.5 d n = 87
MOBL[d]	< 29 Jun	(4-8) 5-6	29 Jun; 5.5 d n = 12	4 Jul; 13-14 d	17 Jul; 22-23 d	> 1 Aug; 41.5 d n = 7
EUST	< 10 May	(4-8) 4-6	10 May; 5 d n = 19	14 May; 12-14 d	27 May; 18-21 d	> 12 Jun; 37.5 d n = 19

[a] Range of clutch sizes in parentheses, followed by mode of clutch sizes (Ehrlich et al. 1988).
[b] Average median fledging date, followed by mean number of days in the nesting period.
[c] First clutch.
[d] Second clutch.

head height, and each band labeled with its assigned transect letter using a black permanent marker (e.g., "TRANS A"). Label each band in several places so it is easily read if approached from various directions. Labeling every band of flagging ensures that the transect will remain identified until the following year. In addition, flagging degrades from exposure to weather and should be replaced each year with new bands. Two trees per transect are marked with flagging, one at each end of the transect (figure 1).

Once the transect tree is flagged, determine on land the extent of your belt transect, which is 100 m, from each side of the centerline. This distance is best estimated with a GPS unit. Plotted locations of previously known nest cavity trees are helpful in determining your bearings while conducting surveys. Use a GPS unit, or a compass with the correct bearings for true north, in conjunction with the field map to follow the belt transect. View the topography within the belt transect, as outlined on the field map. This will provide a reference from which to survey, ensure adequate transect coverage, help with locating previously occupied nest cavities, and prevent one from straying off course. When you know the extent of your belt transect and location of previously occupied cavities that need to be revisited, begin surveying. Record the start time in your field notebook. Take note that when walking downhill at a naturally faster pace, nest cavities could be more easily overlooked. Periodically check the field map while conducting the survey. If straying does occur, backtrack to your transect and continue surveying. Proceed at a comfortable pace maintaining safety with respect to weather conditions, topography, vegetation, down wood, and bird activity. Often you will need to meander and focus attention on key habitat features within your belt transect. For example, high snag densities or snag clumps, bird activity, ridges, valleys, knobs, and inclement weather will require more meandering and increased focus to conduct an adequate survey. Conversely, an open slope with few trees and little bird activity can be surveyed with little or no meandering. When you come to the end of your transect, locate, flag, and label another transect tree, and record general weather conditions and ending time.

Nest Cavity

Definition

Nest cavities must have: (1) a large enough entrance for the species of interest (table 2); (2) cylindrical-shaped entrance walls, ("tunnel-shaped" as opposed to "funnel-shaped" entrance); and (3) vertical depth

Table 2. Descriptions of tree cavities used by cavity-nesting birds common to Interior Western North America. Data taken from *The Birds of North America* species accounts (see literature cited). Means are followed by ± SD. See Appendix A for common and scientific names of each species' four-letter acronym.

Species	Entrance shape	Re-use cavity	Entrance height (cm)	Entrance width (cm)	1° or 2° excavator
AMKE	Variable	Yes	Variable	Variable	2°
FLOW[1]	Variable, often circular	Frequently	5.64 ± 0.99	5.68 ± 1.06	2°
NSWO[2]	Variable, often circular	Yes	6.0-7.0	N/A	2°
LEWO[3]	Variable, often circular	Frequently[3a]	6.2 ± 0.2	N/A	1° & 2°
RNSA[4]	Oval	No	4.0 ± 0.1	4.6 ± 0.1	1°
WISA[5]	Circular	Occasional	4.17 ± 0.10	N/A	1°
HAWO[6]	Circular	Rare[6a]	4.8 ± 0.2	4.5 ± 0.7	1°
DOWO[7]	Circular	Rare[7a]		Diameter range 2.5-3.8	1°
WHWO[8]	Slightly oval	Occasional	5.0	4.8	1°
TTWO[9]	Irregular--gourd/pear	No	3.8-4.5	N/A	1°
BBWO[10]	Circular	Rare	4.4	N/A	1°
NOFL[11]	Variable, often oval	Occasional	7.5 ± 0.3	6.9 ± 0.5	1°
PIWO[12]	Oval	Only for roosting	12.0	8.5	1°
BCCH[13]	Variable	Rare	Variable	Variable	1°
MOCH[14]	Variable	In successive years	Variable	Variable	2°
RBNU[15]	Oval	Occasional	1.4 ± 0.09	4.0 ± 0.35	1°
WBNU[16]	Variable	Occasional	Variable	Variable	1° & 2°
PYNU[17]	Oval	Frequently	3.83 ± 0.63	3.43 ± 0.75	1° & 2°
HOWR[18]	Circular	Frequently	5.5 ± 1.4	N/A	2°
WEBL[19]	Variable	Frequently	Variable	Variable	2°
MOBL[20]	Variable	Frequently	Variable	Variable	2°
EUST[21]	Variable, often slightly oval	Yes	6.9	6.3	2°

[1] McCallum 1994.
[2] Cannings 1993.
[3] Tobalske 1997; [3a] Saab et al. 2004.
[4] Walters et al. 2002.
[5] Dobbs et al. 1997.
[6] Jackson et al. 2002; [6a] Saab et al. 2004.
[7] Jackson and Ouellet 2002; [7a] Saab and Dudley, unpublished data.
[8] Garrett et al. 1996.
[9] Leonard 2001.
[10] Dixon and Saab 2000.
[11] Moore 1995.
[12] Bull and Jackson 1995.
[13] Smith 1993.
[14] McCallum et al. 1999.
[15] Ghalambor and Martin 1999.
[16] Pravosudor and Grubb 1993.
[17] Kingery and Ghalambor 2001.
[18] Johnson 1998.
[19] Guinan et al. 2000.
[20] Power and Lombardo 1996.
[21] Cabe 1993.

below the entrance. If nest cavities are not viewed easily from the ground level, use some type of cavity viewer (mirror or electronic) attached to an extension pole (e.g., TreeTop Peeper by Sandpiper Technologies, Inc., Manteca, CA, http://www.peeperpeople.com). Recent excavations with sufficient-sized entrances but funnel-shaped walls are flagged as "potential cavities." A partial excavation of this type may be completely excavated and used for nesting at a later date. Older snags, however, often contain deep foraging excavations that should not be misidentified as potential cavities.

Locating by Search Image

Surveyors are instructed to develop "search images" for nest trees. A search image is a pictorial and verbal visualization or description of an object that biologists want to find in the field. For example, biologists want to look for broken-topped snags (i.e., the search image) because such snags are frequently used as nest trees by woodpeckers.

Key characteristics or search images of nest trees are well described by Bull et al. (1997) in unburned forests and by Saab and Dudley (1998) in burned forests. Live trees with dead tops (spike tops) are particularly important for nesting in unburned forests. During the first few years after fire, snags with broken or forked tops that pre-dated the wildfire are particularly important for cavity nesters (Saab and Dudley 1998). The sapwood of snags or live trees can be relatively hard and not easily excavated soon after disturbance (fire, disease, insects, or lightning). If the treetop is broken or forked, the 1–2 m section below the break or fork is often soft enough for cavity excavation. This section is most readily used for nesting.

To locate cavity entrances, examine the top couple of meters below major breaks or forks in snags or live trees, or in the dead tops of live coniferous trees. Binoculars are essential for this purpose and should be used continuously to examine potential cavity trees. Some species (e.g., hairy and black-backed woodpeckers), however, have strong excavator morphology and may create cavities in trees with relatively little decay compared to trees excavated by other cavity nesters (Dixon and Saab 2000). Because of this difference, their cavities may be found lower in the trunk of broken and forked-topped snags or in intact snags. As tree decay increases, trees become more suitable for excavation, and cavity placement becomes less related to tree top condition.

Older snags frequently break off to a shorter, relatively stable height. This leads to a second search image for large diameter, relatively short, broken-topped, and heavily decayed coniferous snags. These snags are primarily excavated by northern flickers and may contain several cavities and foraging excavations. Such snags are used for nesting by bluebirds, flickers, Lewis's woodpeckers, kestrels, and starlings.

Other important search images for nests are dead tops in live trees and aspen patches. Dead sections may contain many irregularly shaped cavities of various sizes, and are key for nesting in live-tree stands where snag densities are low. An emphasis should be placed on the importance of aspen patches to cavity nesters. When snags are rare and during the early years following fire, cavity nesters frequently use aspens for nesting. Aspen is often preferred for cavity excavation because it is susceptible to heartwood rot, which provides a soft substrate for excavation while retaining firm sapwood that creates stability and protection for the cavity (Conner et al. 1976, Harestad and Keisker 1989, Aitken et al. 2002). Flickers, sapsuckers, and hairy, Lewis's, downy, and white-headed woodpeckers will excavate aspen for nesting. In addition, fires will create natural cavities in aspen by burning down into the trunk through the top, a knot hole, or branch. Bluebirds, kestrels, and flickers will frequently use these for nesting. Extra time should be spent surveying these patches because they may contain many excavated, natural, or fire-created cavities.

In summary, knowledge of nest-site selection and nest placement is important during surveys. Developing search images for broken and forked-topped snags, relatively short, heavily decayed snags, and dead tops in live trees, and spending extra time in aspen patches will increase the likelihood of locating cavities. In addition, an abundance of wood chips found around the base of a tree usually indicates that a cavity is nearby.

Locating by Bird Behavior and Call Playback

The easiest way to locate cavities is by observing bird behavior. During surveys, search for cavity-nesting birds that breed in your study area (e.g., Appendix A.). Note their behavior. Sit down and observe, concealing yourself if necessary. Patience is important. Using the species/nesting table (table 1), determine the likely stage of the nesting cycle for the species of interest. Try to decipher the reason for the observed behavior. For example, early in the nesting season (April-May), you might observe migrating individuals or courtship behavior, and the birds are not yet associated with a cavity. Record the observations in your field notebook and pencil-in the bird's location on a field map. Return to the area within two weeks to determine if the birds have occupied a nest cavity. Allow time to observe carefully during the nestling stage (June-July), when adults are carrying food to their nest cavity. This could be the only chance to find the nest if nestlings fledge before you revisit the area.

Call playbacks can be used in conjunction with observing bird behavior to locate nests. Playbacks are particularly effective for locating nests early in the nesting season, especially before the onset of incubation. We recommend this method for rare species, those that may be difficult to detect or occupy relatively large home ranges (e.g., black-backed, three-toed, and white-headed woodpeckers) (British Columbia Ministry of Environment, Lands & Parks 1999). Tape recordings of woodpecker drumming and calling are broadcast in areas of known or suspected activity. Play the tape in various directions in order to achieve good sound coverage (e.g., up and down drainages or toward opposing slopes of a ridge). If a response is elicited, woodpeckers often drum or fly into the area of the tape recording. From this point, the bird can be followed to its cavity. If sight of the bird is lost, try the broadcast again. For details on formal call playback surveys, see British Columbia Ministry of Environment, Lands & Parks (1999) http://srmwww.gov.bc.ca/risc/pubs/tebiodiv/woodpeckers/index.htm.

Mapping and Flagging

When a nest cavity is found, determine its location on the field map. Place a dot on the map to indicate the location of the cavity tree. Use a GPS unit to record the digital location. Assign a unique alpha-numeric identification number to the cavity (letter from nearest transect followed by consecutive number, e.g., A1, A2, A3 for the first three cavities found on transect A). Label the dot on your field map with the assigned identification number. Each year for all transects, restart the numbering (e.g., A1, B1, C1 for the first three cavities found on transects A, B, and C). Secondly, select a nearby tree to flag for taking a compass bearing to the cavity tree; this tree is known as the bearing tree (Bt). The bearing tree should be located at least 5-10 m from the cavity tree, at least 30-40 cm in diameter, and with a view of the cavity entrance. Wrap the bearing tree with two bands of flagging and label them with the assigned cavity identification number using the black permanent marker.

Nest Cards

Nest cards are used to record the nest location, physical characteristics of the cavity tree, and the status of a nest at each visit (every two to four days) (Appendix B). When an occupied cavity is found, record on the card the appropriate cavity number and unit identification, bird species, cavity location/description, tree species, and bird behavior (Martin et al. 1997; Appendix B). Additional information will be recorded on the card when vegetation characteristics are measured following the nesting season. If cavities are revisited in subsequent field seasons, information must be accurately transposed from the previous nest card to a new card for the current field season (only front side of card). Changes may occur between years and should be added to the new nest card as necessary (e.g., bird species is left blank because the cavity is unoccupied in subsequent survey, cavity is assigned a different id#, a new bearing tree is selected, the tree top has broken off above the cavity, or the location/cavity description [table 3] section needs clarification). If a nest cavity tree has fallen over, broken below the cavity entrance, or the cavity was destroyed in another way, record the changes in the “nest status” box (see Appendix C for codes). Record the “computer identification number” if one was previously assigned to the nest cavity.

Nest Cavity Location/Description

Nest locations are geographically referenced using a GPS unit, which aids in relocating nests. However, a written site description is needed to ensure that a nest cavity can be visited by several observers and readily found in subsequent years. Descriptions should be recorded at macro- and micro-site levels (table 3). For the macro-site perspective, describe the landscape features surrounding the nest tree and the nest location in relation to the entire study unit. At the micro-site level, describe the area immediately surrounding the nest tree, characteristics of the nest tree, tree features around cavity entrance, and the cavity entrance. If a cavity is difficult to see, or is not excavated (e.g., a natural cavity in aspen), include a sketch with your description using arrows to point out its location.

Cavity Age

Cavity age is determined as either old (O) or new (N). New cavities have light-colored wood (not gray) at the cavity entrance and have been excavated since the previous autumn. Clues to determine cavity age include observations of excavating behavior, wood chips scattered around the base of the cavity tree, woodpecker use at the cavity entrance, and weathering on the cavity walls. If excavating is not observed, search

Table 3. Site descriptions of cavity trees at different spatial scales.

A) MACRO-SITE	1.) Landscape Features (e.g., ridges, creeks, drainages, roads)
	2.) Site Level (e.g., north end of transect, between transects E and F)
B) MICRO-SITE	1.) Area Around Cavity Tree (e.g., S-facing slope, 25m up from the bottom, below G12 40m, across from rock outcrops)
	2.) Cavity Tree (e.g., broken top, several cavities, heavily charred, small diameter, sloughing bark, many branches)
	3.) Area Around Cavity Entrance (e.g.,cavity 20 cm under protruding branch, bark missing ½ m below and above entrance, cavity 1 m below forked top, upper of two cavities)
	4.) Cavity Entrance (e.g., cavity entrance faces down slope, vertically oblong-shaped entrance, "bearded" entrance, natural [not excavated] entrance)

near the base of the tree for wood chips that originated from the cavity. Newly excavated cavities will have light-colored wood chips lying on top rather than under the previous autumn's ground litter. Be careful not to disturb the area prior to determining if wood chips exist near the tree. Old cavities will be dull gray in color because of exposure to weather; the cavity walls and the bark surrounding the cavity entrance will be gray. New cavities generally show less wear on the bark below the entrance (some is expected during excavation) and have relatively brighter, lighter-colored walls than older cavities. With this information we can try to answer whether a species uses previously excavated cavities (O) or newly excavated cavities (N) each time it nests.

Tree Species

To determine tree species of the nest cavity, you may need to consider more than one physical characteristic of the tree (Parks et al. 1997). Here, we provide only a few examples. For ponderosa pine, the bark is puzzle piece-shaped, hard to the touch, and may be yellowish-red. Branches are blunt-ended, with two to three long needles per bundle, and the trees can tolerate open, drier sites. For Douglas-fir (*Pseudotsuga menziesii*), after fire the bark is spongy to the touch. Branches are finely dissected to a point and often pointed downward, needle leaves are short and pointy, and trees tolerate wetter, colder, and north-facing units. For aspen (*Populus tremuloides*), the bark is thin and generally white in color. Aspen trees occur in clumps, are often associated with wet areas, and have many new, live suckers. For subalpine fir (*Abies lasiocarpa*), the bark is thin with horizontal "blistering." Trees are narrowly conical in shape, with curled under branches and short, blunt needle leaves, and occur at higher elevations. For black cottonwood (*Populus trichocarpa*), its bark and sapwood/heartwood resemble that of aspen, being thin and white, and relatively soft, respectively. These trees are usually large in diameter and tall, with spreading branches, and are usually found in small numbers associated with creeks and adjacent tributaries.

Cavity Orientation

Orientation is recorded as the true compass bearing for the direction that the cavity entrance faces. We determine cavity orientation by standing 10-15 m from the cavity tree, facing the cavity to get a direction, then taking the back azimuth. This method is more accurate than standing below the unviewed cavity at the base of the tree because the cavity is viewed directly. Directions are recorded from 0 to 359°.

Original Excavator

Original excavator is defined as the first species responsible for excavating the cavity for nesting. The excavator is most easily determined from direct observation, although direct observation is rare. More commonly, original excavator is determined from knowledge of cavity entrance shapes and sizes (table 2), and microhabitat used by individual species (see *The Birds of North America* species accounts listed in the literature cited). If you are uncertain of the original excavator, circle "unsure" on the nest card (Appendix B). Commonly, cavities are originally excavated by relatively small species (e.g., hairy, black-backed, and white-headed woodpeckers), and subsequently enlarged by larger species (e.g., northern flicker, Lewis's woodpecker). Early in the nesting season between nest visits, the original excavator may be displaced by another species. This can also occur between nesting seasons, creating a potential source of error when determining original excavator.

Tree Top Condition

Tree top condition often indicates the suitability of a tree for nesting (e.g., Bull et al. 1997). Breaks in treetops allow colonization by insects and diseases, causing wood to decay. The decay causes saprot (in ponderosa and lodgepole pines) and heartrot, creating wood that is more easily excavated by primary cavity nesters. Tree top condition can be intact (I), forked (F), broken before fire (BB), broken after fire (BA), or dead top (DT). Intact trees have a single top without any breaks or forks. Forked trees include those with obvious multiple trunks that divide above breast height, and those with a branch or branches that have grown after the top broke, forming a new terminal leader (bayonet). Dead-topped trees have single or multiple dead sections in tops of live trees. Trees in burned forests with tops broken prior to the fire are critical for nesting habitat in the early post-fire years when other trees are not easily excavated (Saab and Dudley 1998). Treetops in burned forests that are broken before fire are blackened at the break, whereas tops broken after fire are lightly colored and unburned.

Previous Cavity ID#, Species, and Year

Previous cavity id#, species, and year are designed for multi-year studies to follow the history of cavity occupancy. Pertinent data (Appendix B) from the previous year's nest card should be transferred to the current year's card. For example, in 2002 a flicker occupies a cavity on transect B. In 2001, a Lewis's woodpecker occupied the same cavity with a cavity id = B1. The 2002 nest card for the flicker would have a previous cavity id# = B1, species = LEWO, year = 2001. If the cavity was not occupied in the previous year, leave the box blank for previous nest species, and transfer the remaining data (previous cavity id# and year).

Multiple Cavity ID#, Species, and Year

Multiple cavity id#, species, and year are designed to track the history of two or more occupied cavities in the same tree. Data are recorded similarly as previous cavity id#, species, and year except the data pertain only to the current year. For example, if a snag has a lower cavity occupied by a flicker (cavity id# = A1) and an upper cavity occupied by a western bluebird (cavity id# = A2), both nest cards for each will indicate that they are sharing the same tree. The nest card for A1 (NOFL) would have multiple cavity id# = A2, species = WEBL, year = 2002. The nest card for A2 (WEBL) would have a multiple cavity id# = A1, species = NOFL, year = 2002. In the next year, the flickers use the same cavity, but the bluebirds do not return and that cavity goes unoccupied. A1 could be reassigned as cavity id# = A5 and species = NOFL. A2 might be reassigned as cavity id# = A6 but species is left blank because the cavity is not occupied. The information recorded for multiple cavity id# for the flicker (A5) would be multiple cavity id# = A6, species = (blank), year = 2003. The nest card for A6 (blank) would have a multiple cavity id# = A5, species = NOFL, year = 2003.

Nest Monitoring

Behavioral Observations

We use BBIRD field protocol (Martin et al. 1997) with some modifications for nest monitoring. Nest monitoring can be conducted throughout the daylight hours. Bird behavior is recorded during each nest visit on the back of the nest card (see Appendix C for commonly used abbreviations). Each occupied nest is monitored every three to four days (e.g., every week on Monday/Thursday or Tuesday/Friday), but increases to daily as fledging dates approach. Each nest visit will last about 1 - 30 minutes, depending on the time it takes to determine the nesting stage (courtship, nest building, egg laying, incubation, nestling, fledgling). If you are unable to view inside the nest cavity, use bird behavior near the cavity to make inferences about the nesting stage (table 4). New observations are added with each return visit until the nest fails or until the young fledge successfully. From these data, nesting success is calculated using the Mayfield method (Mayfield 1961), with modifications to calculate variation in success (Johnson 1979). Detailed observations at each nest visit are necessary for determining the nesting stage. For example, recording aggression, drumming, excavating, copulating, carrying nesting material, percent of adult body entering cavity when feeding young, size of prey delivered to nestlings, fecal sac removal, begging young, or fledged young are all stronger indicators for determining nesting stages rather than only recording flying, calling, or foraging observations. Likewise, when determining nest fate, search for evidence of a failed (e.g., changes in cavity appearance, nest tree with claw marks, feathers or egg shells at the base of the tree) or successful nest (e.g., perched fledglings,

Table 4. Behaviors of cavity-nesting birds during various nesting stages. See Appendix A for common and scientific names of each species' four-letter acronym.

Species	Courtship-laying stages	Incubating stage	Nestling stage	Fledgling stage
HAWO, BBWO, NOFL, LEWO, WHWO, DOWO, RNSA, PIWO	Wing displaying; copulating; reverse mounting (LEWO); head bobbing; drumming; chasing; excavating; calling	Adult looks out cavity entrance on approach or when tree tapped, may or may not flush; adult "nest guarding" (LEWO); drumming	Begging young heard or visible in cavity entrance; adult with frequent trips in/out of cavity; adult carrying food; tail shaking at cavity entrance (NOFL); food preparing then to cavity, food caching (LEWO); long flights to/from cavity tree; agitated calling; remove fecal sac; adult "nest guarding" (LEWO); Adult flushes, faint begging heard	Young perched quietly; awkward movements and flying; young "piggyback" adults; food begging; adults feed fledglings; cavity quiet, no activity
WEBL, MOBL, EUST	Pair investigating cavity (MOBL/WEBL); copulating; female carrying nesting material (MOBL/WEBL); 3 or more at cavity tree; chasing; calling	Adult looks out cavity entrance on approach or when tree tapped, may or may not flush; male perched quietly, female in cavity (MOBL/WEBL); female exits cavity to forage, male follows, female returns without food and enters cavity (MOBL/WEBL); no begging heard	Adults with frequent trips to cavity; adults carrying food; remove fecal sac; agitated calling; bill popping (MOBL/WEBL); begging young heard or visible in cavity entrance; whitewash below cavity entrance (EUST)	Young perched together on nearby branch or loosely together on the ground, quiet (MOBL/WEBL); forage in family groups along riparian zone (EUST) or near cavity trees calling (MOBL/WEBL); adults feed fledglings; cavity quiet or female exits (second clutch begun); whitewash below cavity entrance (EUST)
AMKE	Male swooping/dive display; copulating; calling	Male prey delivery to female; adult flushes on approach or when tree tapped, calling or silent; no response to tree tap	Male prey delivery to female then female carries food into cavity; adults with food into cavity; young begging heard or visible in cavity entrance	Young perched in adjacent trees, generally quiet, then begging when adults arrive with food; calling

calling fledglings, or adults carrying food away from the nest area). These activities or characteristics at the nest tree are stronger evidence for determining nest fate than merely recording that no activity was observed.

Nest Fate

Nest fate should be determined by the individual who conducted the last observation at the nest or by those with the most knowledge of the nest history (see Appendix B, No. 43). Detailed observations about why the nest fledged or failed need to be reported. This will help qualify the data when determining nest success. If nestlings are observed at 80% or more of their mean fledging age, we consider the nest successful because nestlings that reach this age have a high likelihood of fledging (Steenhof and Kochert 1982). For example, hairy woodpecker nestlings typically fledge at 28-30 days from the time of hatching. If hairy woodpecker nestlings were estimated to be 23 days old (82% of fledging age) on the last nest visit in which birds were in the cavity, then the nest would be reported successful unless evidence of failure was observed.

Nest failure may be caused by several factors. It may occur during nest building, cavity excavation, or the egg-laying stage. Early in a nesting attempt, when parental investment is relatively low, abandonment may occur. Abandonment can result from various disturbances such as storm related events, predation of an adult, or human interference at the nest cavity. Abandonment is difficult to determine in cavity nesters without a complete nest history accompanied by routine viewings into the cavity. Ectoparasites are another cause of nest failure. For example, adult flies may lay eggs on newly hatched nestlings that succumb to developing larvae. During this process, nestlings can appear lethargic. Like abandonment, failure due to ectoparasites is difficult to determine. A third cause of nest failure is depredation. It occurs when eggs, nestlings, and/or adults are killed or consumed by a "predator." For purposes here, a "predator" may be defined as mammal (bear, cat, weasel, squirrel, chipmunk), bird (corvid, accipiter, owl, other cavity nesters), or reptile (snake, lizard). Nest sites should be carefully searched for evidence of predators, including claw marks, hair, tracks, scat, torn open cavities, eggshells, feathers, etc. In some cases the nest contents (usually eggs or nestlings) are removed from the nest and the nest is usurped by an aggressive species. Nest usurpation is often exhibited by Lewis's woodpecker, and occasionally by hairy woodpecker and northern flicker. In our study areas, bluebirds, hairy woodpecker, and northern flicker have been the recipients, or "hosts" of nest usurpation, in which their nests were taken over by Lewis's woodpecker (Saab and Dudley, unpublished data).

Date fated is the date of fledging or failure. If the exact date is unknown, then record the median date between the last two visits. Several visits, however, may be required to determine if the nest is no longer active. In these cases, the median date should be calculated between the last visit with nest activity and the subsequent visit.

Field Data Management

At the end of each day, nest cards are filed alphanumerically into study unit card files. During periods when surveys are not conducted, a second, pen-copy version of each nest card is completed. This pen-copy version remains in the field office as a backup copy and is periodically updated to include new nest monitoring observations. In addition, creating composite maps from survey results can be a useful reference for the field office. Maps of each unit are placed over bulletin board material with color-coded, flagged straight pins that signify the species, cavity id#, and location of each cavity tree.

After the nesting cycle is complete, vegetation measurements are recorded at nests and random locations to evaluate nest site and habitat selection. A GPS unit is used to record nest locations and vegetation plots for spatial analysis.

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Appendix A. Common species of cavity-nesting birds in coniferous forests of Interior Western North America.

Common name	Scientific name	AOU[1] acronym
American kestrel	*Falco sparverius*	AMKE
Flammulated owl	*Otus flammeolus*	FLOW
Northern saw-whet owl	*Aegolius acadicus*	NSWO
Lewis's woodpecker	*Melanerpes lewis*	LEWO
Red-naped sapsucker	*Sphyrapicus nuchalis*	RNSA
Williamson's sapsucker	*Sphyrapicus thyroideus*	WISA
Downy woodpecker	*Picoides pubescens*	DOWO
Hairy woodpecker	*Picoides villosus*	HAWO
White-headed woodpecker	*Picoides albolarvatus*	WHWO
Three-toed woodpecker	*Picoides tricdactylus*	TTWO
Black-backed woodpecker	*Picoides arcticus*	BBWO
Northern flicker	*Colaptes auratus*	NOFL
Pileated woodpecker	*Dryocopus pileatus*	PIWO
Black-capped chickadee	*Parus atricapillus*	BCCH
Mountain chickadee	*Poecile gambeli*	MOCH
Red-breasted nuthatch	*Sitta canadensis*	RBNU
White-breasted nuthatch	*Sitta carolinensis*	WBNU
Pygmy nuthatch	*Sitta pygmaea*	PYNU
House wren	*Troglodytes aedon*	HOWR
Western bluebird	*Sialia mexicana*	WEBL
Mountain bluebird	*Sialia currucoides*	MOBL
European starling	*Sturnus vulgaris*	EUST

[1] American Ornithologists' Union.

Appendix B. Example of a nest card.

Appendix B. Example of a Nest Card.

(Front)

Yr[1]:	Loc[2]:	Species[3]:	First Observer[4]:	Cavity ID#[5]:	
Trt[6]:	Unit[7]:	Tasks Comp.[8]: GPS VEG FATE	Direction (°) BT-Nest[9]:	Distance (m) BT-Nest[10]:	
Cavity Location/ Description[11]:					
Nest Status[12]: Find Method[13] (circle one): PB F SS NBC L PY YB			UTM (NAD27) Northing[14]: Easting:		
Computer ID#[15]:	Nest Ht (m) [16]:	Cavity Age[17]:	Decay Class[18]:		
Tree Sp[19]:	Tree Ht (m) [20]:	DBH (cm) [21]:	Orient (°)[22]:		
Original Exc[23]:	OE Cert[24]: SURE UNSURE	Tree Top Condition[25]:	Previous Cavity ID#[26]:	Previous Cavity Sp[27]:	Previous Cavity Yr[28]:
Aspect[29]:	Deg Slope[30]:	Position on Slope[31]:	Multiple Cavity ID#[32]:	Multiple Cavity Sp[33]:	Multiple Cavity Yr[34]:

(Back)

Visit Date[35]		#Egg[36]	#Yng[37]	Beg-End Time[38]	Observations (parental behavior, nestling development, fate, etc)[39]	Cont.[40]	Stage[41]	Obs[42]
Day	Mo							
				-				
				-				
				-				
				-				
				-				
				-				
				-				

Nest Fate[43]: 1-Successful Failed due to: 2-bear, 3-corvid, 4-squirrel, 5-chipmunk, 6-snake, 11-Fate unknown
(circle one) 7-weather, 8-cavity destroyed, 9-unknown, 10-other ___________

Initiation Date[45]:		Success/Failure Notes[44]: Record detailed information used to determine nest fate
Date Fated[46]:		
# Fledged[47]:	Fledge Conf.[48] SURE UNSURE	

1- Yr: Four-digit year (e.g., 1998)
2- Loc: Location code - Combination of two letter location code + two state code (e.g., Payette National Forest, Idaho = PAID)
3- Species: AOU code (e.g., WEBL)
4- First Observer: Initials of surveyor who found nest, use middle initial as needed (e.g., VAS)
5- Cavity ID#: alpha-numeric combination of transect and sequential cavity # on transect (e.g., F12)
6- Trt: Treatment - an alphanumeric code indicating treatment type (e.g., BB= BEFORE BURN; AB=AFTER BURN; C=CONTROL)
7- Unit: two-letter unit code (e.g., BH = Buckhorn)
8- Tasks Comp: Tasks Completed: GPS VEG FATE (circle as completed for each nest)
9- Direction Bt-Nest: true compass direction (0-359°) from bearing tree to nest
10- Distance Bt-Nest: estimated distance from bearing tree to nest in meters
11- Cavity Location/Description: (see Tables 2, 3)
12- Nest Status: status of nest in current year (see Appendix C.)
13- Find Method: (circle one – see Appendix C.)
14- Northing, Easting: UTM Coordinates (NAD27)
15- Computer ID#: Computer number used to uniquely identify each nest
16- Nest Ht: Nest Height in meters
17- Cavity Age: (e.g., N=NEW, O=OLD, U=UNKNOWN)
18- Decay Class: Determined during vegetation surveys
19- Tree Sp: four-letter tree code (e.g., PIPO = Pinus ponderosa)
20- Tree Ht: Tree height in meters
21- DBH: Diameter at Breast Height (1.37 m) in centimeters, determined during vegetation surveys
22- Orient: true compass bearing (0-359°) of direction cavity faces
23- Original Excavator: (e.g., HAWO= Hairy Woodpecker)
24- OE Cert: Original Excavator Certainty (SURE of species that excavated the cavity or UNSURE, circle one)
25- Tree Top Condition: (I=Intact, BB=Broken Before Fire, BA=Broken After Fire, F=Forked, DT=Dead Top)
26- Previous Cavity ID#: Alpha-numeric number assigned to cavity during last survey/monitoring (transferred from box 5 of previous nest card) (e.g., F2)
27- Previous Cavity Sp: Occupant of cavity when last surveyed (e.g., HAWO or left blank if unoccupied)
28- Previous Cavity Yr: Year of last survey (e.g., 1997)
29- Aspect: True compass bearing (0-359°) of slope on which cavity tree resides, determined during vegetation surveys
30- Deg Slope: Degrees slope to nearest tenth, determined during vegetation surveys 31- Position on Slope: Position of cavity tree on slope (L=Lower, M=Middle, U=Upper)
31- Position on Slope: Position of cavity tree on slope (L=Lower, M=Middle, U=Upper)
32- Multiple Cavity ID#: Cavity ID# of any cavities occurring in same tree in same year (e.g., F13)
33- Multiple Cavity Sp: (e.g., NOFL)
34- Multiple Cavity Yr: (e.g., 1998)
35- Visit Date: Day and Month of visit (numeric)
36- #Egg: Enter # eggs in nest, circle value if certain count represents final number of eggs
37- #Yng: Enter # nestlings, circle value if certain count represents final number of nestlings
38- Beg-End Time: Beginning and ending time of observations in military time (e.g., 0742-0813)
39- Observations: Detailed notes of observation, see Appendix C.
40- Cont: Cavity contents (1=eggs, 2=nestlings, 3=eggs and nestlings, 4=nestlings and fledglings nearby)
41- Stage: Stage of nest- (E =Excavation/Nest Building, L= Laying, I=Incubation, N= Nestling, F=Fledgling)
42- Obs: Observer initials for each visit (e.g., VAS)
43- Nest Fate: Circle single best fate code -- 1-Successful, 2-10 Failed due to: 2-bear; 3-corvid; 4-squirrel; 5-chipmunk; 6-snake; 7-weather; 8-cavity destroyed (i.e., cavity tree fell or broke below cavity entrance); 9-unknown; 10-other (includes adult mortality, abandonment, ectoparasitism, predators not listed, human-caused failures). 11-Fate unknown (cannot determine from data)
44- Success or Failure Notes: Record detailed observations about why you think the nest was successful or failed
45- Init Date: Initiation Date, Record date (ddmm) first egg was laid if known, or calculate by backdating
46- Date Fated: Date (ddmm) on which nest fledged or failed, if known, otherwise enter median date between last two visits
47- # Fledged: Number of nestlings that fledged from the nest
48- Fledge Conf: Confidence that the number of fledglings reported in box 47 is the final total (circle SURE or UNSURE)

Appendix C. Examples of commonly used abbreviations and nest status codes.

Nest observations

+ - and
@ - at
~, ≈ - approximately
∞ - many, numerous
≥ - greater than or equal to
♂ - male
♀ - female
ACA - agitated calling
Act - activity
AD, Ad, ad - adult
Adj - adjacent
AF - assume fledged
AFOR - aerial foraging
AG - agitated
Am - morning
CA - calling
CAV - cavity
CE - cavity entrance
COP - copulating
Ct - cavity tree
DR - drumming
E - egg
ENT - entered
FBY - feeding (fed) begging yng
FL - fledgling
FO - fly over
FOR - foraging
FS - fecal sac
INIT, init - initially
Juv - juvenile
LV - leave, leaving
Mins - minutes
NG - nest guarding
NM - nesting material
NR - no response (tapping, etc.)
nstling - nestling
OA - on approach
Obs - observed
Orig - originally
PE - perched
Pm - afternoon
PR - pair
Pred - depredated
rtn, rtns - return(s)
SI - singing
TT - tree tapped
w/ - with
w/o - without
w/in - within
WW - whitewash
X - times
Y, yng - young
YB - young begging

Physical characteristics

Bndry - boundary
Bt - bearing tree
BT - broken top
Dbh - diameter breast height
Dia - diameter
E - east
Elev - elevation
Ht - height
Hvly - heavily
Lrg - large
Med - medium
Mtn - mountain
N - north
NE - northeast
NW - northwest
Rd, rd - road
S - south
SE - southeast
Sm - small
SW - southwest
Trans - transect
W -west

Nest status codes

A - active
B - cavity tree broken below cavity
BC - cavity tree broken at cavity
DB - cavity destroyed by bear
DC - cavity destroyed by corvid
DF - cavity overgrown by fungus
DL - cavity destroyed by limb/branch
DO - cavity destroyed by other (be explicit)
F - fell over
I - inactive
NF - cavity not found
NS - transect not surveyed
U – unknown

Find method

PB - Parental Behavior
F - Flushed
SS -Systematic Search
NBC - Non-Behavioral Cue
L - Luck
PY - Previous Year's Nest
YB - Young Behavior

RMRS
ROCKY MOUNTAIN RESEARCH STATION

The Rocky Mountain Research Station develops scientific information and technology to improve management, protection, and use of the forests and rangelands. Research is designed to meet the needs of the National Forest managers, Federal and State agencies, public and private organizations, academic institutions, industry, and individuals.

Studies accelerate solutions to problems involving ecosystems, range, forests, water, recreation, fire, resource inventory, land reclamation, community sustainability, forest engineering technology, multiple use economics, wildlife and fish habitat, and forest insects and diseases. Studies are conducted cooperatively, and applications may be found worldwide.

Research Locations

Flagstaff, Arizona	Reno, Nevada
Fort Collins, Colorado*	Albuquerque, New Mexico
Boise, Idaho	Rapid City, South Dakota
Moscow, Idaho	Logan, Utah
Bozeman, Montana	Ogden, Utah
Missoula, Montana	Provo, Utah
Lincoln, Nebraska	Laramie, Wyoming

*Station Headquarters, Natural Resources Research Center, 2150 Centre Avenue, Building A, Fort Collins, CO 80526.

APPENDIX B-8

COLUMBIA SPOTTED FROG SURVEY PROTOCOL

APPENDIX B-8

COLUMBIA SPOTTED FROG SURVEY PROTOCOL

Adapted from:

Managers' Monitoring Guide, Visual Encounter Surveys for Amphibians. USGS Patuxent Wildlife Research Center. http://www.pwrc.usgs.gove/monmanual/ techniques/ves.htm. Accessed April 2009.

Description of Technique

Visual encounter surveys (VES) are a time honored field technique. VES was formalized by Campbell and Christman (1982) and Corn and Bury (1990), both using time as the constraint.

Visual Encounter Surveys are used to document the presence of amphibians and are effective in most habitats and for most species that breed in lentic (non-flowing) water. There are a number of assumptions inherent in VES that should be considered when designing a program using this technique. In brief, the assumptions are:

1) equal observability among species and among individuals,
2) no between-sampling visit effects e.g. there is an equal likelihood of being observed for each species for each sampling visit,
3) individuals are recorded only once per survey, and
4) no observer related effects.

Visual encounter surveys are conducted by observers walking through a designated area for a prescribed time, visually searching (in a systematic way, e.g. transects), for animals. The number of animals encountered are noted along with time elapsed during the survey. Visual encounter surveys are effective in easily identifiable habitats, such as riparian zones or ponds or in uniform habitats with good visibility. Species that are highly clumped are also good targets for VES, for example, pond breeding amphibians.

Data collected yields information on the presence of a species but does not establish absence, nor does it give reliable estimates of abundance. VES can be used along transects, streams, ponds, in quadrats or larger areas. There are three standard sampling designs for VES, randomized walk, transects, or a quadrat design (see Crump and Scott 1994 for details).

The scale of inference from this technique depends on the scale of the surveys. For instance if the level of inference is an entire refuge, locations for VES should be chosen randomly, but within strata that provide even spatial coverage of the entire area encompassed by the refuge. The level of inference can scale up to watershed or region with appropriate site selection and sampling effort.

VES can be supplemented with dipnetting and aural identification where appropriate. VES used in conjunction with pitfall arrays may be more effective in some habitats. More than one person can participate, number of minutes searching is always the number of minutes searched multiplied by the number of people searching. Ancillary data such as air and water temperatures, weather conditions, date, and time of survey should also be recorded. Minimum data collected during VES includes, number of each species encountered, size (e.g. length or acreage) of the area searched and total search time.

The following is taken from:

Scarlett, 2006. Columbia Spotted Frog Inventory on the Umatilla National Forest. US Forest Service, Umatilla National Forest, Heppner and Walla Walla Ranger Districts. September 12, 2006.

Surveys occurred between June 15 and September 15. Dip nets were used to positively identify tadpoles and juvenile and adult amphibians. Because sites were generally small and surveyors were able to sample 100% of the habitat at the sites, only a single visit was made to each of the survey sites. Where spotted frogs (or other non-target amphibians) were found, the following information was collected: date, time, location (UTM), water temperature, description of site and habitat, observation method, observer, species, number of individuals detected and their stage of development, comments, and a sketch of the site.

APPENDIX B-9

TERRESTRIAL VISUAL ENCOUNTER SURVEYS

APPENDIX B-9

TERRESTRIAL VISUAL ENCOUNTER SURVEYS

Adapted from:

Manley, P.N.; Van Horne, B.; Roth, J.K.; Zielinski, W.J.; McKenzie, M.M.; Weller, T.J.; Weckerly, F.W.; Vojta, C. 2006. Multiple species inventory and monitoring technical guide. Gen. Tech. Rep. WO-73. Washington, DC: U.S. Department of Agriculture, Forest Service, Washington Office. 204 p.

Terrestrial Visual Encounter Surveys
Terrestrial Visual Encounter Surveys (TVES) is an effective passive sampling technique for detecting nocturnal and diurnal raptors. Although detection rates are low, the technique is simple, low cost, and useful for a wide variety of species that may be missed by the other core methods (bird point counts, small mammal trapping, trackplate and camera surveys), such as some ungulates, lagomorphs, and raptors. TVES can detect signs of nocturnal and diurnal raptors, such as regurgitated pellets, whitewash, and plucking perches. These signs can be followed up to determine associated species.

Thus, TVES is a core survey method for all classes of vertebrates as a companion to taxon-specific core survey methods. TVES can be designed to target different taxonomic groups in a variety of environments (terrestrial vs. aquatic) and at different times of year.

This section describes the summer TVES, which is conducted once in the spring through summer and focuses on special status terrestrial bird, mammals, and reptiles. Along with this effort, a noxious weed inventory will occur. When observers encounter large patches of noxious weeds, a GPS point should be taken (or polygon walked) and a description of size and species should be noted.

Sampling Design

Three observers systematically survey for individuals and animal sign by traversing the 500-foot survey corridor along evenly spaced meandering transects. One observer will walk the centerline while the other two observers will walk at a distance of 150 to 175 feet from either side of the centerline. This allows observers to cover the entire corridor in one pass. Three observers are recommended to reduce observer fatigue, improve consistency in identifications by comparing observations, and provide a second opinion for difficult identifications.

Data Collection

Observers walk along the transect at a pace of approximately 0.5 mph, for a total of approximately 4 to 5 miles a day. Observers are expected to detect all animal sign or target animals or direct detections at any distance.

The perpendicular distance to all detections is recorded to enable the calculation of probability of detection. Aquatic habitats, such as lakes, ponds, streams, and bogs, located within the sample unit are not surveyed as part of this protocol. These areas will be marked on a GPS for subsequent use by wetland delineation crews. Surveys may be conducted any time of day, but it is recommended that they be conducted between 8 a.m. and 6 p.m.

Surveys note direct observations and sign of all less common and/or larger bodied species not well detected by the other survey methods being implemented. Animal sign can include a wide variety of features: tracks, scat, whitewash, regurgitated pellets, nests with fresh nesting material, feathers, burrows, haypiles, foraging marks, territory marks, prey remains, and food caches. Observers search surfaces, vegetation, turn over objects such as logs and rocks, and look in crevices in rocks and bark, replacing all surface objects after examining the ground beneath. Logs and other substrate are not torn apart to minimize disturbance to important habitat elements.

The following information is recorded for each detection: observer, time, search time elapsed, species, detection type (e.g., visual, auditory, capture, sign), age class of captures (juvenile, subadult, or adult), and substrate type (e.g., rock, log, bare ground, etc.). The gender of individuals is also recorded if known. Recording the search time elapsed enables subsetting the data set into increments of time for the purposes of sampling adequacy and comparisons with other data sets. In addition, all unusual captures or sign are documented by taking a digital picture that illustrates the diagnostic characteristics. These photos enhance the accuracy of species identification.

The reliability and utility of TVES for vertebrate species depends on size, gregariousness, uniqueness of their sign, habitat conditions, and time of season. The probability of detecting species presence from sign is highest when species are large, individuals live in groups, or individuals habituate to particular locations for roosting or feeding. Detections based on sign will not always be sufficient to identify species, in which case detections are identified to the lowest taxonomic level possible.

Equipment Needed

Observers will need a clip board, hand spade or rake, field keys, hand lens, stop watch or watch with timer, pocket ruler, resealable plastic baggies (for collecting scat and pellets), digital camera, hand lens, and binoculars.

Staffing, Training, and Safety

Field crews should consist of two biological technicians, with a crew leader at the GS-7 level to supervise and coordinate data collection. Each field crew of three can complete surveys along 4 to 5 miles a day. Crewmembers should be GS-4/5 or higher with academic training in the natural history and identification of multiple vertebrate taxa and/or practical experience in tracking, animal sign, and species identification.

Training should include: (1) literature research on specimens of local species; (2) training in the identification of tracks and sign; (3) field practice of data collection with an experienced tracker/observer; and (4) testing of crewmembers to verify proficiency.

APPENDIX B-10

WESTERN BURROWING OWL SURVEY PROTOCOL

APPENDIX B-10

WESTERN BURROWING OWL SURVEY PROTOCOL

Adapted from:

Conway, J. C., and J. C. Simon. 2003. “Comparison of detection probability associated with burrowing owl survey methods,” *Journal of Range Management,* 67(3):501-511.

Broadcast Acoustical Survey

Acoustical surveys consist of broadcasting taped burrowing owl calls along roads to elicit responses from territorial burrowing owls.

Survey Period

The first survey would take place between March 15th and May 15th. The second survey would take place between May 15th and July 1st.

Survey Methods

Burrowing owls are active throughout the day and can be surveyed between sunrise and sunset. Conway and Simon (2003) recommend surveying when temperatures are at least 68 F (20 C) and winds less than 7.5 mph (12 km/hr). However given the constraints of the survey area and survey timeframe, burrowing owl surveys would be conducted when temperatures are above 50 F (10 C) and winds are less than 10 mph (16 km/hr).

Call stations should occur every 0.25 (400m) to 0.5 (800m) miles along roads where the best view of the landscape occurs.

After arriving at the call station, the surveyor should watch and listen silently for 3 minutes, followed by a 3-minute call-broadcast segment. Calls should be broadcast at 80 decibels (measured 3 feet (1m) from the speaker). The 3-minute call-broadcast segment should consist of 30 seconds of calls followed by 30 seconds of silence, with this pattern repeated 3 times. The first 2 30-second call periods consisted of the primary song of male burrowing owls and the final 30-second call period of an alarm call.

A GPS point should be taken at each calling station, no matter whether a burrowing owl is seen or not. Number of individuals seen should be recorded, as well as age and sex when possible. Observers should also take a compass bearing of the observation from their GPS point. If multiple individuals are observed in different locations, take a compass bearing of the observation most likely to represent the burrow location. Also note distance of observation from the GPS point.

APPENDIX B-11

PYGMY RABBIT SURVEY PROTOCOL

APPENDIX B-11

PYGMY RABBIT SURVEY PROTOCOL

Ulmschneider, H. 2004. Surveying for pygmy rabbits (*Brachylagus idahoensis*), fourth draft. Bureau of Land Management. Boise, ID.

Field Training

A key piece of advice: The rabbits themselves are secretive and difficult to see; thus it is being familiar with their habitat and sign that is the key to finding populations. Before surveying, look at pygmy rabbit habitat, burrows and pellets with an experienced person in the field. If possible, also look at badger and ground squirrel diggings, to help you learn to distinguish the differences between their burrows and those of pygmy rabbits. Descriptions and pictures are helpful, but there's no substitute for seeing it in the field. Biologists from different states with experience in surveying for pygmy rabbits are listed in Appendix A.

Habitat

There are two main features of pygmy rabbit habitat: relatively taller and denser big sagebrush (*Artemisia tridentata)* (but see below) and deep soils.

Sagebrush

Usually burrows are found in the taller and denser big sagebrush in an area. The height of the sagebrush can vary enormously, from about 1 ½ to 7 feet. Density can also vary, but commonly the sagebrush is so dense right at burrows that it is difficult to walk through. This means > 30% cover. Various subspecies of sagebrush are used, including Wyoming (*A. t. wyomingensis*), mountain (*A. t. vaseyana*), and Great Basin (*A. t. tridentata*). Other shrub species may be present, including bitterbrush (*Purshia tridentata)*, rabbitbrush (*Chrysothamnus* spp.*)*, greasewood (*Sarcobatus vermiculatus)*, snowberry (*Symphoricarpos* spp.*)*, and juniper (*Juniperus* spp.).

In some habitats used by pygmy rabbit in Oregon and Nevada, rabbitbrush is dominant or co-dominant with sagebrush, and burrows occasionally or commonly occur under large dense rabbitbrush (T. Forbes, OR; E. Sequin, NV, pers. comm.) and greasewood (J. Himes, NV, pers. comm.). The burrows are so hidden under the canopy that they are often only found by lifting the vegetation.

Pygmy rabbits also may occupy habitat that does not appear ideal: with short sagebrush and "bad" soil. In east-central Idaho, pygmy rabbits occupy "mima mounds" (mounds of soil several feet high and approximately 20-30 feet in diameter) with taller and denser sage, which are dotted in a landscape of shorter and thinner sagebrush (Roberts 2001). Katzner and Kozlowski (pers. comm.) both emphasize that it is important to keep an open mind, and not develop set ideas about what comprises pygmy rabbit habitat too early, or you may overlook inhabited areas. In Wyoming, Katzner (pers. comm.) has seen pygmy rabbits in areas that he initially would not have thought were habitat. In Montana, the average sagebrush height in occupied sites was only about 15 inches. There, Rauscher (pers. comm.) has often found them in areas where the sagebrush is not very dense and only knee-high or less, especially in mountain bowls and where sagebrush has been manipulated. In Utah, pygmy rabbits have been found to occupy 12 to 120-inch tall sagebrush. Regardless of the absolute height of the vegetation, the rabbits will almost always burrow in the tallest and densest sagebrush on the landscape.

Soils

Generally, pygmy rabbits burrow in loamy soils deeper than 20 inches. Soil composition needs to be able to support a burrow system with numerous entrances, but also must be soft enough for digging. A habitat model from the Univ. of Idaho (Rachlow and Svancara 2003) used a clay content of 13 to 30%, but models from Idaho State Univ. (Simons and Laundre 2001) used <13.5 % clay. In central Washington, pygmy rabbits are found only in areas with deep loamy soils. In southwest Idaho, they occur in areas with soils classified as stony sandy loam, and sandy loam over sandy clay and clay loam. In east-central Idaho, soils are gravelly outwash plains with lime-coated rocks. On the lava plains of southeast Idaho, rabbits will often burrow between or under lava boulders. In Nevada, soils are light-colored and friable.

At the Landscape Scale

Pygmy rabbits are found in alluvial fans, swales in a rolling landscape, large flat valleys, at the foot of mountains, along creek and drainage bottoms, in basins in the mountains, or other landscape features where soil may have accumulated to greater depths. They are generally on flatter ground, sometimes on moderate slopes, and not on steep ground.

At the Patch Scale

Look for relatively taller, denser big sagebrush (not low sage) and areas where there appears to be a non-uniform distribution of sage, in other words, where the texture of the sagebrush stand is uneven, or "lumpy", in both height and density. When scanning across a valley these clumps stand out as taller, or as having a different color. It is fairly effective to go directly to these areas to begin a search. Also look for signs of digging, and for soil surface that is not flat and level. The rabbits tend to mound up the soil where they have been burrowing over the years. Drainage bottoms and sagebrush draws with a relatively uniform coverage of sagebrush are also often used by pygmy rabbits.

Habitat Descriptions by State

Idaho: Areas with mounded topography – 'mima mounds' – are prime areas to target for surveys. In the Salmon, Idaho area, alluvial plains where rabbits are found are dotted with mounds about 20-30 ft in diameter, 1-2 ft tall, several hundred feet or yards apart, where the sagebrush is taller than in the surrounding intermound spaces. On 1:24,000 aerial photos, these mounds can be seen as a pattern of darker dots, extending over many miles of landscape (Photo 1 – Rocky Canyon); and from the ground, the mounds appear as lenses of darker and taller sage. The mounds are where the pygmy rabbits burrow. In southwest Idaho, a similar habitat is big sagebrush islands intermingled with low sagebrush (*Artemisia arbuscula)(* Photo 2 – Hutch Springs, Photo 3 – Mudflat Rd with Lynell). These kinds of areas are also visible on aerial photos).

In the mahogany (*Cercocarpus ledifolius)* savannah in the Owyhees of southwest Idaho, the rabbits are found in swales of taller sagebrush (photo 4 – aerial of mahogany savannah, photo 5- Dry Cr.) Mounding of the soil is present, but does not form distinctive mima mounds. A dotted pattern is usually not visible on 1:24,000 aerial photographs, although careful examination can show subtle and dim dotting. The soil does end up mounded where the pygmy rabbits have been digging their burrows and maintaining them over time.

Another major habitat in the Bruneau plateau country is the bottoms and lower slopes of small drainages where the sagebrush is denser and taller, indicating deeper soils (Photos 6 -& 7).

<u>Oregon</u>: Habitats in Oregon are very similar to those in Idaho. Most habitat is comprised of areas where big sagebrush inclusions are mixed with low sagebrush, rabbit brush, or shorter stature big sagebrush. Mounding similar to 'mima mounding' occurs in most of these sites (Photos 8, 9, 10, 11). Sagebrush on the mounds is usually 1-3 feet taller than that of the surrounding area. These mounds or clumps of big sagebrush can be spaced from a few feet to hundreds of feet apart.

The second most common type of habitat in Oregon is small draw bottoms where deeper soils have collected. Most of these sites are vegetated with basin big sagebrush in the drainage bottom, surrounded by Wyoming big sagebrush, low sagebrush, or mountain big sagebrush in the surrounding uplands. Some mounding can occur in these areas, but it is absent or very subtle. Burrows in these areas seem to be restricted to the very bottom of the drainages or the lower inside slopes of the drainage itself. Some areas with rabbits are dominated by rabbitbrush (Photo 12 - rabbitbrush).

Pygmy Rabbit Sign

Burrows

- Burrow entrances range from 4-10 inches across, usually fairly round but may be slightly wider than tall. The size of pygmy rabbit burrows usually surprises biologists the first time they see them because the holes are larger than they would have thought; many would have identified them as badger burrows. The older a burrow, the more the entrance seems to get enlarged, possibly from predators digging.
- Burrows are most often placed right at the base of a sagebrush, or occasionally another shrub species. Sometimes an entrance will be more in the open, but the majority of entrances will be underneath sage.
- At burrows, usually you will find the sagebrush so dense that walking is difficult, and you have to thread your way through it (which means >30% canopy cover). In more open sagebrush where you can walk more freely, you will probably not find burrows.
- The opening of the burrow usually flares out, and there may be a large pile of dirt outside the entrance, 1 to 3 feet in diameter.
- Usually, there will be more than one entrance in a burrow system; 2-4 is most common, with a maximum of up to 12, and occasionally there is only one.
- The burrow can slope down very steeply or moderately, and the burrow often narrows down from the flared entrance to about 4-5 inches in diameter.
- At currently used burrows, there will often be a lot of fresh dirt piled outside the entrances. Key your search on piles of fresh dirt to find burrows.
- Burrow systems will rarely be isolated; there will be a number of them in a habitat area. Isolated burrows without pellets are difficult to identify with certainty.
- A key feature of pygmy rabbit burrow systems is that they show evidence of having been built up and used over many years, unlike ground squirrel or badger diggings, which are generally a one-time affair. Pygmy rabbits remodel in the same spot year after year, creating mounded areas with taller, denser sagebrush growing on the old dirt piles, and evidence of burying the lower stem of nearby sagebrush over time. The undug areas between these mounded areas will have a fairly level ground surface (observation from Dana Quinney, expert on badger and ground squirrel diggings, Idaho Army National Guard).

- Sagebrush grows taller and denser on the mounded dirt. As pygmy rabbits 'remodel' over the years, filling in one tunnel and digging new ones within the same burrow system, they create overlapping mounds of varying ages in one area. The resulting complex of mounded area may be 15 to 30 ft in diameter. Thus, pygmy rabbit burrow areas have old mounding with plants and shrubs growing on them in addition to the current fresh dirt piles.

It is common to find many old burrows, with no fresh pellets, while surveying. In general, unoccupied old burrows appear to last some years. However, in Nevada, Sequin (pers. comm.) has observed extensive burrow systems "melt" completely into non-existence over the course of two to four weeks of wet weather in certain soils. All evidence of burrows was erased. Some of these burrows had been associated with very high pygmy rabbit activity just a few weeks prior. Later, the rabbits appear to return and dig burrows again.

Pellets

Rabbit pellets are distinctive: round, without dents or points, different from those of any other group of animals. Pygmy rabbit pellets are the smallest of the rabbit pellets, averaging 4-6 mm in diameter. However, the size can vary. Pregnant females produce bigger pellets, as large as cottontails, and up to 11 mm in diameter! (Dave Hays, pers. comm.). Young cottontails can produce very small pellets. Usually the size of pellets is uniform within a pellet group.

- Pellets are in little groupings near the burrow entrance and under sagebrush nearby. At an active burrow, there will often be a carpet of evenly-sized small pellets. Large quantities of uniformly small pellets around a burrow entrance are diagnostic of pygmy rabbits.
- Mountain cottontail pellets average 6-10 mm, but can be smaller. It appears that younger, smaller cottontails produce smaller pellets. Thus, they can overlap in size with pygmy rabbit pellets, creating potential for confusion. Be cautious: in Washington, genetic testing of pellets thought to be pygmy rabbit revealed they were from cottontails (Dave Hays, pers. comm.).
- Cottontails may use some of the same areas as pygmy rabbits, and may use their burrows. Beware particularly if there are rocky outcrops nearby. This is less of an issue in some places such as the Lemhi Valley, where the two do not commonly coexist. It can be more of a problem in smaller pygmy rabbit habitat patches intermixed with rock outcrops, such as in the Owyhee uplands. However, in Lakeview, Oregon, a telemetry study showed cottontails using the same habitats and some of the same burrows as the pygmy rabbits, though there are no rock outcrops for miles.
- Full-grown whitetail jackrabbit scat is 11-12 mm in diameter; blacktail jackrabbit pellets are about 9-10 mm in diameter.
- Rodents, including ground squirrels, have oblong droppings.
- Recent rabbit pellets are usually a dark to medium brown to greenish or blackish color. Very fresh pellets have sheen or appear somewhat glossy. Older pellets appear somewhat dull and eventually weather to gray. If the rabbits have been eating a lot of dry grass, fresh pellets may be more tan, the color of dry grass, and a little larger. If rabbits have been eating green wet feed in the spring, the pellets can be almost black on the outside, green on the inside, and may be more elongated and have little pinched ends, being softer when they were deposited.
- We don't know how long pellets last or how long they take to turn grey. Weather conditions affect how fast they turn grey; dry pellets will stay brown, wet pellets will turn grey faster. Pellets under winter snow may stay very fresh looking until uncovered the next spring. In an experiment at 6000 ft in southwest Idaho, pellets gathered fresh in

April and placed under a sagebrush were still brown in December. By the next April, they were grey, probably from the wet of winter snows and spring rains followed by exposure to sunlight.

- Some ants collect the pellets, so if you find burrows and no pellets, it may be due to ants. Look for them on the conical ant piles.
- Rabbits sometimes eat their own pellets (coprophagy), apparently mostly during the night (Dave Hays, pers. comm.).

Other Burrows

- A key difference between pygmy rabbit and badger or ground squirrel burrows is that badger and ground squirrel burrows generally do not create large complex mounds of overlapping dirt piles.
- Richardson's ground squirrels make smaller holes the size of the diameter of their bodies (approximately 2 -3 inches), and which do not usually have a flared entrance or a sizable pile of dirt. They usually dig holes in the open, overall occupy more open areas, and are often associated with a wet area of some kind. Belding's ground squirrel burrows are similar, but are in dry areas, and can be found under sagebrush as well as in the open. Pygmy rabbit and ground squirrel burrows may be mingled in the same area. Any ground squirrel may use pygmy rabbit burrows, or may dig their smaller burrows off of pygmy rabbit tunnels (Dana Quinney, Idaho National Guard, pers. comm.).
- Piute (Townsend's) ground squirrels also have small burrows with little dirt around them, and may be both under bushes or out in the open, but not particularly near water.
- Antelope ground squirrels have many small entrance holes placed in a mound of dirt 5 - 10 ft across and a foot or so high. Kangaroo rat burrows are similar. Both tend to be in sandier soils than pygmy rabbit burrows.
- Badger diggings are typically bigger than those of pygmy rabbits, 12-18 inches across and very round. Where there are ground squirrels, badger diggings may be numerous. Typically, however, you will see large, badger-dug holes located next to small ground squirrel holes, at least while ground squirrels are active. So instead of several moderate-sized burrow entrances near each other, like a pygmy rabbit burrow system, there will be big and small burrows together. Additionally, badger hunting burrows are one-time affairs, and even their natal burrows are only used briefly during one year.
- Where badgers have dug out pygmy rabbit burrows, which is common in some areas, the entrance will be enlarged to 12 to 18 inches, and very round, with a large pile of dirt. You probably will find both badger-dug and regular pygmy rabbit burrows in the area.
- Coyote and fox burrows are bigger, and more in the open, not under the sage. There will be only one burrow system in an area, not a number of them.
- Chipmunks, pocket mice, and deer mice all have burrows that are tiny (1 inch in diameter or so) and no or little loose dirt outside.
- Pocket gophers produce a mound of dirt about a foot in diameter, approximately 4-6 inches high, and the entrance hole, approximately 2-3 inches in diameter, is hidden under the mound of dirt. There will be a number of mounds in an area, and they are usually more in the open, between the bushes. In winter, pocket gophers tunnel under snow and fill the tunnels with soil; these will produce ropes of soil after the snow melts. They move through the landscape as they burrow, rather than maintaining a stationary burrow system.

Deciding whether or not burrows are pygmy rabbit

It is the combination of all indicators that you need to consider, both of the burrow itself, pellets, and the pattern of burrows on the landscape. No other animal digs burrows with the combination of features of those of the pygmy rabbit: in tall dense sagebrush habitat, burrow entrance 5-7 inches average diameter, located under sagebrush, a number of burrow systems in an area, and small round pellets. A burrow system with a carpet of small rabbit pellets around it is diagnostic of pygmy rabbits.

- First, you need to find both burrows and pellets together.
- For burrows that appear characteristic of pygmy rabbits but have no pellets, search further in the area, and/or look at another time of year. If you find other burrows with pygmy rabbit pellets in the area, then you can conclude that other, similar burrows without pellets are also from pygmy rabbits. Old burrows may tell us something about changes in population extent or density (although we're not sure how to interpret it yet!), and are also important to map.
- If you find small rabbit pellets but no burrows in the area, they are probably from mountain cottontails, especially near rocks. Burrows are an essential piece of evidence, because the pygmy rabbit seldom ventures far from them. (However, see the section on seasonal considerations.). There should be a number of burrow systems in an area, within a habitat patch.
- Is it the right habitat – big sagebrush and deep soils?
- Are the burrows placed underneath sage? Are they the right size and shape?
- What other animals are around? Be aware there may be cottontails and perhaps young jackrabbits producing small pellets similar in size to pygmy rabbit pellets, or ground squirrels, badgers, or other burrowers to sort out.
- Cottontails and ground squirrels may use burrows originally dug by pygmy rabbits, and further confuse the issue. However, of the rabbits, only pygmy rabbits actually dig burrows. We are interested in burrows dug originally by pygmy rabbits, even if they are now occupied by another animal.
- Finally, you can use other methods (discussed at the end of this paper) to confirm presence of pygmy rabbits.

Table 1. Rabbit track sizes, from information in Forrest 1988, Green and Flinders 1980, and Katzner 1994

	Pygmy Rabbit		**Cottontail**		**Jackrabbit**	
Back foot length	1.8-2.5 in	46-71 mm	3-3.5 in	77-90 mm	3.5 -4 in	90-103 mm
One track set (4 feet)	6-8 in		6.5-11 in		10-30 in	
Between track sets	6-16 in		8-22 in		10-60 in	

Organizing and Conducting Surveys

Targeting habitat

Pygmy rabbits are not randomly distributed within the sagebrush landscape, they are patchily distributed, because they choose particular soils and sagebrush habitats, and they do not appear to be abundant in many situations. Additionally, we cannot yet accurately predict with models where they might occur. With a patchy distribution, random survey methods that might work well for a more evenly distributed animal would be ineffective and inefficient. It is necessary to first target habitat as best you can, that is, to sort out the most likely habitat. We describe below a several-stage approach to doing this, using aerial photos, soil and vegetation maps, Geographic Information Systems (GIS, if available), field knowledge, and driving and walking in the field as the final step to target where to look for pygmy rabbits.

Landscape Scale: The most basic components to use in a GIS model or other map are sagebrush types overlaid on soils (composition and depth). One kind of area to target for surveys is regions where big and low sagebrush are intermingled. Some models have added slope, aspect, fire history, and elevation, but these would be secondary parameters after first delineating sagebrush types and soils.

Fire history can be relevant but you need to know whether sagebrush has come back in or not. The timescale for this will vary enormously depending on whether its mountain sagebrush (maybe 15 years) or Wyoming sagebrush (maybe 100 years or never). So you must include this difference in a model. Aspect may be relevant if windblown soils are being deposited on the lee sides of hills, as in Gabler's model for the Idaho National Engineering and Environmental Laboratory, and Himes' model for east-central Nevada. Slope and elevation may be somewhat useful, after first delineating potential habitat using sagebrush types and soils.

For examples of GIS models from Idaho, see Rachlow and Svancara 2003, or Gabler et al 2000. John Himes (Texas Parks and Wildlife Dept.) has developed one for east-central Nevada, currently in review for publication. Be cautious with GIS models – we don't have successful ones yet. The Idaho models need refinement. The data used for both models did not distinguish between low sagebrush and big sagebrush. This resulted in the models rating as habitat large homogenous expanses of low sage with very rocky shallow soils, where no pygmy rabbits are found. Areas where pygmy rabbits were subsequently found in southwest Idaho were not targeted, some prime areas with intermingled big and low sagebrush.
The lessons from these efforts are that better habitat models are needed, as well as finer-scale, more accurate soil and sagebrush data. Additionally, there is no substitute for knowing what to look for from field experience, and going in the field and looking.

Mid-scale: Examine aerial photos, topographic maps, and use local knowledge to add or delete areas from your initial map. It is usually possible to distinguish dense sagebrush or to see mounds of taller, denser sagebrush as a dotted or mottled pattern on aerial photos. Local knowledge will help to eliminate burned areas that haven't regrown to sagebrush- e.g. some large old fires in the very southwest corner of Idaho are still vegetated with grass, but are included in the 2003 GIS model because they burned more than 15 years ago (the parameter used in the model). In Oregon, biologists have had success with flying over sagebrush landscapes and identifying dense areas of sagebrush for future ground surveys. You could combine surveys for sage grouse or big game with surveys for pygmy rabbit habitat.

Rank the areas you identified at the large scale, and start surveys in the most likely areas. These would be the largest blocks on the sagebrush and soils map which weren't eliminated by your refinements, areas surrounding past records, areas where aerial photos show mounds of sagebrush as a dotted pattern (see example photo at end), where big and low sagebrush are interspersed, and where there are swales of deep soils and tall dense sage.

Fine scale: You will probably have to make the final choice of where to walk a survey route while you are in the field, because the available data are not at a fine enough scale to do this from a distance. While you are driving to or in a chosen area, look for dense tall sage, especially with a "lumpy" or uneven texture, as well as for signs of digging. Sometimes, particularly where soils are light-colored or contain white, lime-covered rocks thrown out by digging, the mounds of freshly dug soil or white rocks are visible from the road. However, in darker soils this is not true, and you have to walk to see burrows. When a suitable area is spotted, stop and walk a survey route.

Your sampling scheme will be dictated by your particular circumstances, both by how the potential habitat is distributed and by your "person-power". Your planned survey intensity for each area will vary with its priority, the size of the area you want to survey, and the people available to do it. Depending on travel time and whether you are finding burrows, (which will slow you down), you might expect to complete about 3 to 7 miles of walking transects in a day. Conduct the greatest amount of sampling in high priority areas, less sampling in lower priority areas. Portion your survey efforts among your highest priorities, with some sampling in lower priority habitat also, as a check on your ability to target habitat.

In snow: Areas where pygmy rabbits are concentrated will attract predators: coyote, badger, bobcat, and weasel. You can use their tracks to help guide you to pygmy rabbit areas, and even to burrows.

Patch scale: While you are walking a survey route you should target the tallest, densest patches of sage. These patches look like islands that stand out above the rest.

Survey Routes

The goal of a survey route is to check enough habitat in an efficient manner to determine whether pygmy rabbits are present or not, and secondarily to get an index of density of burrows. The goal is not to map out the total patch of habitat or to map every burrow within the habitat. Therefore you will not be trying to walk the perimeter of the population to map its extent, or to completely inventory the habitat, because this can be very time-consuming. Mapping a polygon requires a lot of walking to determine, first, whether rabbits are there, and their extent, and then walk the whole perimeter to map it with a GPS unit. It is simpler and faster to walk a meandering line through a habitat patch, targeting the most likely looking places (instead of the edge), and then continue on to the next swale or habitat patch, or loop back the other side of the valley. If you map your route and record results well, especially if you use a GPS unit, your survey route will be repeatable.

There are several advantages of recording burrow system locations with a GPS unit as you walk a survey route, as opposed to just tallying them. If you use the "repeat" feature (which fills out each new feature with the data from the previous one, so you only have to change a few things), it only takes a few seconds to record a burrow system as a point using a GPS unit, and will not appreciably increase your survey time. The advantages to having the data in this electronic form are many. You can directly download the points to a GIS map and see the pattern of distribution and density on the large scale. If you only record your survey route, and not the burrow points, you will not be able to easily see this pattern. Being able to see the points displayed on a GIS map is useful for refining your understanding of small-to-large scale distribution and habitat. Displaying the points on a background of orthophotoquads will help you with interpreting habitat from aerial photos, and will help you draw the extent of habitat patches on a topographic map or aerial photo.

Recording burrow system locations is a more complete record for those who come after you and want to repeat your work to determine changes over time – they will know exactly what you found where. For example, on a 2-mile long survey route, you may have found clusters of burrows in only a couple places. You can create a baseline for long-term monitoring at the same time as doing an initial survey, because you have a repeatable survey line along with very site-specific results. By recording burrow points along your survey line you can determine the whether the distribution of burrow complexes changes over time, which will help us understand how to interpret old burrow complexes.

If you are alone, walk in a loop or triangle, targeting patches of taller, denser sage, looking for pygmy rabbit burrows and pellets. The goal of a looping or triangular route is to survey during all your walking time, and to avoid walking without actually surveying. You may walk through some unsuitable-looking sagebrush, but these data will be useful for helping distinguish where the rabbits do not occur, and will function as a check on your ability to target habitat. Using a topo map, you should be able to design a route that takes you up one swale and down another, or up and down two sides of a valley. In patchy habitat and where patches are small and follow the contours of the land, following the landforms and targeting the taller sagebrush clumps will be most effective. This means your survey line will be meandering, not straight.

If the habitat is uniform or on extensive flats, as in Nevada, straight transect lines arranged in a triangle, or a spiral pattern may be appropriate. For a spiral transect, walk directly to the center of a large, dense sagebrush patch, and then spiral your way out, gradually increasing the diameter of your circle until the habitat is no longer appropriate. To fully check out a potential site often takes about one hour of survey time (Eveline Sequin, pers. comm.).

Transect length should be dictated by the extent of the habitat patch, road distribution, and the amount of overall habitat you have identified to cover. Surveys in Idaho have shown that you will likely need to walk at least ½ mile to check an area for presence of pygmy rabbits with any degree of confidence, because of the distances between burrow systems, unless you find burrows immediately.

With two people working together, one-way linear transects may work, by “leapfrogging”: one person is dropped off to begin a survey route, the second drives ahead and starts another survey route; the first person ends up at the truck and drives ahead to pick up the second. If two people walk a survey route in tandem, the width each can cover will be determined by the habitat, but may be on the order of 100 ft., or 50 ft to each side. When two people are surveying together, each can simultaneously sample opposite sides of the road when the road bisects suitable habitat .

When you drive through unsuitable looking habitat within a generally potential habitat area, stop occasionally and walk a short survey route, as a check on your judgment of habitat, and record your transect walked. Note why the habitat looks unsuitable. Remember that ‘zeroes’ are as important to record as finding pygmy rabbit sign. These data will be used to refine habitat models, and will let us know where to and where not to focus management for pygmy rabbits.

Dogs and horses may be useful during surveys, if available. Dogs can let you know when a burrow is inhabited (though not what animal it is), and may flush rabbits. Horses can be used to survey more quickly than on foot.

Area search

When you find several current burrows and you are inventorying a new area, (or if you have not yet seen a pygmy rabbit in the area) take about a half hour to search the area looking for pygmy rabbits. This will help confirm whether you have pygmy rabbits, and will help you gain confidence in your ability to distinguish pygmy rabbit sign. So far you have had the search image for a burrow, and have been looking down. Now, switch, get the search image for movement and rabbits, and walk slowly, in widening circles around the active sites, looking ahead. Rabbits will often slip quietly into the burrow as you approach, and you have to be alert for the slight movement. Once you learn how to look for the actual animal, you will begin to see them more (Dave Hays, pers com.).

Pygmy rabbits are easy to distinguish from mountain cottontails. When running away, the white of a mountain cottontail tail is usually visible. Pygmy rabbits do not have any white on their tail. Also, pygmy rabbits seldom run as far as mountain cottontails. Pygmy rabbits will scamper a short distance and stop, often under sagebrush plant or near a burrow entrance.

Seasonal Considerations
Surveys in Washington, Idaho, Nevada, and Oregon have shown considerable variation in the amount of fresh sign at burrows over the course of a year. During late summer and early fall pellets can be scarce at burrows. Burrow complexes that had lots of sign in winter or spring may appear almost deserted in late summer, with few pellets present, and then appear repopulated later.

Pygmy rabbits may use burrows less in summer and fall. In the fall, in SW Idaho, Ulmschneider found many burrows in big sagebrush islands on a valley bottom, with a mix of old and a few brown pellets. Several hundred yards away, under very dense tall sagebrush and bitterbrush on a rocky side slope, lots of fresh small pellets and a pygmy rabbit were observed, although no burrows were found right there. Rachlow (pers. comm.) found a similar situation in the summer in Montana, where there were lots of small pellets but no burrows in very tall sagebrush, and lots of burrows with few pellets in a nearby area. Apparently pygmy rabbits may abandon their burrows at that time of year in favor of dense cover, perhaps due to parasites. Himes (pers. comm.) also observed pygmy rabbit pellets without burrows in dense sage in Nevada in late summer.

In Nevada, Sequin (pers. comm.) has observed pygmy rabbits using certain areas dominated by rabbitbrush only during the dryer part of the year, late spring through fall. These areas have "loamier" soils that are much wetter in winter. Burrows in these areas often disintegrate during the winter, and there is no evidence of rabbits remaining in the area, by tracks, photo monitoring, or sightings. New burrows are then excavated in this habitat in spring. However, during all seasons, rabbits were still found in the adjacent sagebrush-dominated areas.

Winter may be a better time of year to confirm rabbit presence than the summer and fall. After a fresh light snow, fresh tracks and fresh pellets are obvious. Also, rabbits clean out burrow entrances after a snow, which helps identify occupied burrows. Pygmy tracks can often be followed to a burrow entrance. Winter logistics can become difficult, though, as snow deepens. Additionally, rabbits begin to burrow under the snow as it deepens, and you may not see much sign on the surface.

When initial surveys are conducted in the summer, and if you find possible or "old" pygmy rabbit sign, plan to return in late fall or winter and check again. For monitoring known populations, the time of the year should be consistent.

In the spring, rabbits appear to be active at their burrows; however, pellets can be more confusing because pregnant females make larger pellets that can be confused with cottontail.

Recording data

The basics to record are where and when you surveyed, whether you found burrows and pellets or not, and burrow locations and status. If you did find pygmy rabbit burrows, categorize, count them, and map them and your survey route.

Classify the status of each pygmy rabbit burrow system (not each entrance) according to the following system:

Used burrow plus fresh pellets (B+FP): brown pellets near a burrow, at least one entrance open, without cobwebs or debris that shows lack of use, usually shows a trail. In snow, tracks and/or pellets visible.
Unused burrow plus fresh pellet (UB+FP): burrow entrances have cobwebs, grass seeds, or other debris in entrance, but with brown pellets. May show transitory use.
Burrow plus old pellets (B+OP): only grey pellets at a burrow, entrances may show signs of non-use.
Burrow, no pellets (B): burrow entrance is not collapsed but no pellets found. Also use this category for burrows in snow where no tracks or pellets are visible.
Collapsed burrow (Col): No pellets
Pellets only (P): No burrows found, but pellets appear right for pygmy rabbit. (Collect and label.)
Fresh digging at a burrow but no pellets (B+dig): Digging may have been by a predator such as coyote or badger. If it was a predator, it was most likely digging after prey, and the prey may have been pygmy rabbit.
Possible PR burrow (Poss): Burrow seems right for pygmy rabbit, but there are confusing pellets or no pellets, or it is not in association with other pygmy rabbit burrows (identified by pellets or sightings).

There are several options for recording data, depending on the equipment available: electronically with GPS units, paper data forms, topographic maps, and aerial photos. With GPS units, one might think that it would be easy to map a polygon delineating a pygmy rabbit population, instead of walking a transect and mapping burrows. However, in the field one soon finds that mapping polygons is difficult and complicated, unless they are very small, and generally requires much more wandering about than walking a transect through a habitat patch, as you try to determine the extent of an often complicated population, exactly where the burrows stop, and then try to walk the perimeter. Additionally, a transect with burrow points added up along it will give you an index of burrow density that can be measured in future years (most GPS units are accurate within about 2 meters), which a polygon will not give you. If you try to do both, you will greatly lose efficiency! The simplest way to delineate the habitat is to draw the approximate extent of the habitat on a topographic map or aerial photo, after you finish your transect.

1. GPS unit with a data dictionary (e.g., GeoExplorer 3): *note your projection on a data sheet e.g., NAD 27.* (A "data dictionary" is an electronic data form that can be filled out directly into the GPS unit, and later downloaded directly to a computer. It can be created to match the paper data form given at the end of this paper.)
With a Geo Explorer 3 or other GPS unit that has capability for a data dictionary:

- Record your survey route (where you walked) using a line feature. You can interrupt the line where you record a pygmy rabbit point (i.e., a burrow system), and then resume it afterwards.
- Record each pygmy rabbit burrow system (not individual openings) as a point feature, using a pygmy rabbit data dictionary that includes the essential information on the data form at the end of this paper. Use the "repeat' feature, and when you become skilled, it will only take about 30 seconds to record a burrow. Burrow systems may be about 15 ft across. In areas with dense burrows, it may be difficult to decide when to record a new burrow system. One rule of thumb is to record a new burrow system at least 30 ft apart

(however they can be much denser than that; in Montana, Rauscher [1997] found an area with 8 burrow systems within 30 m).

- Take daily field notes of where you surveyed for the day, habitat, numbers of burrows in each status category, extent of habitat, why you thought they were or weren't from pygmy rabbits, general findings (no sign, old sign, lots of current sign, other critters), any other notes that would help someone else determine where you looked, what you found, and the validity of what you found. Remember that it is possible to lose GPS data, and that general notes are often extremely useful in interpreting the data! Remember zeroes are important to record and discuss!
- Map your survey areas on a topographic map or aerial photo, with date, your name, and a key to any symbols used.
- When finding pygmy rabbit sign in a new area, take samples of droppings and label each container with date, location, and your name (film canisters work well, or plastic zip bags).
- Take photos of burrows, landscape setting, and any other sign (tracks, trails, bones, pellets). Label your photos with date, location (Township, Range, Section and ¼ sections), your name, and what it shows.
- Also mark your driving routes on the maps, when you are within a search area and looking for target habitat to do foot surveys.

2. <u>GPS unit without a data dictionary:</u>
   - Record your survey route using a line feature and pygmy rabbit burrow systems using a point feature, as above.
   - Use the paper data form to record the necessary information.
   - Collect pellets and take photos as above.
   - Mark your survey areas on a topographic map or aerial photos, with date, your name, and general findings.
   - Also mark your driving routes on the maps.

3. <u>No GPS unit (or GPS unit with a dead battery!)</u>
   - Use aerial photos and/or topographic maps to record locations of any burrow systems found and of your survey route. Label each map and photo with "Pygmy Rabbit Survey," dates, your name, and a key to burrow classification and survey routes.
   - Alternatively, if burrows are too dense or difficult to map separately, map out your survey route and the area where burrows are found.
   - Keep a tally of burrow systems in each category as you walk a transect within the area delineated (see data sheet). Also mark your driving routes on the maps.

Other Methods

Traps

Trapping is not effective for general surveys. It may be useful once you know where you have the right burrows for further study or to confirm presence. Even in areas with known dense populations of pygmy rabbits, and putting traps right in the entrances of burrows that show fresh activity, trapping success rates are low (0-4%). Burrows are always there and usually distinctive, and therefore are more useful for general surveys.

Camera with automatic trigger (from Eveline Sequin)

Cameras can be used to determine if pygmy rabbits are currently active in an area. Photographs provide direct and convincing evidence that rabbits are present and provide a permanent record. Once burrows are located, or unconfirmed sightings are reported, cameras can be left at the site with minimal human attention to collect the required data. Cameras are able to visually detect pygmy rabbits at locations where other survey methods do not detect them, and may be especially helpful in the spring when the potential presence of other young rabbits may confuse pellet surveys.

Equipment for an "active" camera set-up consists of a camera connected to an infrared beam unit (sender and receiver) that triggers the camera when the beam is interrupted. These infrared units are sold as burglar alarms for modest prices at electronic stores such as Radio Shack®. "Passive" camera setups are triggered by a motion or heat sensor. Active infrared cameras have proven to be more cost effective than passive cameras because they can easily be set in vegetated areas without being triggered by the surrounding moving vegetation.

First a site inspection should be conducted by walking around the area looking for burrowing activity, animals and fresh pellets. Next, set up one active infrared-triggered camera in a central location (near burrows if they have been located). Cameras can be set either across the entrance of an active burrow, or across an open area nearby. The receiver should be set to trigger the camera if the infrared beam is blocked for 0.5 seconds (1 infrared pulse, or the minimum amount of pulses the unit will allow). To make the camera units even more sensitive, reduce the width of the infrared lens to 1 mm with black electrical tape. This combination of settings is responsive enough to capture full body images of rabbits even when they are surprised by the flash or noise. Set the transmitter about 2-4m from the receiver and camera allowing plenty of area for rabbits to travel between the two units. The beam should be set at a height of approximately 5 cm. Set a camera delay of 1 or 2 minutes so that one animal will not use up the entire roll of film. Use 100 or 200 ASA film, and set the cameras to be active 24 hours a day. In locations where pygmy rabbits are known to be active, it was shown that cameras were usually able to record their presence over the course of one week. Depending on the site and the season, the roll of film will be used up in a few days or over the span of a week. In winter, snow may trigger the camera and use all film in an hour.

It is possible to distinguish pygmy rabbits from other rabbits (juvenile jackrabbits, cottontails) using this method. Adult pygmy rabbits can be distinguished reliably by their tails, heads, ear shape, and size in relation to camera equipment. Juvenile cottontails and jackrabbits can be distinguished by tails, head and ear shape, and coloration. Individual rabbits are generally photographed multiple times at one camera location. Therefore, even if not every photograph is entirely conclusive, the multiple angles of single individuals allow for conclusive evidence. If for some reason only one questionable photograph is received, the camera can always be set out for another week. Comparison photos of rabbit species by Eveline Sequin may be viewed at www.wildlife.utah.gov/habitat.

Spotlighting

It is possible to see pygmy rabbits by spotlighting at night; however, it is not as effective or efficient as looking for burrows. Burrows are permanent and easy to spot once you know what to look for, and you can look for them in the day. Spotlighting may be useful for confirming presence by seeing a rabbit once you find an area with burrows, however, the daytime area searches described above are probably more practical. Rauscher reports, "I attempted to spotlight pygmy rabbits in an area I knew to have a relatively high density of rabbits. I only saw 2 pygmy rabbits. This method is not very effective."

Peeper Probe

This is a flexible cable with an infrared camera on the end, allowing you to look down a burrow. It may be useful, once you have found burrows, in spotting a rabbit or helping to identify what species dug a burrow in questionable cases. You may be able to figure out how to distinguish the underground features of pygmy rabbit burrows versus other burrows. Rauscher in Montana has used these probes in known occupied sites, and was able to see pygmy rabbits; however, he thinks that it is probably not too useful or effective for general surveys. The peeper probe may be useful for some aspects of demographic studies, such as looking into natal dens (J. Rachlow, pers. comm.) Females apparently dig single, simple burrows for giving birth, and fill the entrance with dirt, so these burrows may be hard to find.

Inquire of Locals; Check Hunting Records
Ask hunters or ranchers who have bagged or claim to have seen pygmy rabbits. On all state-owned Wildlife Management Areas that permit hunting, hunters are required to fill out and submit a card afterwards that indicates their kill to the respective state wildlife agency, which would be an additional way of determining potential sites to survey for pygmy rabbits

Track Plots
To determine presence of pygmy rabbits near a burrow, lay aluminum tracking sheets on the ground or make cleared track plots, and cover them with a thin layer of fine dust to record tracks.

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Appendix A. Persons Knowledgeable about Pygmy Rabbits

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PYGMY RABBIT SURVEY FORM

Observer(s): ______________________ Affiliation: ____________

Address: ______________________ Phone: ____________

Observation Date: ________ Site Name: ____________ Co.: ________ State: ________ Site #: ________

Township: ______ Range: ______ Meridian: ______ Section: ______ Quarter/Quarter: ______ of Quarter: ______

Project / Transect ID #: ______________ Field Map ID: ______________

Survey Method: ______________ Search Time: Start : ________ Stop : ________

GPS Data

Projection: Decimal Degrees ☐ Decimal Minutes ☐ Degrees/Minutes/Seconds ☐ UTM Zone: 10 ☐ 11 ☐

Datum: NAD27 ☐ NAD83 ☐ WGS84 ☐

Coordinates:

Starting point Easting ____________ Northing ____________ Elevation ____________

Accuracy: PDOP ______ FOM ______ +/- ________ Feet ☐ Meters ☐

Land Ownership: State ☐ BLM ☐ USFS ☐ USFWS ☐ Private* ☐ (state below)
Tribal ☐ Military ☐ Nat. Park ☐ Other: ____________

*Private landowner / Address / Phone: ______________________

Potential Threats to Area: Agriculture☐ Fire☐ Development ☐ Grazing ☐ OHV ☐ None Other: ________

Summary of Results for Survey Route Pellets collected? Yes ☐ No ☐

Pygmy rabbit observed? Yes☐ No ☐ Pygmy Rabbit sign observed? Yes ☐ No ☐ Possible burrows ☐ Possible Pellets ☐

Summary of numbers of burrows B+FP: _ B+OP: B: _ _ UB+FP: Col: _ _ B+dig:__ FP alone: _ ____

Length of survey route Miles: Feet: Meters:

Predators (T- tracks, S–scat, V-visual) Coyote T S V Fox T S V Badger T S V Weasel T S V Bobcat T S V Raptor T S V Other

Notes. *Provide directions, describe landscape setting, note other animals, explain why if no pygmy rabbits were found, describe behavior of any pygmy rabbits seen, etc.*

CODES FOR DATA

Burrow Status	**B+FP –** used burrow plus brown, green, or black pellets	**B+OP** – burrow plus grey pellets	**B –** open burrow, no pellets	**UB +FP** Unused burrow, fresh pellets	**Col –** collapsed burrow	**B+dig –** burrow, fresh digging, no pellets	**FP –** fresh pellets alone	**Poss** Possible PR burrow
Burrow Details	**T** –Clean trail **O** – Open **Col** – Collapsed **Deb**- Debris filled **Dig** - Fresh digging **TS** – tracks in snow **US** – Untracked snow **B** - At base of bush **R** - At base of rock **E**– Enlarged by predator							
Pellet Quantity	**H –** high**,** lots, a carpet **M –** moderate **F-** few							
Soil	**L** - Loam **S** - sand **C** - Clay **G -** Gravelly **R** - Rocky							
CanopyCover (20 ft radius)	**S –** shrubs **F -** Forbs **G** – grass **B** - bare ground **0** –(0 – Trace) **1** - (1-10%) **2 -** (11-25%) **3 -** (26-50%) **4** - (51-75%) **5** – (76-100%							
Grazing use level	**0** - None **1** - slight **2** - light **3** - moderate **4** - heavy **5** – severe *Use descriptions from BLM's Landscape Appearance Method*							

Burrow #	**UTM Easting**	**UTM Northing**	**Status**	**Burrow details**	**Pellets**	**Soil**	**Canopy Cover**				**Grass Use levels**	**Pygmy rab seen**	**# of entrances**	**Comments**
							Shrub	**Grass**	**Forbs**	**Bare**				

BLM's Landscape Appearance Method for classifying Grazing Use Level:

1. **None** (0-5 %). The rangeland shows no evidence of grazing use; or the rangeland has the appearance of negligible grazing.
2. **Slight** (6-20%). The rangeland has the appearance of very light grazing. The key herbaceous forage plants may be topped or slightly used. Current seedstalks and young plants of key herbaceous species are little disturbed.
3. **Light** (21-40%). The rangeland may be topped, skimmed, or grazed in patches. The low value herbaceous plants are ungrazed and 60 to 80 % of the number of current seedstalks of key herbaceous plants remain intact. Most ground plants are undamaged.
4. **Moderate** (41-60%). The rangeland appears entirely covered as uniformly as natural features and facilities will allow. Fifteen to 20 % of the number of current seedstalks of key herbaceous species remains intact. No more than 10 % of the number of low value herbaceous forage plants are utilized. (Moderate use does not imply proper use.)
5. **Heavy** (61-80%). The rangeland has the appearance of complete search. Key herbaceous species are almost completely utilized with less than 10 % of the current seedstalks remaining. Shoots of rhizomatous grasses are missing. More than 10 % of the number of low value herbaceous forage plants have been utilized.
6. **Severe** (81-100%). The rangeland has a mown appearance and there are indications of repeated coverage. There is no evidence of reproduction or current seedstalks of key herbaceous species. Key herbaceous forage species are completely utilized. The remaining stubble of preferred grasses is grazed to the soil surface.

Pygmy Rabbit Summary Sheet

Burrows

- 5-10 inches in diameter
- Placed under sagebrush
- In relatively tall dense sage

Pellets

Pygmy Rabbit	Cottontail	Jackrabbit
4-6 mm – in carpets near burrow is diagnostic	6-10 mm	9-12 mm

Tracks – length of hind foot

Pygmy Rabbit	Cottontail	Jackrabbit
46-71 mm	77-90 mm	90-103 mm

Visual

Pygmy Rabbit	Cottontail	Jackrabbit
Brown tail	White tail, obvious from rear	Black-tipped tail (blacktail) or whitish tail (whitetail)
Ears 2 1/4 – 2 1/2 in, about length of head	Ears 2 1/5 – 2 3/5 in, about length of head	Ears 5-7 in, way longer than head, and black tipped
Won't run far, zigzags, often stops at sagebrush or burrow	Bolts fast and far	Bolts fast and far
Small – 8 1/2-11 in	Medium – 12-14 in	Large – 17-21 in Blacktail; 18-22 in Whitetail.

APPENDIX C-1

FEDERALLY LISTED PLANT DESCRIPTIONS

APPENDIX C-1

FEDERALLY LISTED PLANT DESCRIPTIONS

Howell's spectacular thelypody (*Thelypodium howellii* ssp. *spectabilis*) – US Threatened; Oregon Endangered.

T. howellii ssp. spectabilis is a biennial herb belonging to the mustard family, Brassicaceae. During the first growing season this species typically forms a rosette with wavy-margined leaves. Ultimate height is one to two feet. Numerous pinkish-purple flowers with four petals on slender, elongate racemes occur in late May through June. Fruits are siliques (long, slender pods), maturing by mid-July. Seeds apparently germinate immediately, with new plants overwintering as basal rosettes. Preferred habitat is moist, alkaline valley bottoms dominated by basin wildrye (*Leymus cinereus*), alkali-grasses (*Distichlis stricta, Puccinella lemmonii, Poa juncifolia*), and black greasewood (*Sarcobatus vermiculatus*). Sites are usually in alluvial outwash areas, near streams or rivers, with seasonal moisture (ODA, Plant Division 2008).

Slickspot peppergrass (*Lepidium papilliferum*) – US Threatened; Idaho BLM Type 1.

L. papilliferum is an herbaceous, annual or biennial plant, also in the mustard family. It grows 4-12 inches in height with clusters of small white flowers containing four petals each. Plants are densely papillose-puberulent (having clusters of fine hairs). Flowering occurs in May through June. *L. papilliferum* occupies slick spots, also called mini-playas or natric sites. These are distinct, small, typically whitish patches with a clay subsurface soil horizon and exhibit higher alkalinity than surrounding soils. Slickspots are found scattered in sagebrush-steppe habitat at elevations ranging from 2,200 to 5,400 feet. Due to poor soils, vegetation is often sparse in undisturbed slickspots (Menke and Kaye 2006).

APPENDIX C-2

OREGON STATE LISTED AND
BLM / FOREST SERVICE SENSITIVE PLANT
DESCRIPTIONS

APPENDIX C-2

OREGON STATE LISTED AND IDAHO BLM SENSITIVE PLANT DESCRIPTIONS

Biennial stanleya (*Stanleya confertifolia*) – Oregon BLM Sensitive; Idaho BLM Type 2

S. confertifolia is a biennial (living two years) mustard (family Brassicaceae) also known as Malheur or biennial princesplume. Flowers are cream or yellow in color and form a dense raceme. Plants flower from April through June and may reach 3 feet in height. The species typically grows on dry plains in clay soils that are somewhat sparsely vegetated. Elevations range from 2,400 feet to 5,000 feet (Atwood and Debolt 2000).

Bigelow's four-o'clock (*Mirabilis laevis* var. *retorsa*) – ORHNIC List 2

Mirabilis laevis var*. retorsa* is a perennial forb from the Nyctaginaceae family. It has calyx-like involucres which are campanulate and clustered near the ends of branches. What appears to be pink to purple-red petals, are in fact cleft petaloid sepals. It has five stamens that extend beyond the sepals. It typically flowers from December to June (eFloras 2008).

Calcareous buckwheat (*Eriogonum ochrocephalum* var. *calcareum*) – Idaho BLM Type 3

A member of the buckwheat family (Polygonaceae), *E. ochrocephalum* var. *calcareum* is a mat forming plant with glabrous, elliptic or oblong, grey-green leaf blades. Scapes grow from 4 to 14 inches and have many small yellow flowers arranged in a terminal umbel/head. Flowering occurs from May through August and occasionally into September. This species grows on rolling, sparsely vegetated, clay hills among four-wing saltbush, shadscale, and spiny hopsage communities at 2,100 to 3,300 feet (Atwood and Debolt 2000).

Cronquist's Stickseed (*Hackelia cronquistii*) – Oregon State Threatened; ORHNIC List 1; Oregon BLM Sensitive

H. cronquistii is a perennial borage (Family Boraginaceae) growing 8 to 26 inches tall with blue tinged white flowers. Flowering occurs in May; seeds ripen in June. The species inhabits sandy sagebrush slopes, sometimes moist slopes in ravines, at elevations between 2,000 to 2,500 feet; nearly always on north facing slopes. Associates are big sagebrush (*Artemisia tridentata*)*,* Indian ricegrass (*Achnatherum hymenoides*)*,* bluebunch wheatgrass (*Pseudoroegnaria spicata*)*,* spiny hopsage (*Grayia spinosa*)*,* cheatgrass (*Bromus tectorum*), and many others (OFP 2007).

Cusick's false yarrow (*Chaenactis cusickii*) – Idaho BLM Type 2; ORNHIC List 4**

C. cusickii is an annual in the Asteraceae (sunflower) family. It is small in stature (less than 4 inches tall) with entire, linear leaves and sparsely wooly stems. Flowers are small, white to pinkish and disk-like clustered into heads, and bloom from May through June. This species grows on volcanic ash, especially the Succor Creek formation, in open places within the Wyoming big sagebrush and desert saltbush zone. Elevations range from 2,200 to 4,300 feet (Atwood and Debolt 2000).

Cusick's lupine (*Lupinus lepidus* var. *cusickii*) – Oregon State Endangered; ORNHIC List 1; Oregon BLM Sensitive

L. lepidus var. *cusickii* is a perennial in the pea family, Fabaceae. Morphology is low and spreading, with plants generally shorter than one foot. Plants are often grayish and the main stems are leafy. Flowering occurs in mid-June. Populations have been verified for only five sites in eastern Baker County along the Burnt River. The species is found in dry, open settings extending from barren upper slopes to rather dense stands of sagebrush on lower slopes. Substrates often consist of eroding slopes of volcanic ash (Newton and Thorpe 2010).

Desert pincushion (*Chaenactis stevioides*) – Idaho BLM Type 4

Also, an annual plant in the sunflower family, *C. stevioides* grows to approximately one foot in height. Leaves are deeply lobed to divided. Flowers are whitish, disk-like and clustered into heads. Flowering occurs from April through June. This plant typically grows in open sandy sites in salt desert shrub communities up to 4,000 feet elevation (Atwood and Debolt 2000).

Dimeresia (*Dimeresia howellii*) – Idaho BLM Type 3

D. howellii is an annual in the Asteraceae family. Flowers are white to pinkish or purple and all alike and perfect. Plant has mostly discoid heads and is wooly at base. Phenology is June in Idaho. Habitat is high desert foothills and dry areas on rocky, cinder or gravelly soils, from 3600 – 9600 ft elevation. Idaho occurrences are in Owyhee County (Atwood and Debolt 2000).

Douglas' clover (*Trifolium douglasii*) – Oregon BLM Sensitive

T. douglasii is member of the pea family, Fabaceae. Flowers are numerous (50-100) reddish-purple, tube-like, and clustered into a head at the top of the stem. Leaves are alternate and contain leaflets of three. This species typically blooms June through July. Habitats include moist to wet meadows, forested wetlands, and streambanks (WDNR 2000).

Greeley's wavewing (*Cymopterus acaulis* var. *greeleyorum*) – ORNHIC List 1; Oregon BLM Sensitive; Idaho BLM Type 3

C. acaulis var. *greeleyorum* is a perennial plant belonging to the Apiaceae (carrot) family. Its leaves are divided into lobed leaflets. Inflorescences consist of umbels made up of many small yellow flowers with yellow stamens (in contrast to var. acaulis which has white stamens). This species flowers from March through April and fruits into early June. It occurs on brown and white volcanic ash in Wyoming big sagebrush, salt desert shrub and Indian ricegrass zones (Atwood and Debolt 2000).

Janish's penstemon (*Penstemon janishiae*) – Idaho BLM Type 2

P. janishiae is a perennial plant in the figwort family (*Scrophulariaceae*). Flowers have large corollas from 18 to 28 mm long that abruptly expand into broadly netricose-ampliate throat (7 to 12 mm). The upper lip is from 8 to 13 mm long. Flowering occurs from late May through

June. This species is found in clay soils derived from volcanic ash or lake bed sediments in sagebrush communities from elevations of 2,600 to 4,300 feet (Atwood and Debolt 2000).

Laurence's milk-vetch (*Astragalus collinus* var. *laurentii*) – Oregon State Threatened; ORNHIC List 1; Oregon BLM Sensitive

A. collinus var. *laurentii* is a perennial herb in the pea family (Fabaceae) that branches freely into small leaflets. Flowering occurs from May to July; the flower petals are cream or yellowish. Fruit (pendulous pods bearing short, shaggy hairs) are present from June to early August. The species occurs on dry slopes in areas with loess deposits, occasionally with sandy or rocky substrates, in bluebunch wheatgrass-Idaho fescue (*P. spicata-Festuca idahoensis*) palouse grassland or canyon communities. The majority of sites are in roadsides adjacent to wheatlands, or on canyon walls above streams and below the farmlands (Kagan, Morgan, and Blakely 2000).

Least Phacelia (*Phacelia minutissima*) – Idaho BLM Type 2

P. minutissima is a member of the waterleaf family (Hydrophyllaceae) that flowers April through July. It is the only annual *Phacelia* of moist habitats in Idaho. Distinguishing characteristics include unequal fruiting calyx lobes, mostly cauline leaves, and inflorescence terminating at the stem. The tubular-campanulate corolla is lavender and inconspicuous (Atwood and Debolt 2000).

Least snapdragon (*Sairocarpus kingii*) – State of Idaho Priority 1

S. kingii is an annual herb in the figwart family(*Scrophulariaceae*). It is found in pinyon-juniper woodlands from 1,600 feet to 7,500 feet. Plant is often clinging to other plants, raceme solitary with corolla of white flowers 5 to 7 mm, veins violet. Flowers from late April to mid July (JOI 2011).

Malheur cryptantha (*Cryptantha propria*) – State of Idaho Review Species

M. propria is a densely caespitose perennial herb in the borage family (Boraginaceae). Plants from 1 to 2.5 dm tall, with green, finely strigose and appressed-setulose pubescence. Species found on bare soil of ash and clay on open hillsides at elevations from 3,000 to 4,000 feet. Flowers from April through May (Atwood and Debolt 2000).

Malheur Yellow Phacelia (*Phacelia lutea* var. *calva*) – Idaho BLM Type 3

P. lutea var. calva is an annual belonging to the Hydrophyllaceae (waterleaf) family. Stems sometimes numerous, spreading. Plant is 1-4 cm tall. With exception of the inflorescence, the plant is glabrous. Corolla is yellow, with filaments usually surpassing the corolla sinuses.
Found in Owyhee County, Idaho on volcanic ash soils in Wyoming sagebrush or salt desert shrub zones from 2900-5300 feet elevation. Blooming period is May through June (Atwood and Debolt 2000).

Many-flowered phlox (*Phlox multiflora*) – ORNHIC List 2; Oregon BLM Sensitive

This species is in the phlox family, Polemoniacea. *P. multiflora* originates from a taproot. Its numerous, occasionally almost erect stems (usually less than 4 inches tall) form a loose mat. One to three white (occasionally bluish) flowers are borne on the ends of the stems. The blooming period is from May to August (MPL 2011).

Mingan's moonwort (Botrychium minganense) – Oregon BLM Sensitive

B. minganense is a member of the fern family (Ophioglossaceae). Annually, it produces a single dull green, somewhat fleshy frond which is divided into two parts, a sterile trophophore and a fertile sporophore, which share the same stalk. The frond is usually less than 6 inches tall and is often much smaller. Emergent fronds may be observed from July through September (Vanderhorst 1997).

Mountain moonwort (Botrychium montanum) – Oregon BLM Sensitive

B. montanum is a member of the fern family (Ophioglossaceae). This species is a small perennial fern with a single above ground frond. The frond varies in height up to about 12 cm tall, is a dull glaucous gray-green, somewhat succulent, and divided into two segments which share a relatively short common stalk. Emergent fronds may be observed from July through September (Vanderhorst 1997).

Mulford's milk-vetch *(Astragalus mulfordiae)* – Oregon State Endangered; ORNHIC List 1; OR BLM Sensitive; Idaho BLM Type 2

A. mulfordiae is a perennial herb in the pea family. This species grows about 4-12 inches tall. Leaflets are paired except for the single terminal leaflet. Flowers are pea-like and whitish. Flowering occurs from late April to June, in fruit May to June. Fruits are peapod-like. The species occurs on old river deposits, sandy places near rivers, sandy bluffs, and dune-like talus in the foothills near the Snake River and on the Snake River Plain in northeastern Malheur County, Oregon and adjacent Ada, Owyhee and Washington Counties, Idaho (Atwood and Debolt 2000).

Oregon Semaphore Grass *(Pleuropogon oregonus)* – Oregon State Threatened; ORNHIC List 1; Oregon BLM Sensitive

P. oregonus is a perennial grass (Family Poaceae) 20-35 inches tall with slender rhizomes that have purplish-red scales. Culms are erect with overlapping sheaths. The ligule is 4-5 mm long, white and lacerate. Leaf blades are erect, flat, 3-7 inches long, abruptly narrowed into an acute apex. Flowering occurs in June, fruiting in June and July. The species inhabits moist meadows and marshland at about 2,500 to 4,000 feet in association with aquatic and semiaquatic species (OFP 2007).

Owyhee Clover *(Trifolium owyheense)* – ORNHIC List 1; Oregon BLM Sensitive; Idaho BLM Type 2

T. owyheense (Family Fabaceae) is a glaucous perennial plant with several spreading stems reaching 8 inches in length. The leaflets are thick, broad, overlapping, more or less emarginate, glaucous-green with white crescents. Flowering occurs in May and June, seed ripe June through August. The species inhabits bare slopes composed of loose diatomaceous talus or volcanic ash. Surrounding plant communities are dominated by sagebrush and juniper (*Juniperus occidentalis*). This species is a regional endemic to Owyhee uplands: Malheur County, Oregon and Owyhee County, Idaho (OFP 2007).

Packard's Mentzelia *(Mentzelia packardiae)* – Oregon State Threatened; ORNHIC List 1; Oregon BLM Sensitive

M. packardiae (Family Loasaceae) is a small, upright annual forb with linear leaves and solitary yellow flowers in terminal clusters. Flowering occurs in May and June, fruiting in June. The species is restricted to volcanic ash high in potassium, growing on loose slopes with other ash endemics such as Owyhee clover (*T. owyheense*), and Least yellow phacelia (*Phacelia lutea*) within the surrounding sagebrush-saltbush/bunchgrass zone. Narrow endemic in extreme east-central Malheur County, Oregon, near Idaho border (OFP 2007).

Packard's Wormwood (*Artemisia packardiae*) – ORNHIC List 4

Artemisia packardiae is a perennial forb from the Asteraceae family. It occurs along the boarder of Oregon, Idaho, and Nevada; it typically grown on basalt rock outcrops in shallow poorly developed soil. It forms a pistillate flower that is typically yellow. It blooms during late summer (eFloras 2008).

Red-fruited lomatium *(Lomatium erythrocarpum)* – Oregon State Endangered; ORNHIC List 1; Oregon BLM Sensitive

L. erythrocarpum is a perennial short-stemmed forb in the carrot family, Apiaceae. The plant is glabrous throughout and grows 2-3 inches tall. Stems, petioles, and peduncles are often purplish. Petals and anthers are purplish-white (petals with a purple midvein), fading to white. Flowering occurs in June through July. Fruits mature by mid-July, and drop by late July or early August. Suitable habitat is comprised of dry, moderately steep south-facing slopes of sandy-stony granodiorite soil and talus. This species occurs between lower shrub-steppe (dominated by mountain mahogany (*Cercocarpus ledifolius*) and big sagebrush (*A. tridentata*) and higher subalpine woodland (dominated by whitebark pine (*Pinus albicaulis*) and Engleman spruce (*Picea engelmannii*)) (Yates 2005).

Retrorse sedge (*Carex retrorsa* **)** – ORNHIC List 2; Oregon BLM Sensitive

A member of the family Cyperaceae, *C. retrorsa* contains leaves with dark reddish brown basal sheaths, mid to dark green blades that are flat to W-shaped Inflorescences 3–20(–35) cm; proximal bract 19–70(–100) cm, (2.5–)3–9 times longer than inflorescence; proximal (2–)3–6 spikes pistillate, ascending to spreading. Fruiting occurs June through Aug. Swamps, wet thickets, often along streams, marshes, sedge meadows, shores of streams, ponds, and lakes (Wilson et al. 2008).

Salt heliotrope (*Heliotropium curassavicum*) – ORNHIC List 2; Oregon BLM Sensitive

H. curassavicum belongs to the family Boraginaceae. Numerous white flowers are arranged in a helicoid fashion. The foliage is grey-green and decumbent (lying on the ground) with peduncles reaching up to 1 foot. This species occurs in association with wetlands. The blooming period is mid-spring (JOI 2011).

Simpon's Hedgehog Cactus (*Pediocactus simpsonii*) – Idaho BLM Type 4

P. simpsonii is a perennial in the Cactaceae (cactus) family. Plants consist of 1 to several globose to ovoid stems. Flowers are borne on the side of the areole at the tubercle apex. Corollas are yellow to purplish. Tubercles in 8-13 spiral longitudinal rows. Lacks longitudinally ribbed stems. Found on rocky or sandy benches and canyon rims in low sagebrush, budsage, and sandberg bluegrass communities, from 2900 to 6000 feet elevation. Blooming period is May through July (Atwood and Debolt 2000).

Smooth Mentzelia (*Mentzelia mollis*) – Oregon State Endangered; ORNHIC List 1; Oregon BLM Sensitive; Idaho BLM Type 2

M. mollis (family Loasaceae) is a small, finely hairy, branching annual growing 2-4.5 inches tall with small bright yellow flowers clustered in a terminal head. Flowering occurs in May and June. *M. mollis* is found only on green or grey montmorillonite derived from the Succor Creek formation with abnormally high potassium content. Restricted to volcanic ash outcrops in the Succor Creek drainage, Malheur County, Oregon and adjacent Idaho at elevations around 4,500 feet (OFP 2007).

Snake River Goldenweed (*Pyrrocoma radiata*) – Oregon State Endangered; ORNHIC List 1; Oregon BLM Sensitive; Idaho BLM Type 3

P. radiata is a large herbaceous perennial in the sunflower family, Asteraceae. Plants have clasping stem leaves and large, yellow headed flowers. Flowering occurs in July; germination may occur both in fall and spring. Dieback depends on severity of frosts. The species is commonly associated with big sage/bluebunch wheatgrass-Sandberg's bluegrass communities. Slopes and aspect vary, but rarely occurs on north slopes. Elevations range from 2,000 to 4,000 feet on shallow, mesic, slightly acidic soils (OFP 2007).

Sterile Milk-vetch (*Astragalus cusickii* var. *sterilis*) – Oregon State Threatened; ORNHIC List 1; Oregon BLM Sensitive; Idaho BLM Type 3

A. cusickii var. *sterilis* (Family Fabaceae) is a small, wiry, perennial herb with one to three 2-6 inch stems arising from an underground rootstock. Leaves have 6 to 8 widely spaced tiny 1/4 inch leaflets. Loosely clustered white flowers grow on an upward curving stem with 2 to 5 blooms per stalk. The species flowers in June and July, although many plants (stems) are often sterile. Flowers are followed by pendulous, inflated, purple mottled green fruit pods. Plants occur on open ash deposits nearly bare of other vegetation in the canyonlands of the Owyhee Uplands (OFP 2007). Given the specialized habitat requirements for this species, exact survey locations will be determined following the comprehensive vegetation and habitat mapping phase.

Stiff milkvetch (Astragalus conjunctus) – Idaho BLM Sensitive

A. conjunctus in a member of the pea family (Fabaceae). It is easily discinguished by its ascending flowers and connate proximal stipules. Habitat includes rocky hilltops, hillsides and canyon benches of sagebrush and steppe-desert communities from elevations of 3,600 to 5,200 feet. Flowers from mid-April through June (Atwood and Debolt 2000).

White-margined waxplant (*Glyptopleura marginata*) – Idaho BLM Type 4

G. marginata is a small (1-3 inches in diameter) prostrate annual herb in the family Asteraceae. Leaves are crustaceous-margined and shallow-lobed. Inflorescences consist of inconspicuous whitish ray flowers which bloom May through June. It occurs in dry sandy-gravelly or loose ash soils among shadscale, greasewood, spiny hopsage, rabbitbrush, winterfat, and sagebrush communities at elevations ranging from 2,600 to 4,000 feet (Atwood and Debolt 2000).

*Species is also considered sensitive in Idaho, but no known occurrences are present within 5 miles of the preferred route.

**Species is a “watch species” (ORNHIC List 4) in the state of Oregon; therefore, not part of the survey there.

ORNHIC LIST AND OREGON & IDAHO BLM RANK EXPLANATIONS

ORNHIC Lists:
List 1: Threatened or Endangered throughout range
List 2: Threatened, Endangered, or extirpated from Oregon; secure elsewhere
List 3: Review species
List 4: Watch species

Oregon BLM rankings:
Sensitive – A designation made by The BLM State Director under national policy (BLM manual 6840). Sensitive species equate to ORNHIC List 1 and 2 parameters.

Strategic – Strategic species equate to ORNHIC List 3 parameters.

Idaho BLM rankings:
Type 1 – Threatened, Endangered, Proposed, and Candidate Species: species listed by the USFWS as Threatened or Endangered, or Proposed or Candidates for listing under the Endangered Species Act (ESA) of 1973.

Type 2 – Rangewide/Globally Imperiled Species – High Endangerment: species with a high likelihood of being listed in the foreseeable future due to their global rarity and significant endangerment factors.

Type 3 – Rangewide/Globally Imperiled Species – Moderate Endangerment: species that are globally rare with moderate endangerment factors. Their global rarity and inherent risks associated with rarity make them imperiled species.

Type 4 – Species of Concern: species that are generally rare in Idaho with small populations and/or localized distribution which currently have low threat levels. Due to the small populations and habitat area, certain future land uses in close proximity could significantly jeopardize these species.

Type 5 – Watch List: species not considered BLM sensitive species, and associated sensitive species policy guidance does not apply. Watch list species include species that may be added to the sensitive species list depending on new information concerning threats and species biology or statewide trends.

APPENDIX C-3

NOXIOUS WEEDS LIST

APPENDIX C-3

NOXIOUS WEEDS LIST

OREGON AND IDAHO NOXIOUS WEEDS

Common Name	Scientific Name
Oregon Noxious Weeds – List A	
African rue	*Peganum harmala*
Camelthorn	*Alhagi pseudalhagi*
Coltsfoot	*Tussilago farfara*
Cordgrass: common, dense-flowered, saltmeadow, smooth	*Spartina anglica, Spartina densiflora, Spartina patens, Spartina alterniflora*
European water chestnut	*Trapa natans*
Giant hogweed	*Heracleum mantegazzianum*
Goatgrass: barbed, ovate	*Aegilops triuncialis, Aegilops ovata*
Goatsrue	*Galega officinalis*
Hawkweed: king-devil, meadow, mouse-ear, orange, yellow	*Hieracium piloselloides, Hieracium pretense, Hieracium pilosella, Hieracium aurantiacum, Hieracium floribundum*
Hydrilla	*Hydrilla verticillata*
Kudzu	*Pueraria lobata*
Matgrass	*Nardus stricta*
Oblong spurge	*Euphorbia oblongata*
Paterson’s curse	*Echium plantagineum*
Purple nutsedge	*Cyperus rotundus*
Silverleaf nightshade	*Solanum elaeagnifolium*
Skeletonleaf bursage	*Ambrosia tomentosa*
Squarrose knapweed	*Centaurea virgata*
Starthistle: Iberian, purple	*Centaurea iberica, Centaurea calcitrapa*
Syrian bean-caper	*Zygophyllum fabago*
Texas blueweed	*Helianthus ciliaris*
Plumeless smooth distaff	*Carduus acanthoides*
Taurian woolly distaff	*Carthamus baeticus*
White bryonia	*Bryonia alba*
Yellow floating heart	*Nymphoides peltata*
Medusahead rye	*Taeniatherum caput-medusae*
Old man’s beard	*Clematis vitalba*
Parrots feather	*Myriophyllum aquaticum*
Perennial peavine	*Lathyrus latifolius*

Common Name	Scientific Name
Oregon Noxious Weeds – List B	
Biddy-biddy	*Acaena novae-zelandiae*
Buffalobur	*Solanum rostratum*
Butterfly bush	*Buddleja davidii (B. variabilis)*
Common bugloss	*Anchusa officinalis*
Common crupina (bearded creeper)	*Crupina vulgaris*
Creeping yellow cress	*Rorippa sylvestris*
Cutleaf teasel	*Dipsacus laciniatus*
Dodder	*Cuscuta spp.*
Dyers woad	*Isatis tinctoria*
English ivy	*Hedera helix (H. hibernica)*
Eurasian watermilfoil	*Myriophyllum spicatum*
False brome	*Brachypodium sylvaticum*
Field bindweed	*Convolvulus arvensis*
Garlic mustard	*Alliaria petiolata*
Giant horsetail	*Equisetum telmateia*
Gorse	*Ulex europaeus*
Halogeton	*Halogeton glomeratus*
Himalayan blackberry	*Rubus aremeniacus (R. procerus, R. discolor)*
Houndstongue	*Cynoglossum officinale*
Johnsongrass	*Sorghum halepense*
Jointed goatgrass	*Aegilops cylindrical*
Jubata grass	*Cortaderia jubata*
Diffuse knapweed	*Centaurea diffusa*
Meadow knapweed	*Centaurea pratensis (C. jacea x C. nigra)*
Russian knapweed	*Acroptilon repens*
Spotted knapweed	*Centaurea stoebe (C. maculosa)*
Giant Himalayan knotweed	*Fallopia sachalinensis (Polyganum)*
Japanese knotweed (fleece flower)	*Fallopia japonica (Polyganum cuspidatum)*
Kochia	*Kochia scoparia*
Lesser celandine	*Ranunculus ficaria*
Mediterranean sage	*Salvia aethiopis*
Medusahead rye	*Taeniatherum caput-medusae*
Old man’s beard	*Clematis vitalba*
Parrots feather	*Myriophyllum aquaticum*
Perennial peavine	*Lathyrus latifolius*
Idaho Noxious Weeds – EDDR List	
Brazilian elodea	*Egeria densa*
Hydrilla	*Hydrilla verticillata*

Common Name	Scientific Name
Policeman's helmet	*Impatiens glandulifera*
Squarrose knapweed	*Centaurea squarrosa*
Syrian Beancaper	Zygophyllum fabago
Tall hawkweed	*Hieracium piloselloides*
Water hyacinth	*Eichhornia crassipes*
Yellow devil hawkweed	*Hieracium glomeratum*
Idaho Noxious Weeds – Control List	
Black henbane	*Hyoscyamus niger*
Bohemian knotweed	*Polygonum bohemicum*
Buffalobur	*Solanum rostratum*
Common crupina	*Crupina vulgaris*
Dyer's woad	*Isatis tinctoria*
Eurasian watermilfoil	*Myriophyllum spicatum*
Giant knotweed	*Polygonum sachalinense*
Japanese knotweed	*Polygonum cuspidatum*
Johnsongrass	*Sorghum halpense*
Matgrass	*Nardus stricta*
Meadow knapweed	*Centaurea pratensis*
Mediterranean sage	*Salvia aethiopis*
Musk Thistle	*Carduus nutans*
Orange Hawkweed	*Hieracium aurantiacum*
Parrotfeather milfoil	*Myriophyllum aquaticum*
Perennial Sowthistle	*Sonchus arvensis*
Russian Knapweed	*Acroptilon repens*
Scotch Broom	*Cytisus scoparius*
Scotch Thistle	*Onopordum acanthium*
Skeletonleaf Bursage	*Ambrosia tomentosa*
Small bugloss	*Anchusa arvesis*
Toothed Spurge	*Euphorbia dentata*
Vipers bugloss	*Echium vulgare*
Yellow hawkweed	*Hieracium caespitosum*
Idaho Noxious Weeds – Containment List	
Canada thistle	*Cirsium arvense*
Dalmatian toadflax	*Linaria genistifolia* ssp. *dalmatica*
Diffuse knapweed	*Centaurea diffusa*
Field bindweed	*Convolvulus arvensis*
Hoary allysum	*Berteroa incana*
Houndstongue	*Cynoglossum officinale*
Jointed goatgrass	*Aegilops cylindrica*

Common Name	Scientific Name
Leafy spurge	*Euphorbia esela*
Milium	*Milium vernale*
Oxeye daisy	*Crysanthemum leucanthemum*
Perennial pepperweed	*Lepidium latifolium*
Plumeless thistle	*Carduus achanthoides*
Poison hemlock	*Conium maculatum*
Puncturevine	*Tribulus terrestris*
Purple loosestrife	*Lythrum salicaria*
Rush Skeletonweed	*Chondrilla juncea*
Saltcedar	*Tamarix* sp.
Scotch Thistle	*Onopordum acanthium*
Spotted Knapweed	*Centaurea stoebe* ssp. *micranthos*
Tansy Ragwort	*Senecia jacobaea*
White bryony	*Bryonia alba*
Whitetop (hoary cress)	*Cardaria draba*
Yellow starthistle	*Centaurea solstitialis*
Yellow Toadflax	*Linaria vulgaris*

APPENDIX C-4

BLM COVER AND SPECIES DOMINANCE PROTOCOLS AND WORKSHEETS

APPENDIX C-4

BLM COVER AND SPECIES DOMINANCE PROTOCOLS AND WORKSHEETS

Completing the BLM Cover Worksheet

From BLM Technical Reference 1734-6, Interpreting Indicators of Rangeland Health (2000)

The Cover Worksheet is divided into two sections: The Life Forms section, where canopy cover is estimated for important life forms (e.g., grass, forb, shrub, tree, succulents, and biological crusts) and the Ground Cover section, where the amount (cover) of bare ground, litter, standing dead vegetation, rock/gravel, biological crust, and plants are estimated.

Canopy cover is the percentage of the ground covered by plant foliage. When estimating canopy cover, small openings (less than 2 inches in diameter) within the canopy are included as cover. Canopy cover of plants removed by grazing is not reconstructed to pregrazing canopy for this estimate. Estimate only the canopy cover present at the time the evaluation is conducted. This ensures an accurate picture of the actual site protection from raindrop impacts at the time that the assessment is conducted.

The cover in the Life Forms section includes cover estimates of the overlapping canopies of different life forms. For example, the cover of both a grass beneath a shrub canopy and the canopy cover of the shrub are estimated and recorded on the worksheet in the appropriate categories. The subdivisions of life forms for each life form class (e.g., annuals, native perennial, exotic perennial under the Grass category) may be deleted and other categories added to better represent local vegetation. The cover ranges may also be changed to better fit natural or ecologically relevant breaks in cover for different areas.

The Ground Cover section represents the proportion of the soil that is protected from being hit directly by a raindrop. Ground cover is the percentage of material (e.g., litter, standing dead vegetation, gravel/rocks, vascular plants, and biological crust), covering the land surface. In contrast with the Life Forms section, overlapping cover classes are not estimated.

Ground cover is estimated by recording cover estimates of the first contact (i.e., highest contact above soil surface) with live vascular plants, standing dead vegetation, litter, biological crust, rock/gravel, and bare ground. The sum of these six cover categories should roughly total 100 percent, given the use of ranges of cover instead of discrete cover values on the form. If cover measurements are taken, they may be inserted into the Cover Worksheet in lieu of a checkmark for the appropriate cover category.

The total cover of the vegetation Life Forms will not necessarily equal the Vascular Plants cover value in the Ground Cover section since the former contains cover estimates for overlapping canopies while the latter does not. The litter category in the Ground Cover section includes both persistent and non-persistent litter. Litter includes all dead organic matter in contact with the soil surface. Standing dead vegetation includes all plants that have been dead more than one growing season that are not in direct contact with the soil surface. Standing dead vegetation is important in protecting the site from raindrop contact, while litter provides the same site protection and is an important source of organic matter via decomposition in many areas. The rock/gravel category includes all material with a diameter greater than 0.2 inch. Any gravel less than this diameter is recorded as bare ground.

Biological crust includes lichens, mosses, cyanobacteria, and algae that grow on the soil surface. It is sometimes difficult to differentiate biological crust from bare soil or dead organic matter during the dry portion of summer. Spraying questionable areas with water and waiting a minute will often give live lichens or mosses a greenish tinge indicating live tissue. Conversely, cyanobacteria crusts are often very difficult to identify, especially when weakly developed, without a careful examination of the internal structure of the crust. Cyanobacteria crusts are generally not included when estimating cover.

Completing the Species Dominance Worksheet

The Species Dominance Worksheet is used to identify the dominant species based upon either production or cover. State or federally listed noxious weeds and invasive plants are also recorded. The evaluator(s) should be trained in the identification of all state or federally listed noxious weeds prior to conducting any evaluations. New noxious weed locations should be reported immediately to the appropriate person or office.

Part 1 is required, while Part 2 (Dominant Species by Life Form) is recommended but not required. Do not reconstruct canopy cover or production when determining species dominance if utilization of plants has occurred. It is not necessary to fill each blank in the list with a plant name if additional dominant species in that life form are not present or are rare.

Cover Worksheet

State ____________ Office ____________ Ecological Site ____________

Observer(s) ____________ Date ____________ Site ID ____________

COVER CLASSES (% Canopy)

LIFE FORMS[1]	0	0-1	2-5	6-15	16-30	31-50	51-75	76-100
I - Grass								
Annual								
Native Perennial								
Exotic Perennial								
II - Forb								
Annual								
Perennial								
III - Shrub								
IV - Tree								
V - Succulent								
VI - Biological Crust								

% GROUND COVER[2]	0	0-1	2-5	6-15	16-30	31-50	51-75	76-100
I - Vascular Plants								
II - Standing Dead Vegetation								
III - Litter (in contact with the soil surface)								
IV - Biological Crust								
V - Rock/Gravel								
VI - Bare Ground								

[1] **Life Forms Cover** - Record multiple canopy cover classes; total plant canopy may exceed 100%. Small openings (less than 2" in diameter) are included as cover.

[2] **Ground Cover** - Category I is an estimate of total vascular plant cover; overlapping canopies are counted as only **one** canopy (record life form with first point of contact). Total vascular plant cover (I) together with the sum of cover in Categories II-VI should total to approximately 100%.

Notes: Include source of cover data (e.g., estimates or measurements)

Species Dominance Worksheet

Part 1 (Required)

The most common species, noxious weeds (state-listed plants), invasive natives, invasive exotics (non-noxious) are **ranked** according to dominance using cover ☐ or weight ☐.

Dominant Species on Site

1 ______________________________
2 ______________________________
3 ______________________________
4 ______________________________

Noxious Weeds

1 ______________________________
2 ______________________________
3 ______________________________

Invasive Natives

1 ______________________________
2 ______________________________
3 ______________________________

Invasive Exotics

1 ______________________________
2 ______________________________
3 ______________________________

Part 2 (Optional) **Dominant Species by Life Form**

The most common species are ranked according to dominance using cover ☐ or weight ☐ by life form.

Annual Grasses

1 ______________________________
2 ______________________________
3 ______________________________

Annual Forbs

1 ______________________________
2 ______________________________
3 ______________________________

Perennial Grasses

1 ______________________________
2 ______________________________
3 ______________________________

Perennial Forbs

1 ______________________________
2 ______________________________
3 ______________________________

Shrubs and Trees

1 ______________________________
2 ______________________________
3 ______________________________

Succulents

1 ______________________________
2 ______________________________
3 ______________________________

Biological Crust (rate by component not species, e.g., lichen, moss, or algae)

1 ______________________________
2 ______________________________
3 ______________________________

APPENDIX C-5

OREGON AND IDAHO
RARE PLANT OBSERVATION FORMS

OREGON NATURAL HERITAGE INFORMATION CENTER
RARE PLANT FIELD SURVEY FORM

Please complete all entries in the top section above the heavy line. Please complete as much as possible the more detailed section below the heavy line. You may use the back for comments or additional space. If possible, please attach a map of the location, preferably something of the same quality as a USGS 7.5' map.

Scientific Name: ____________________

Date of Field Work: ____________ County: ____________ Collection: ___Yes (____________), ___No
mo. day year coll # , herbarium

Directions:____________________

____

Reporter: ____________________ Phone: ____________

Address: ____________________

1. LOCATION - Attach separate map or sketch a map indicating exact site, scale and proximity to prominent features.

A. Plant found? ___Yes ___No If no, reason:____________________

B. Location: T________ R________ Sec__________ ________1/4 of ________1/4 (use back for more TRS)

C. Source of GPS coordinates (circle one): GPS (make & model____________) or map (type & scale____________)

GPS differentially corrected? ___Yes ____ No

Datum (circle): Nad 27, Nad 83, other________. Easting/Longitude____________Northing/Latitude____________

Coordinate System (circle): UTM (Zone 10), UTM (Zone 11) or Latitude/Longitude

D. Owner/Manager: ____________________

2. SPECIES BIOLOGY

A. Phenology: _______% in flower, ________% in fruit, ________% in leaf

B. Population size: Number of plants: ____________ Area occupied: ____________

C. Age Class: ______% seedlings, _______% immature, _______% 1st year, _______% mature, ______% senescent

3. HABITAT

A. Plant communities/Habitat Description/Associated species: ____________________

____

____

B. Aspect: ____________ (enter compass direction(s) or degrees)
C. Slope: _____slight (0°-20°), _____moderate (20°-45°), _____extreme (45°+), ____vertical
D. Topographic position: ______crest, ______upper slope, ______mid-slope, ______lower slope, ______bottom
E. Light: ______open, ______filtered, ______shade
F. Moisture: ______inundated, ______saturated, ______moist, ______dry

G. Elevation range: ____________ to ____________ (choose unit: feet or meters)

H. Substrate/soil: ____________________

I. Visible threats/potential disturbance: ____________________

4. DETERMINATION - How was plant identified? (choose one or more, please fill in the source for each choice)
______keyed in flora , ______compared with specimen, ______compared with photo/drawing,
______identified by someone else, ______other .
Source (name of flora/which specimen/which drawing/name of identifier): ____________________

5. PHOTOGRAPHS/SLIDES
Did you take a print or slide: _____Yes (specify which), _____No. May we obtain duplicates at our cost? ____Yes ____No

Oregon Natural Heritage Information Center / 1322 SE Morrison Street / Portland, Oregon 97214 / 503-731-3070 phone & fax

IDAHO RARE PLANT OBSERVATION REPORT

Fill out the form by tabbing through and completing the fields. Some fields contain check boxes and drop-down menus. If you do not have information for the field, leave it blank. Use F1 for help in any shaded field. E-mail completed form to scooke@idfg.state.id.us or send to Botany Information Manager, Idaho Conservation Data Center, Idaho Department of Fish and Game, PO Box 25, Boise, ID 83707.

Species: _____ Date of Observation: _____

Observer(s): _____

Agency/Organization/Company: _____

Address:_____

Phone: _____

County:_____ Quad: _____

Township: _____ Range: _____ _____ 1/4 of _____ 1/4 of Section _____

Township: _____ Range: _____ _____ 1/4 of _____ 1/4 of Section _____

GPS Information: Enter **either** UTMs **or** latitude/longitude coordinates from GPS, as well as datum, way points (optional) and accuracy information in the table below. **If you did not take GPS readings, please leave this table blank.**

Have your GPS Coordinates been differentially corrected? Yes ☐ No ☐ Unsure ☐

Do you have this report location digitized already? Yes ☐ No ☐

If yes, you may send shape-files in lieu of a paper map. Did you submit shape-files with this form? ☐ Yes ☐ No.
If yes, list projection of shape-files:
Please give the parameters if the projection is not standard:

Datum	Way Point	UTM Northing	UTM Easting	Latitude	Longitude	Accuracy
Datum	WP#					+/-
Datum	WP#					+/-

If you have more coordinates, please list them under Additional Comments.

Minimum Elevation: _____ ft. Maximum Elevation: _____ft.

Stand # or other identification #: _____

Directions (be specific):_____

Is this a new location? ☐Yes ☐ No ☐ Unsure? Give occurrence # if known:_____

Mapping Instructions:, If submitting paper maps, complete A - C. If submitting shape–files complete parts B and C.

A) Please attach a photocopy of the appropriate part of the USGS 7.5 minute quad (or comparable map) and delineate the population and all subpopulations (if present) on the map using the guidelines listed below. **Label subpopulations if you have population and/or habitat information for them.**

* If the population/subpopulation area is < 12.5 meters (40 ft.) in diameter, place a single point on the map marking its location. If necessary, indicate these point locations with an arrow so they are easier to see.

* If the population/subpopulation area is >12.5 meters (40 ft.) in diameter, draw a polygon on the map marking its location.

* If the population/subpopulation follows the boundary of a trail, lake, stream, road, etc., draw the boundary on the edge of this feature. Where needed, add notes on where boundary lines are.

B) How accurately do you feel you mapped or digitized the population compared to its actual location on the ground? Use the guidelines to determine how many meters (m) or miles on the ground correspond to millimeters (mm.) or inches (in.) on a 1:24,000 scale map. Within 25 m (0 - 1 mm. on map) Custom:

C) I sent a hard-copy map via U.S. mail. Other:

Population Information - Please fill in this section with the information for the **entire population**. If subpopulations exist and you have information for them, complete the subpopulation information forms on the last page.

Total # of individuals in the population(s) is _____ ☐ Actual ☐ Estimated

What was counted? ☐ Genets ☐ Ramets ☐ N/A (non-vascular etc.) ☐ Unknown

Phenology: _____% seedling _____ %non-reproductive _____ % reproductive _____ % dormant _____ % unknown

The size of the population area is _____

Population vigor is ☐ excellent ☐ good ☐ fair ☐ poor

Do you feel you mapped the full extent of the population? ☐ Yes ☐ No ☐ Unsure

Is there more potential habitat in the area that hasn't been surveyed? ☐ Yes ☐ No ☐ Unsure

The survey was: ☐ very thorough ☐ somewhat thorough ☐ cursory ☐ incidental observation

Additional population comments: _____

Habitat Description – Please fill in this section with information for the **entire population**, using ranges where appropriate. If subpopulations exist and there is specific habitat information or threats that need noting, use the forms on page 4. Please avoid abbreviations if possible, thanks!

General habitat description: _____

Aspect: _____ Slope: _____

Substrate/soil: _____

Light regime: _____

Community type: _____

Associated Species include: _____

Look-alike species that are present: _____

Comment on threats to the population and its immediate habitat including **level** and **imminency** of threat if known.

Include factors such as land use, disturbance, disease or predation, invasive weeds, etc: _____

CONDITION is an integrated measure of the quality of biotic and abiotic factors, structures, and processes **within** the occurrence, and the degree to which they affect the continued existence of the occurrence. Condition has the following components: reproduction and health for species, ecological processes, species composition and biological structure, and abiotic/chemical factors.

Briefly comment on the **CONDITION** of the occurrence:

Overall **condition** is: A (excellent)

LANDSCAPE CONTEXT is an integrated measure of the quality of biotic and abiotic factors, structures, and processes **surrounding** the occurrence, and the degree to which they affect the continued existence of the EO. Components of Landscape Context are: landscape structure and extent, including genetic connectivity, and condition of the surrounding landscape.

Briefly comment on the **LANDSCAPE in the area surrounding the population**. Include factors such as current and past land use (farmland, residential area etc.), disturbance factors, and fragmentation: _____

Overall **landscape** is: A (excellent)

Land Owner/Managers (forest/ranger district/BLM/ or private land owner if known): _____

Owner Comments: _____

Management, Monitoring, and Research Needs (include any steps that you think should be taken to protect the population): _____

Collector/Collection #:_____ Herbarium:_____

Photo Attached? ☐ Yes ☐ No

Other knowledgeable individuals: _____

Additional Comments (anything you think is important that did not fit in any other space on the form):

_____

Subpopulation Information

Subpopulation # _____ Subpopulation area: _____

The total # of individuals in subpopulation is _____ ☐ Actual ☐ Estimated

Population vigor is ☐ excellent ☐ good ☐ fair ☐ poor

Habitat information: _____

Threats to this subpopulation: _____

Subpopulation Information

Subpopulation # _____ Subpopulation area: _____

The total # of individuals in subpopulation is _____ ☐ Actual ☐ Estimated

Population vigor is ☐ excellent ☐ good ☐ fair ☐ poor

Habitat information: _____

Threats to this subpopulation: _____

Subpopulation Information

Subpopulation # _____ Subpopulation area: _____

The total # of individuals in subpopulation is _____ ☐ Actual ☐ Estimated

Population vigor is ☐ excellent ☐ good ☐ fair ☐ poor

Habitat information: _____

Threats to this subpopulation: _____

Subpopulation Information

Subpopulation # _____ Subpopulation area: _____

The total # of individuals in subpopulation is _____ ☐ Actual ☐ Estimated

Population vigor is ☐ excellent ☐ good ☐ fair ☐ poor

Habitat information: _____

Threats to this subpopulation: _____

Subpopulation Information

Subpopulation # _____ Subpopulation area: _____

The total # of individuals in subpopulation is _____ ☐ Actual ☐ Estimated

Population vigor is ☐ excellent ☐ good ☐ fair ☐ poor

Habitat information: _____

Threats to this subpopulation: _____

Subpopulation Information

Subpopulation # _____ Subpopulation area: _____

The total # of individuals in subpopulation is _____ ☐ Actual ☐ Estimated

Population vigor is ☐ excellent ☐ good ☐ fair ☐ poor

Habitat information: _____

Threats to this subpopulation: _____

Subpopulation Information

Subpopulation # _____ Subpopulation area: _____

The total # of individuals in subpopulation is _____ ☐ Actual ☐ Estimated

Population vigor is ☐ excellent ☐ good ☐ fair ☐ poor

Habitat information: _____

Threats to this subpopulation: _____

Subpopulation Information

Subpopulation # _____ Subpopulation area: _____

The total # of individuals in subpopulation is _____ ☐ Actual ☐ Estimated

Population vigor is ☐ excellent ☐ good ☐ fair ☐ poor

Habitat information: _____

Threats to this subpopulation: _____

Subpopulation Information

Subpopulation # _____ Subpopulation area: _____

The total # of individuals in subpopulation is _____ ☐ Actual ☐ Estimated

Population vigor is ☐ excellent ☐ good ☐ fair ☐ poor

Habitat information: _____

Threats to this subpopulation: _____

Subpopulation Information

Subpopulation # _____ Subpopulation area: _____

The total # of individuals in subpopulation is _____ ☐ Actual ☐ Estimated

Population vigor is ☐ excellent ☐ good ☐ fair ☐ poor

Habitat information: _____

Threats to this subpopulation: _____

APPENDIX D-1

WETLAND DETERMINATION DATA FORM
ARID WEST REGION

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: ______________________ City/County: ______________________ Sampling Date: __________

Applicant/Owner: ______________________ State: ________ Sampling Point: __________

Investigator(s): ______________________ Section, Township, Range: ______________________

Landform (hillslope, terrace, etc.): ______________________ Local relief (concave, convex, none): ______________ Slope (%): ______

Subregion (LRR): ______________________ Lat: ______________ Long: ______________ Datum: __________

Soil Map Unit Name: ______________________ NWI classification: ______________

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ______ No ______ (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes ______ No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ______	No ______	**Is the Sampled Area within a Wetland?** **Yes ______ No ______**
Hydric Soil Present?	Yes ______	No ______	
Wetland Hydrology Present?	Yes ______	No ______	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: __________)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	______ = Total Cover		
Sapling/Shrub Stratum (Plot size: __________)			
1.			
2.			
3.			
4.			
5.			
	______ = Total Cover		
Herb Stratum (Plot size: __________)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	______ = Total Cover		
Woody Vine Stratum (Plot size: __________)			
1.			
2.			
	______ = Total Cover		

% Bare Ground in Herb Stratum __________ % Cover of Biotic Crust __________

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: __________ (A)

Total Number of Dominant Species Across All Strata: __________ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: __________ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	________	x 1 = ________
FACW species	________	x 2 = ________
FAC species	________	x 3 = ________
FACU species	________	x 4 = ________
UPL species	________	x 5 = ________
Column Totals:	________ (A)	________ (B)

Prevalence Index = B/A = __________

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ______ No ______

Remarks:

SOIL

Sampling Point: ___________

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______________________________

Depth (inches): ______________________

Hydric Soil Present? Yes ______ No ______

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No ______ Depth (inches): ____________

Water Table Present? Yes ______ No ______ Depth (inches): ____________

Saturation Present? (includes capillary fringe) Yes ______ No ______ Depth (inches): ____________

Wetland Hydrology Present? Yes ______ No ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

APPENDIX D-2

WETLAND DETERMINATION DATA FORM WESTERN MOUNTAINS, VALLEYS, AND COAST REGION

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: ____________________ City/County: ____________________ Sampling Date: __________

Applicant/Owner: ____________________ State: ______ Sampling Point: __________

Investigator(s): ____________________ Section, Township, Range: ____________________

Landform (hillslope, terrace, etc.): ____________ Local relief (concave, convex, none): __________ Slope (%): ______

Subregion (LRR): ____________ Lat: ____________ Long: ____________ Datum: ______

Soil Map Unit Name: ____________________ NWI classification: __________

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ______ No ______ (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes ______ No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ______	No ______	**Is the Sampled Area within a Wetland?** **Yes ______ No ______**
Hydric Soil Present?	Yes ______	No ______	
Wetland Hydrology Present?	Yes ______	No ______	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: __________)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	______ = Total Cover		
Sapling/Shrub Stratum (Plot size: __________)			
1.			
2.			
3.			
4.			
5.			
	______ = Total Cover		
Herb Stratum (Plot size: __________)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	______ = Total Cover		
Woody Vine Stratum (Plot size: __________)			
1.			
2.			
	______ = Total Cover		

% Bare Ground in Herb Stratum __________

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: __________ (A)

Total Number of Dominant Species Across All Strata: __________ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: __________ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	______	x 1 = ______
FACW species	______	x 2 = ______
FAC species	______	x 3 = ______
FACU species	______	x 4 = ______
UPL species	______	x 5 = ______
Column Totals:	______ (A)	______ (B)

Prevalence Index = B/A = __________

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ______ No ______

Remarks:

SOIL

Sampling Point: ___________

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

__ Histosol (A1)
__ Histic Epipedon (A2)
__ Black Histic (A3)
__ Hydrogen Sulfide (A4)
__ Depleted Below Dark Surface (A11)
__ Thick Dark Surface (A12)
__ Sandy Mucky Mineral (S1)
__ Sandy Gleyed Matrix (S4)
__ Sandy Redox (S5)
__ Stripped Matrix (S6)
__ Loamy Mucky Mineral (F1) (**except MLRA 1**)
__ Loamy Gleyed Matrix (F2)
__ Depleted Matrix (F3)
__ Redox Dark Surface (F6)
__ Depleted Dark Surface (F7)
__ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

__ 2 cm Muck (A10)
__ Red Parent Material (TF2)
__ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______________________________

Depth (inches): ______________________

Hydric Soil Present? Yes ______ No ______

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

__ Surface Water (A1)
__ High Water Table (A2)
__ Saturation (A3)
__ Water Marks (B1)
__ Sediment Deposits (B2)
__ Drift Deposits (B3)
__ Algal Mat or Crust (B4)
__ Iron Deposits (B5)
__ Surface Soil Cracks (B6)
__ Inundation Visible on Aerial Imagery (B7)
__ Sparsely Vegetated Concave Surface (B8)
__ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
__ Salt Crust (B11)
__ Aquatic Invertebrates (B13)
__ Hydrogen Sulfide Odor (C1)
__ Oxidized Rhizospheres along Living Roots (C3)
__ Presence of Reduced Iron (C4)
__ Recent Iron Reduction in Tilled Soils (C6)
__ Stunted or Stressed Plants (D1) (**LRR A**)
__ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

__ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
__ Drainage Patterns (B10)
__ Dry-Season Water Table (C2)
__ Saturation Visible on Aerial Imagery (C9)
__ Geomorphic Position (D2)
__ Shallow Aquitard (D3)
__ FAC-Neutral Test (D5)
__ Raised Ant Mounds (D6) (**LRR A**)
__ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): ____________

Water Table Present? Yes _____ No _____ Depth (inches): ____________

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): ____________

Wetland Hydrology Present? Yes ______ No ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

APPENDIX D-3

OREGON RAPID WETLAND ASSESSMENT PROTOCOL MANUAL

VERSION 2.0.2

JULY 2010



Manual for the Oregon Rapid Wetland Assessment Protocol (ORWAP)

version 2.0.2

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Adamus Resource Assessment, Inc.

Janet Morlan, PWS
Kathy Verble, CPSS
Oregon Department of State Lands

WETLANDS PROGRAM
OREGON DEPARTMENT OF STATE LANDS

Manual for the Oregon Rapid Wetland Assessment Protocol (ORWAP)

Version 2.0.2

July 2010

by:
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Salem, OR

This manual should be cited as:
Adamus, P., J. Morlan, and K. Verble. 2010. Manual for the Oregon Rapid Wetland Assessment Protocol (ORWAP). Version 2.0.2. Oregon Dept. of State Lands, Salem, OR.

The actual protocol should be cited as:
Adamus, P., J. Morlan, and K. Verble. 2010. Oregon Rapid Wetland Assessment Protocol (ORWAP): calculator spreadsheet, databases, and data forms. Oregon Dept. of State Lands, Salem, OR.

The supporting Web site should be cited as:
Rempel, M., P. Adamus, and J. Kagan. 2009. Oregon Wetlands Explorer: an internet tool for ORWAP wetland assessment support and data archiving. Oregon State University Library and Institute for Natural Resources, Oregon State University, Corvallis, OR. Internet: http://oregonexplorer.info/wetlands/orwap/

This manual, the calculator spreadsheet, supporting data files, data forms and other wetland assessment guidebooks may be downloaded from:
www.oregonstate.edu/~adamusp/
or
http://www.oregonstatelands.us/DSL/WETLAND/technical_resources.shtml
Updates also will be posted periodically at these locations.

For more information about this protocol and opportunities to be trained in its use, please contact:

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SUMMARY

The Oregon Rapid Wetland Assessment Protocol (ORWAP) is a standardized protocol for rapidly assessing the functions and values of wetlands. The Department of State Lands (DSL) has led its development with funding from the U.S. Environmental Protection Agency and oversight by an advisory committee of state and federal agencies and private consultants. ORWAP is designed to be used for multiple purposes by multiple agencies. The purposes may include assessing all wetlands within a city for land use planning; assessing wetlands within a watershed; assessing individual wetlands or portions of wetlands for purposes of state and federal permitting and compensatory wetland mitigation; and evaluating success of voluntary wetland restoration or enhancement projects. An accompanying document *Guidance for Using the Oregon Rapid Wetland Assessment Protocol (ORWAP) in State and Federal Permit Programs* (Oregon Department of State Lands, May 2009) is available from DSL.

ORWAP is applicable to wetlands of any type anywhere in Oregon. Unlike Oregon's previous hydrogeomorphic (HGM) wetland assessment methods, ORWAP can be used to compare wetlands of very different types. ORWAP does not require the user to fill out different data forms for different wetland types or regions of the state. A single three-part data form can be used for all Oregon wetlands. The procedure for using ORWAP involves six basic steps (see Section 2.1). After data from the three-part form are entered into an Excel spreadsheet, ORWAP automatically generates scores intended to reflect a wetland's ability to support the following functions: Water Storage and Delay, Sediment Retention and Stabilization, Phosphorus Retention, Nitrate Removal and Retention, Thermoregulation, Carbon Sequestration, Organic Matter Export, Pollinator Habitat, Aquatic Invertebrate Habitat, Anadromous Fish Habitat, Non-anadromous Fish Habitat, Amphibian & Reptile Habitat, Waterbird Feeding Habitat, Waterbird Nesting Habitat, Songbird, Raptor and Mammal Habitat, Pollinator Habitat, and Native Plant Diversity. For all but two of these functions, scores are given for both components of an ecosystem service: function and value. The functions are also condensed into thematic groups, called "grouped services." In addition, wetland Ecological Condition (Integrity), Provisioning Services, Public Use and Recognition, Sensitivity, and Stressors are scored. Extensive testing showed that a typical application of ORWAP requires 3 to 6 hours to complete. Among independent users, repeatability of the scores for most functions and values was found to be within ± 0.7 point or less on a 0-to-10 scoring scale.

ORWAP's scoring is based on logic models programmed into the Excel spreadsheet. Although this has the potential to create a "black box" wherein underlying assumptions and calculations are not transparent to the user, transparency has been assured by detailed explanations of the assumptions and mathematics of each scoring model (both in the spreadsheet and Appendix A). The models use 140 indicators that are assessed onsite, as well as from information gathered mainly from four Web sites and from aerial imagery. Although most indicators are applied to estimate several wetland functions, values, and other attributes, the data for each indicator need be entered in only one place on the data forms. The models also estimate a wetland's HGM class and implicitly account for differences associated with HGM class. When not pertinent to the HGM class being assessed, indicators are automatically dropped from a model's calculations rather than being scored as a "0."

ORWAP assessments of 221 wetlands from throughout Oregon showed a statistically significant inverse correlation between scores for Ecological Condition and Stressors, despite their sharing no indicators, thus partially validating the indicators and procedures ORWAP uses to estimate those. Also, the scores of nearly all of ORWAP's 16 wetland functions and 21 values did not correlate with the scores for wetland Ecological Condition, and several functions were inversely correlated with each other. This suggests that wetland condition alone, as estimated by ORWAP, does not consistently predict the levels of most functions and values present in Oregon wetlands.

A Web site created collaboratively with this project provides an online support tool for locating a site and then viewing and overlaying existing maps of Oregon wetlands, hydric soils, floodplains, watersheds, and related themes, as well as broadly noting the known locations of rare wetland plants and animals: www.oregonexplorer.info/wetlands/orwap. The Wetland Explorer Web site also allows ORWAP users to archive their completed assessments (see Section 2.4.4).

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Numerous individuals contributed to the development of ORWAP, many of them over a period of several years. The authors and the Department of State Lands are deeply grateful for their contributions and commitment to developing this much-needed tool for assessing Oregon's wetlands.

Environmental Protection Agency, Region 10: Yvonne Vallette (Grant Officer)

Oregon Department of State Lands: Janet Morlan and Kevin Moynahan (Project Administrators)

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ORWAP Wetlands Portal Web Site: Marc Rempel, Jimmy Kagan, John Christy, Kuuipo Walsh, Sue Vrilakas (Oregon Natural Heritage Program, Institute for Natural Resources, Oregon State University)

Assistance with Compilation of Spatial and Other Data: Ron Raney and Cory Owens (NRCS), Jennifer Rose (DSL), Joshua Grabel (Oregon State University), Andrew Adamus

ORWAP Plant List Updates: Jevra Brown, Peter Ryan, Dana Field, Dana Hicks (DSL)

Assistance/ Participation with Statewide Field Testing:

Natural Resources Conservation Service: Jeremy Maestes, Ron Raney, Cory Owens, Jason Outlaw, Jeremy Jirek, Mitch Cummings
Corps of Engineers, Portland District: Mike Turaski, Tom Taylor, Charles Hanner, James Holm, Jaimee Hammit, Dominic Yballe, Carol Franson, Merina Christoffersen, Brian Wilson, Debra Henry, Anita Andazola
U.S. Environmental Protection Agency: Yvonne Vallette
U.S. Fish & Wildlife Service: John Marshall (Portland), Rick Roy (Malheur NWR)
U.S. Forest Service: Robert Gecy (Baker City), Joe Rausch (John Day)
U.S.D.I. Bureau of Land Management: Vern Stofleth (Lakeview)
Oregon Department of State Lands: Janet Morlan, Kathy Verble, Dana Field, Lynne McAllister, Peter Ryan, Jevra Brown, Anna Buckley, Kirk Jarvie, Lori Warner-Dickason
Oregon Department of Fish and Wildlife: Patty Snow (Portland), Cathy Nowak (La Grande), Marty St. Louis (Summer Lake)
Oregon Department of Transportation: Patti Caswell (Salem), Allison Cowie (Bend), Brad Livingston (Roseburg), Irene Ulm (Corvallis)
Oregon Watershed Enhancement Board: Courtney Shaff
Blue Mountains Conservancy: Joel Rice
Clean Water Services: Bobby Cochran, Kendra Petersen-Morgan, Kendra Smith
Coos Watershed Association: Bessie Joyce, Sarah Dyrdahl
Curry County Soil & Water Conservation District: Barbara Grant
Upper Deschutes Watershed Council: Mike Logan
The Nature Conservancy: Darren Borgias (Medford), Jeff Fields (John Day)
Xerces Society: Celeste Mazzacano
Eastern Oregon University (La Grande): Dr. Karen Antell
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1.0 Introduction

1.1 Background and Purpose

National and state goals for "no net loss" of wetlands pertain not only to wetland acreage but also to the ecosystem services (functions and values) that wetlands provide naturally. By providing these services, well-functioning wetlands can reduce the need for humans to construct alternative infrastructure necessary to provide those services, often at much higher cost (Costanza et al. 1997, Finlayson et al. 2005, Euliss et al. 2008). In addition, Oregon's Removal-Fill Law and the federal Clean Water Act both require that when compensating for permitted impacts to wetlands through compensatory mitigation, wetland functions and values must be considered and replaced. Nonetheless, most agencies responsible for wetlands have focused only on measuring net change of wetland acreage, with little attention to assessing changes that result from the degradation of the many remaining wetlands. However, the increasing availability of standardized, regionally-tailored, rapid procedures for estimating the functions and values of wetlands has highlighted the importance and improved the feasibility of measuring and regulating losses of functions and values, over and beyond the simple loss of acreage.

The primary driver for developing ORWAP was the need for a rapid wetland assessment method that could be used for all kinds of wetlands in all regions of Oregon for state and federal wetland regulatory programs. However, ORWAP is designed to be used for multiple purposes by multiple agencies, including:

- Assessing individual wetlands or portions of wetlands for purposes of state and federal permitting and compensatory wetland mitigation (e.g., impact assessment, compensatory mitigation)
- Evaluating success of voluntary wetland restoration or enhancement projects
- Assessing all wetlands within a community or watershed (e.g., for characterizing watershed health, prioritizing restoration opportunities, or developing a wetland protection program)
- Assessing wetland impacts for activities subject to "Swampbuster" provisions of the 1985 Farm Bill

In addition, under Section 401 of the federal Clean Water Act, states and tribes are just as responsible for maintaining the quality and beneficial uses of jurisdictional wetlands as they are for maintaining the quality and designated uses of streams, rivers, lakes, and estuaries. The need to assess wetland *functions and values* —not just wetland condition or integrity—is mentioned explicitly in numerous laws and policies of state and federal agencies, e.g., December 2002 Regulatory Guidance Letter pertaining to Section 404 of the Federal Clean Water Act, Oregon Removal-Fill Law, and Oregon Watershed Assessment Manual. The requirement to assess functions and values is viewed as generally compatible with the requirement for assessing "aquatic life uses" in waters for which that is the officially designated "use."

In order to be used for these purposes, ORWAP needed to be rapid (take less than a full day to complete an assessment) and require only a single site visit in any season. ORWAP is intended to provide consistent and accurate numeric estimates of the relative ability of a wetland to support a wide variety of functions and values important to society. To do so, ORWAP uses standardized data forms, procedures, and data processing models. Its authors have attempted to incorporate current scientific knowledge of wetlands through peer-reviewed technical literature and the shared knowledge of dozens of local experts who participated in field-testing early versions of ORWAP.

1.2 Conceptual Basis

Functions and values are independent of one another. For example, a wetland that is extremely effective for removing whatever nitrate enters it is not considered to be of high *value* for that *function* unless it is exposed to significant loads of nitrate and/or its watershed has been designated as "Water Quality Limited" as a result of ongoing problems with nitrate pollution. A high level of function does not alone make a wetland valuable. Likewise, even if a wetland's effectiveness for storing water is low, the *value* of that function may be considered potentially high if the wetland is situated above homes that are periodically flooded by heavy runoff. Similarly, if a wetland occurs within a designated "Priority Area" for conservation, it potentially may have great *value*, but if the designation was based mainly on presence of rare plants or salmon, whereas the function under consideration is nitrate removal or waterbird habitat, then it cannot be assumed to be valuable for those functions, especially if the structural characteristics necessary to support those functions are lacking. As described later in this report, analyses of data from 221 Oregon wetlands demonstrated that it is unlikely to have all functions occurring in a single wetland at a high level, regardless of the wetland's unaltered condition or priority designations. A survey of European wetlands reached a similar conclusion (Hansson et al. 2005). In concept, wetland *services* are the combination of *functions* and the *values* of those functions, judged individually. Thus, for a wetland to be considered as providing a high level of services, *both* its functions and the values of those functions should be high.

Fundamentally, the levels and types of *functions* that wetlands individually and collectively provide are determined by the processes and disturbances that affect the movement and other characteristics of water, soil/sediment, plants, and animals (Zedler & Kercher 2005, Euliss et al. 2008). In particular, the frequency, duration, magnitude and timing of these processes and disturbances shapes a given wetland's functions (Smith et al. 2008). Climate, geology, topographic position, and land use strongly influence all of these. The levels and types of *values* that wetlands provide, individually and collectively, are largely determined by the *opportunity* to provide a particular function and the local *significance* of that function (Adamus 1983). For many hydrologic and water quality values, opportunity is determined by what's upslope of a wetland (e.g., land use and buffers in the wetland's contributing area) and significance is predicted partly by what's downslope (e.g., floodplains, water-quality limited water bodies).

To estimate services, variables that determine or at least correlate with each function or value must first be identified. These are commonly termed *indicators*. The number of variables that potentially indicate wetland functions is enormous, but the number of meaningful indicators that can be assessed rapidly and consistently during a single visit is small. To convert indicator estimates to estimates of functions, values, and services, specific *aggregation procedures* must next be constructed and applied. Depending on user needs, the aggregation procedures may include scoring models (Smith et al. 1995), narrative criteria (e.g., Rocchio 2005), or simply best professional judgment ("BPJ").

For regulatory and management applications (e.g., wetland functional enhancement), it's often helpful to assign the indicators of functions to one of four categories:
1. *Onsite modifiable*. These features may be either natural or human-associated and are relatively practical to manage. Examples are water depth, flood frequency and duration, amount of large woody debris, and presence of invasive species. More important than the simple presence of these are their rates of formation and resupply, but those often are more difficult to control.
2. *Onsite intrinsic*. These are natural features that occur within the wetland and are not easily changed or managed. Examples are soil type and groundwater inflow rates. Thus they are poor candidates for manipulation when the goal is to enhance a particular wetland function.
3. *Offsite modifiable.* These are human or natural features whose ability to be manipulated in order to benefit a particular wetland function depends largely on property boundaries, water rights, local regulations, and cooperation among landowners. Examples are watershed land use, stream flow in wetland tributaries, lake levels, and wetland buffer zone conditions.
4. *Offsite intrinsic*. These are natural features such as a wetland's topographic setting (contributing area size, elevation) and regional climate that in most cases cannot be manipulated. Still, they must be included in a wetland assessment method because of their sometimes-pivotal influence on wetland functions and values.

Stressors are factors or features that diminish the levels of specific wetland functions. These typically include only human-associated features, but some assessment methods (such as ORWAP) include natural disturbances as well when they have the potential to cause long-term changes in the delivery of some ecosystem services, especially changes that are far outside the historical precedent. Stressors occur either onsite or offsite (more often the latter). Their indicators can be direct (e.g., existing data showing water quality degradation) or indirect (e.g., presence of potentially polluting land use practices near the wetland). Stressor indicators that are indirect are more correctly termed *risk* indicators until their presumed negative influence on a specific wetland is proven. The functions of some wetland types are more *sensitive* to the influence of stressors. For that reason, ORWAP includes a model whose purpose is to estimate the relative sensitivity of a wetland.

The impact of potential stressors on a wetland depends partly on their proximity to the wetland, their proportional extent, and spatial arrangement. There are many ways to measure these, and nearly limitless combinations (e.g., Mita et al. 2007). For example, assuming that intensively cropped areas are a potential wetland stressor, that could be expressed as a proportion of the surrounding landscape at any particular distance from the center or edge of a wetland. In addition or instead, that land use could be measured as a percent of the wetland-upland edge (wetland perimeter). The measurement could be limited to just the areas upslope of the wetland being assessed, or include all areas within a specified radius. Alternatively, for some functions the size of the largest patch of a land use within some specified distance may be more important than its distance and the presence of connecting corridors. Some research data suggest land use practices many miles from an isolated wetland can impact its functions (Houlahan & Findlay 2003, DeLuca et al. 2004), but the relationship of function to distance cannot be assumed to always be linear, and there are limits to what can be estimated both accurately and rapidly from aerial imagery and field inspection. The array of potential choices for defining and measuring "landscape" or "connectivity" indicators is befuddling, and there is no compelling research data from replicate studies that support particular proximities, proportions, and configurations that are especially pivotal (Baker et al. 2006). ORWAP somewhat arbitrarily estimates most of the important landscape features at distances of 100 ft, 0.5 mile, and/or 2 miles. For adequately assessing stressor effects on wetland functions, field evaluation of stressors is at least as important as the analysis of aerial imagery using GIS (Wardrop et al. 2007)

1.3 Limitations

ORWAP is not intended to answer all questions about wetlands. Users should understand the following important limitations:

1. ORWAP does not change any current procedures for determining wetland jurisdictional status, delineating wetland boundaries, or requirements for monitoring mitigation banks or other wetland projects. When using ORWAP for regulatory applications, it is important to be familiar with other regulatory requirements related to wetland assessment. Contact the pertinent agencies as necessary.

2. The intended users are wetland specialists for government agencies, natural resource organizations, and consulting companies, who are skilled in conducting jurisdictional delineations of wetlands. Users should be able to (a) recognize most wetland plants, (b) determine soil texture (c) understand wetland hydrology, (d) delineate wetland contributing area boundaries from a topographic map, (e) access and acquire information from the internet, and (f) enter data in Microsoft Excel® (1997 or later version). For field application of ORWAP, a multidisciplinary team is encouraged but not required. Training in the use of ORWAP also is encouraged but not required at this time. Prior training and experience sufficient to accurately delineate wetlands is important for using ORWAP. For ORWAP training information, contact the Department of State Lands.

3. The numeric estimates ORWAP provides of wetland functions, values, and other attributes are not actual direct measures of those attributes, nor the products of validated mechanistic models of ecosystem processes. Rather, they are estimates of those attributes arrived at by using standardized scoring models that systematically combine well-accepted indicators. As is true of all other rapid assessment methods applicable to this region, ORWAP's scoring models have not been validated in the sense of comparing their outputs with those from long-term direct measurement of wetland processes. That is the case because the time and cost of making the measurements necessary to fully determine model accuracy would be exorbitant. Nonetheless, the lack of validation is not, by itself, sufficient to avoid use of any standardized rapid method, because the only practical alternative—relying entirely on non-systematic judgments (best professional judgment)—is not demonstrably better in many cases. When properly applied, ORWAP's scoring models and their indicators are believed to adequately describe the *relative* effectiveness in performing the function.

4. ORWAP's scoring models provide a degree of standardization, balance, and comprehensiveness that seldom is obtainable from a single expert. That said, ORWAP may be used to augment—not necessarily replace—the interpretations of a subject professional (e.g., a fisheries biologist, plant ecologist, ornithologist, hydrologist, biogeochemist) when such

expertise is necessary and available. That is partly because ORWAP's spreadsheet models, like those of other rapid methods, lack the intuitiveness and integrative skills of an actual person knowledgeable of a particular function. Also, a model cannot anticipate every situation that may occur in nature. ORWAP outputs should always be screened by the user to see if they "make sense."

5. ORWAP's logic-based process for combining indicators has attempted to reflect currently-understood paradigms of wetland hydrology, biogeochemistry, and ecology. Still, the scientific understanding of wetlands is far less than optimal to support, as confidently as some might desire, the models ORWAP and other rapid methods use to score wetland attributes. To provide transparency about this uncertainty, in the Rationales column of the ORWAP worksheets for individual functions, some of the more significant alternative or confounding interpretations are noted for indicators used in that function's scoring model.

6. ORWAP does not assess *all* functions, values, and services that a wetland might support. In particular, ORWAP does not assess the suitability of a wetland as habitat for any individual wildlife or plant *species*. Where warranted, such assessments must be done using other approaches. The 16 functions and 21 values ORWAP assesses are those most commonly ascribed to Oregon wetlands.

7. If two wetlands have similar effectiveness scores for a function and its value, the larger wetland is usually more likely to provide a greater total level of the associated ecosystem service. However, the relationship between wetland size and the total level of a service delivered is not necessarily linear. For example, if its characteristics make a particular wetland ineffective for storing or purifying water, or for supporting particular plants and animals, then simply increasing its size by adding more wetland having the same characteristics will usually not increase the total amount of water stored or purified, or plants and animals supported. The threshold below which a wetland's characteristics make it completely ineffective is unknown in many cases. Where scientific evidence has suggested that wetland size may benefit a function in a greater-than-linear manner, ORWAP has included wetland size as an indicator for that function. Those functions are Waterbird Feeding, Waterbird Nesting, Songbirds-Mammals, and Pollinators.

8. In some wetlands, the scores that ORWAP's models generate may not be sufficiently sensitive to detect, in the short term, mild changes in some functions. For example, ORWAP is not intended to measure small year-to-year changes in a slowly-recovering restored wetland, or minor changes in specific functions, as potentially associated with limited "enhancement" activities such as weed control. Nonetheless, in such situations, ORWAP can use information about a project to predict the likely *direction* of the change for a wide array of functions. Quantifying the actual change will often require more intensive (not rapid) measurement protocols that are complementary.

9. ORWAP outputs are not intended to address the important question, "Is a proposed or previous wetland creation or enhancement project in a *geomorphically appropriate* location?" That is, is the wetland in a location where key processes can be expected to adaptively sustain the wetland and the particular functions which those of its type usually support, e.g., its "site potential?" Although ORWAP uses many landscape-scale indicators to estimate functions and

values of a wetland, ORWAP is less practical for identifying the relative influence of multiple processes that support a single wetland. See the *Guidance for Using the Oregon Rapid Wetland Assessment Protocol (ORWAP) in State and Federal Permit Programs* (Oregon Department of State Lands, May 2009) for additional information on site selection.

Other important cautions on ORWAP use and interpretation are provided throughout Section 2.0, as well as in the ORWAP regulatory use guidance document available from DSL.

1.4 Comparison With Oregon's Hydrogeomorphic (HGM) Methods

In parts of Oregon where reference-based HGM methods are available (Willamette Valley, Oregon Coast) for assessing functions and values of specific wetland types (riverine and slope/flat wetlands; tidal wetlands, respectively), either the HGM methods or ORWAP may be used. In vernal pool wetlands in southwestern Oregon, a DSL-funded assessment method (Packenham-Walsh et al. 2006) may be most appropriate. In all other parts of Oregon, and for other wetland types in the above-mentioned regions, ORWAP is applicable. Even in the regions already covered by existing HGM methods, ORWAP should be used whenever out-of-kind comparisons among wetlands must be made.

Important note: *If assessing wetlands for state or federal permit purposes, it is important to be familiar with all pertinent DSL and Corps of Engineers regulations and guidance regarding permissible methods for different situations. Consult with DSL and the Corps for information, as needed.*

ORWAP and Oregon's HGM methods have many similarities and several important differences. They are similar in: (1) being relatively rapid to apply during a single site visit, (2) using indicators to assess mainly the same functions and values on an ordinal scale, and (3) requiring personal computers to process data collected both in the field and in the office. Aside from ORWAP's inclusion of all wetland types and regions of Oregon, they differ as follows:

1. ORWAP allows comparisons to be made among any and all wetland types in Oregon, whereas the HGM methods were limited to a few specific types and regions for which HGM guidebooks have been developed. HGM methods cannot be used to compare two different wetlands if they are not of the same HGM classification.

2. The scoring scale used in the HGM methods is anchored at its upper end using numeric scores from a few "reference wetlands" that were believed to be the *least-altered* of their type in their region, and the HGM methods also provide a second scaling method, in which the wetland with the *highest score* (regardless of whether it happened to be among the least-altered) for each function is used to scale that score to that of the function in other wetlands. In contrast, ORWAP does not adjust the scores to a scale based on the least-altered site, or anything else. The scores are reported as they result directly from the scoring models. All of ORWAP's scoring models can potentially generate a score anywhere between 0 and 10, but for some functions and values, those endpoints were not achieved by any of the 221 wetlands to which ORWAP was applied during testing. As a practical matter, the endpoints may never be achieved by any wetland

because some combinations of indicator scores within some scoring models may seldom or never occur together in nature.

3. ORWAP includes a standardized process for scoring indicators of wetland *values*, and then aggregating those scores into a score for the relative value of each function. The HGM methods did not provide that. It also provides a systematic process for scoring wetland stressors, which the Willamette Valley HGM method did not.

4. ORWAP combines closely related functions and their values into fewer groups (without losing the scores for the individual functions and values) to facilitate ease of use in regulatory applications. The HGM methods do not.

5. Data forms for ORWAP are slightly longer and use more indicators. That is partly due to the need to address the wider variation among all wetland types in the much larger region. It also reflects increasing understanding of wetland functions and values, and increasing availability of critical spatial information (aerial imagery, maps) now obtainable via the internet.

6. Although ORWAP uses nearly all the indicators used by the HGM methods, ORWAP defines or explains some of those indicators slightly differently (and hopefully more clearly) based on feedback from HGM users and users of draft versions of ORWAP.

7. A few of the indicators used by the HGM methods that required the most time, effort, or expertise to assess (e.g., measurement of width and depth of tidal channels, identification of plant cover by species in quadrats) have not been included in ORWAP.

8. For some indicators, ORWAP provides different thresholds or choices of condition. This is again due to the larger region encompassed.

9. ORWAP includes two functions (Carbon Sequestration and Pollinator Habitat) not covered by the HGM methods as well as two additional values (Public Use and Recognition, Provisioning Services). It also includes a score for wetland Sensitivity, and provides models that automatically help the user predict a wetland's HGM class. Two other wetland attributes (Ecological Condition and Stressors) included in ORWAP were scored by Oregon's tidal wetland HGM method but not by the Willamette HGM method.

10. ORWAP does not require the user to fill out different data forms for different wetland types or regions of the state. A single three-part data form can be used for all Oregon wetlands. While it is obvious that different HGM classes tend to have different levels of some wetland functions, ORWAP's models do not require the user to first determine a wetland's HGM class. Rather, the information the user provides about a wetland's indicators is used by the scoring models to automatically score the likelihood of the wetland belonging to various wetland types (HGM classes). The ORWAP spreadsheets contain different sub-models for different wetland types or regions when so warranted to increase the sensitivity and efficiency of the scoring. The spreadsheet automatically recognizes the wetland type and shunts the data analysis and scoring process through the most applicable sub-model. For many functions, the main distinctions that warranted separate sub-models, each with a wider or more restrictive set of indicators, are (a)

tidal wetlands, (b) non-tidal wetlands that are saturated-only (i.e., contain no surface water most years), (c) non-tidal wetlands that contain surface water at least seasonally, and (d) wetlands with inlets and outlets, vs. those without. ORWAP data forms also instruct users to skip some questions if their wetland is not of a particular type.

11. In arriving at a score for a function, ORWAP treats stressor indicators differently than in the HGM methods. In the HGM methods, if a stressor is absent, a wetland receives a higher score, other factors being equal. When an HGM score is obtained by averaging several indicators, this causes the other indicators that could be more limiting in that situation to be overshadowed. By contrast, in ORWAP, if a stressor is absent, the computerized model in the spreadsheet does not include it at all when indicators are averaged. However, in both methods, when a stressor is present it is allowed to detract from the function's score.

12. Similarly, for a few indicators ORWAP allows the user to choose "do not know" or "data unavailable" without such a response counting as a "0" in the scoring model (which then would artificially reduce the function's score). When such a choice is selected, ORWAP drops that indicator from calculations that involve averaging.

13. Similarly, when the influence of some indicators is expected to be insignificant in a particular context, ORWAP drops them automatically from scoring models that involve averaging, rather than counting them as 0's. For example, the indicator "Percent Ground Cover" is irrelevant if another indicator "Extent of Persistent Water" shows that nearly the entire wetland is inundated year-round. Many of the indicators that involve woody vegetation are dropped from the calculations if the response to one indicator question (D3) shows that the wetland is in a landscape whose wetlands historically are not wooded (e.g., parts of the Great Basin in eastern Oregon). Dozens of other situations are embedded in the spreadsheet formulas and are identified in the last column of each function's worksheet. Thus, the models in the ORWAP spreadsheet use Boolean logic extensively (in the form of multiple nested "if" statements in their formulas) to give greater recognition of the interactions and potentially contingent or limiting relationships among indicators, thus representing wetland processes more realistically. Such a strategy was identified recently by Faber- Langendoen et al. (2008) as a promising way of aggregating indicators.

14. ORWAP was tested in more wetlands by more potential users than either of Oregon's HGM methods (see Section 7.0). As a result of that iterative feedback, the wording of ORWAP's indicator questions was modified dozens of times to improve clarity to the widest array of potential users. Also, more definitions and illustrations were added and many questions were explained in greater detail. The near-final version of ORWAP was tested in six wetlands to determine the repeatability of scores among independent users assessing the same wetland (see Sections 7.2 and 7.5.1).

15. In addition to having a Web site with supporting data and a data archiving feature, ORWAP provides users with several supporting databases as worksheets in the *ORWAP_SuppInfo* file, that facilitate the answering of several indicator questions.

2.0 Procedures for Using ORWAP

The steps below provide an outline of the process and the instructions that follow. You will be completing four forms: a cover page (CoverPg); an office form (Form OF); and two field forms (FieldF and FieldS). In order to answer the questions on the cover page and Form OF, you will be accessing four Web sites in detail and two others briefly. The Department of State Lands has no affiliation with any of the internet sites other than its own, and users should be aware that online information is frequently updated and Web site addresses may change.

2.1 Steps for Using ORWAP

1. Read this entire section (Section 2) before proceeding to follow the instructions and complete the forms.
2. Download the most recent version of the two Excel spreadsheet files necessary to use ORWAP: *ORWAP_ Calculator* and *ORWAP_ SuppInfo*[1] at either of these Web sites: http://www.oregonstatelands.us/DSL/PERMITS/forms.shtml or www.oregonstate.edu/~adamusp/ORWAP
3. Also download and print (from the same sites) the PDF files of the data forms (CoverPg, Form OF, FieldF, and FieldS). Do not print anything from the Excel spreadsheet at this point, except perhaps some of the plant lists in the *ORWAP SuppInfo* file before conducting the field work.
4. Complete the "office" component, which involves filling out the CoverPg and Form OF worksheets in the *ORWAP Calculator* file (directions in Section 2.2 below).
5. Visit the wetland and complete the "field" component by filling out data forms FieldF and FieldS and refine your answers to questions on Form OF if necessary (directions in Section 2.3).
6. In the office, refer to the Web resources and other information (e.g., plant list worksheets) as needed to adjust answers on any of the forms based upon your field investigation.
7. Process and interpret the results (Section 2.4).

2.2 Instructions for "Office" Component

The instructions below direct you to sources of information that you will use to answer questions on the office forms (CoverPg and Form OF) and, as needed, explain how to find specific information on those sources. The electronic version of those and the other data forms (worksheets) which you'll need are in the file *ORWAP_Calculator.xls*. When you open that file, you may get a message asking if you want to enable "macros." Mark yes; the macros in this file will not harm your computer. They are necessary to automate all the calculations.

You will need to print an aerial photograph, a soils map, and a topographic map (if you do not currently have a paper copy). Then, obtain information needed to fill out parts of the CoverPg using the procedures described in the following sections of this manual:

---

[1] The *ORWAP_Calculator* file contains the following worksheets: CoverPg, Sketch, Form OF, FieldF, FieldS, Scores, Matrix, and individual worksheets for each function or attribute containing the indicators, their scores, rationales, and scoring models. The *ORWAP_SuppInfo file* contains the following worksheets (data tables): P_WIS, P_Salt, P_LowMarsh, P_Invas, P_Exo, P_UnCom, NFIX, IBAs, HUC4, HUC5, HUC6, HUCbest, WetVerts, WetInverts, InvertsExo, InvertsRare, WQprob, AllSites, Normed

- For latitude and longitude of your assessment area: Section 2.2.1B
- For TRS and Tax Lot(s) if not already known: Section 2.2.9
- For soil map units: Section 2.2.6

As you fill out Form OF, you may find it helpful to:
- Minimize rather than close the four Web sites you access until you have answered all of the office form questions, as you may refer to a Web site more than once.
- Flag those questions that you particularly want to evaluate in the field, as well, because of inadequate resolution in the aerial imagery or the topo map.

2.2.1 Obtain Aerial Images

A recent aerial image of the assessment area (AA) (see Section 2.2.4 for procedures required to delineate the AA) is needed to answer several of the questions in Form OF. In addition, the image will be useful while walking through the AA and may be required as a Base Map (see Section 2.3.2).

The images should be of adequate resolution, viewed at (zoomed to) and printed at a scale of 1:24,000 (1 inch = 0.5 mile) or finer, such that the entire AA nearly fills a printed page. The same aerial image should be printed again but covering the entire wetland, if the AA does not comprise all of the wetland. Aerial images from any convenient source may be used. To expedite finding an aerial image of your wetland online, you will need to input its geographic coordinates (latitude and longitude).

2.2.1.A Determine the Geographic Coordinates

Determine the latitude and longitude of the AA's center in decimal-degrees, e.g., 45.2434, -123.3425. For ORWAP's purposes, the precision of the coordinates need not be any greater than about half of the width of the wetland. If the wetland's coordinates have not already been determined in the field using a GPS (NAD83 datum), determine them as follows:

a. Download the free Google Earth software at http://earth.google.com/download-earth.html.
   To set the options display for coordinates to decimal degrees, go to the Tools dropdown menu and select options (Figure 1). Under Google Earth options select the 3D view tab and check **decimal degrees** in the show Lat / Long box (Figure 2). This defaults the display Lat / Long to be in decimal degrees.
b. If you know the Lat / Long in degrees minutes seconds you can type in that value and Google Earth will convert it to decimal degrees which will be displayed in the bottom left corner of the window.
c. Alternatively, if you enter a street address, cross streets, or other information into the "Fly To" space, the map will zoom to that approximate location. Locate your wetland and move the cursor to the center of the part you wish to assess.
d. The correct Lat / Long is displayed in the bottom left corner of the window (Figure 3).

After you've determined the AA's boundaries, center the cursor in the middle of it and indicate the Lat/Long on the CoverPg form (see Section 2.2.4).

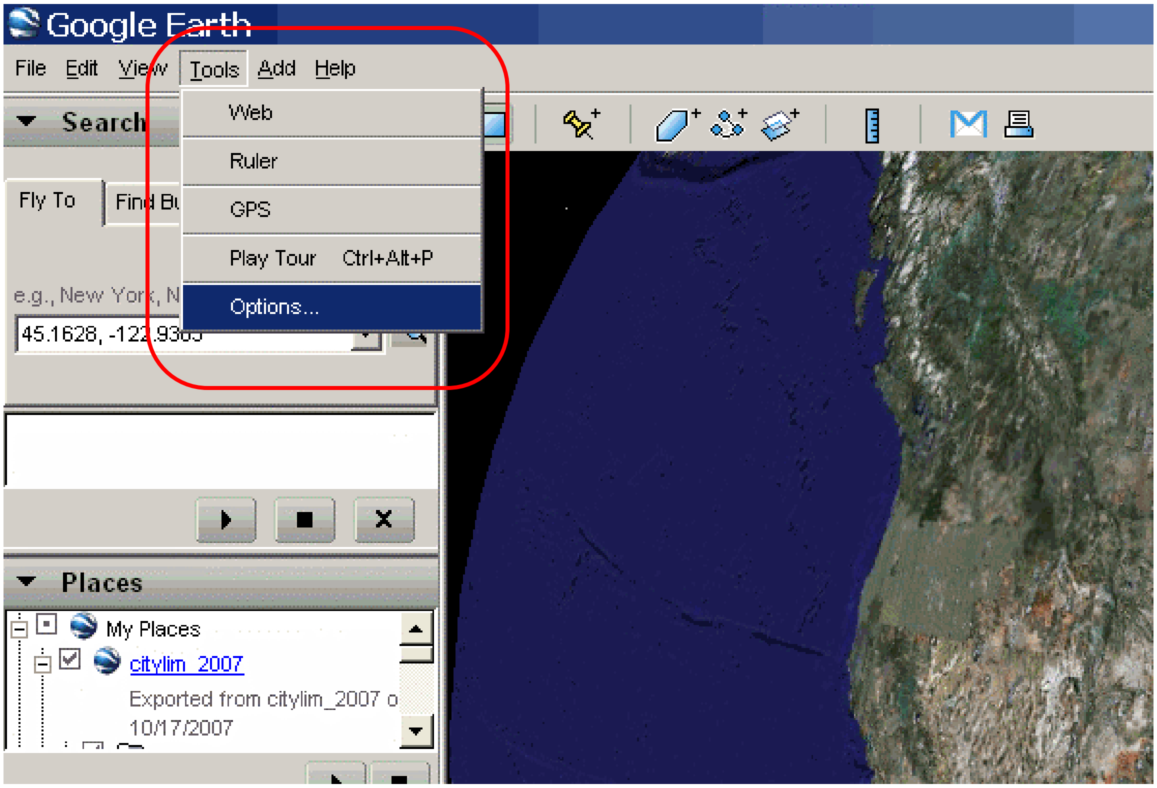

Figure 1. Setting the options display in Google Earth.

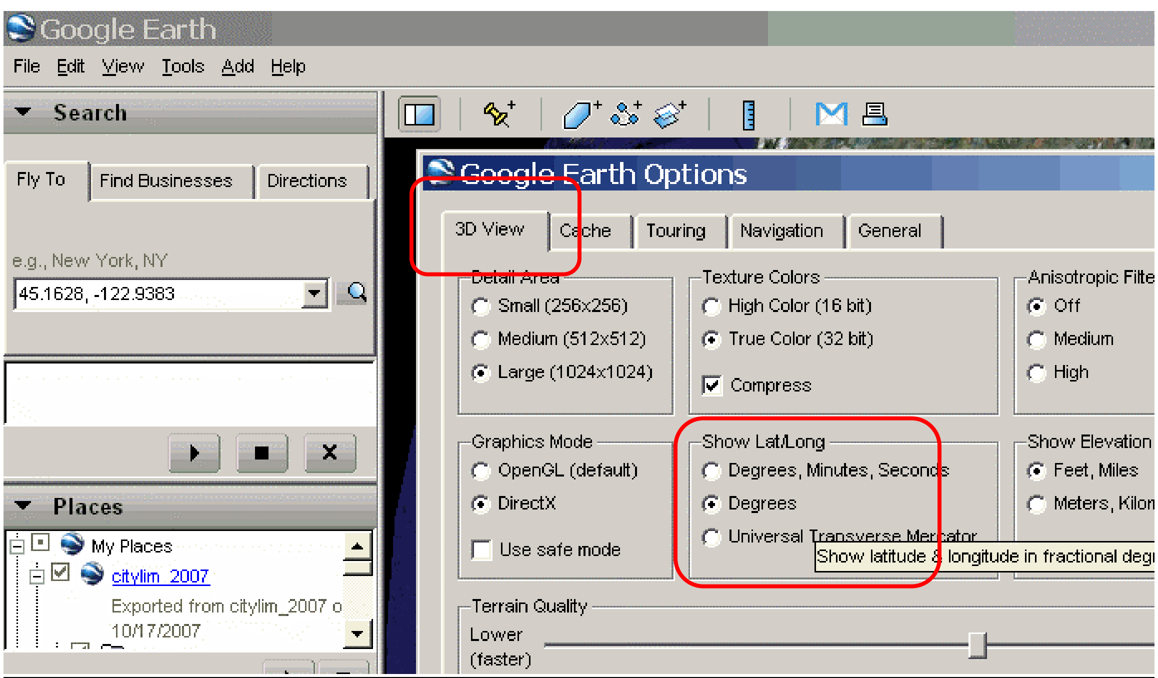

Figure 2. Setting decimal degrees for Lat /Long in Google Earth.

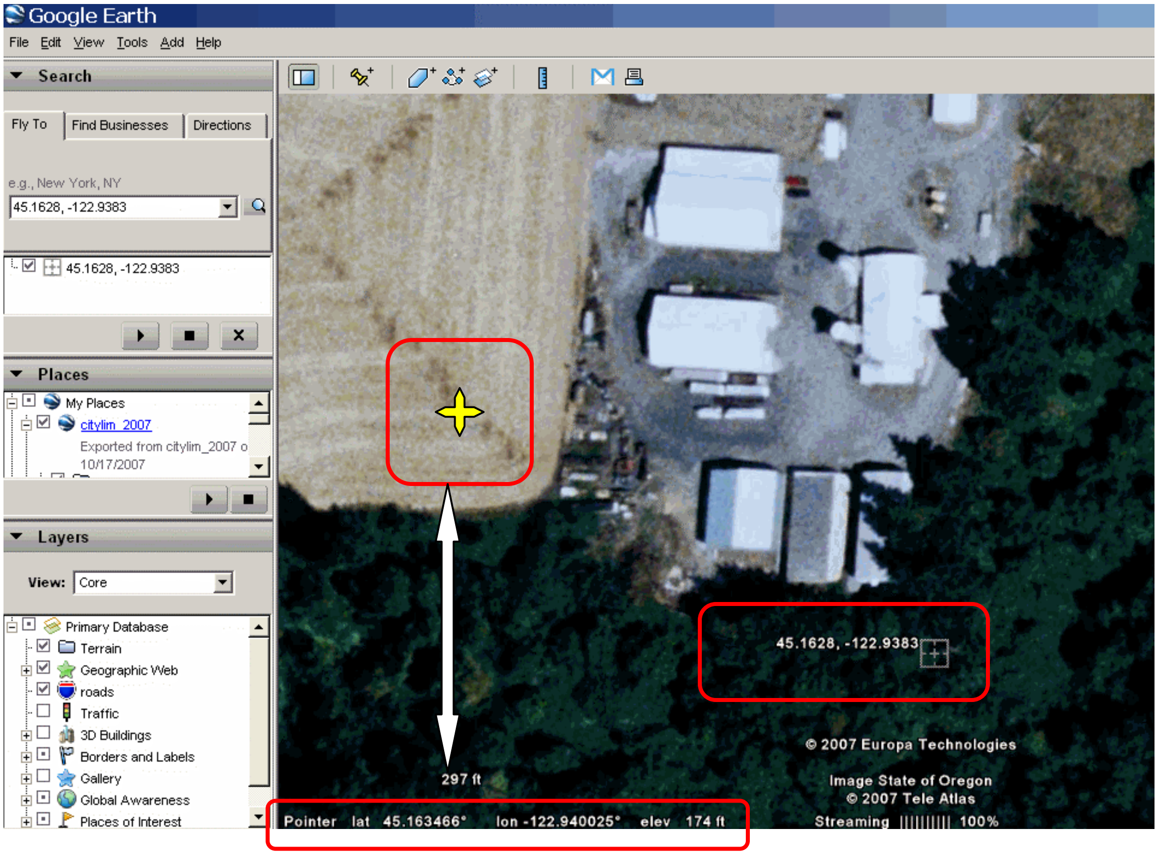

Figure 3. Identifying Lat /Long using Google Earth.

2.2.1.B Sources of Aerial Images

Online sources of aerial imagery can include any of the following:

- Google Earth Web site: http://earth.google.com/downloadearth.html

As described above. Contains some of the clearest aerial images, plus a distance measuring tool.

- Microsoft Imagery Web site: http://maps.live.com/

Click on Aerial and zoom into the desired scale. In more populated parts of the state, there will also be a tab called "Birds Eye" which provides remarkable side-views of the specified site.

- Oregon Wetland Explorer Web site: www.oregonexplorer.info/wetlands/orwap

An advantage of this service is that you will be visiting this Web site for many types of data required by ORWAP (see Section 2.2.8) and circles of various radii requested by ORWAP are displayed automatically. Click on Aerial tab above the map. Resolution may be less than when using Google Earth.

- Oregon DEQ LASAR Web site: http://deq12.deq.state.or.us/lasar2/default.aspx

An advantage of this service is that you will be visiting this Web site for water quality information (Section 2.2.7). Click on "A Map." In the Map Feature Menu, click on Ortho Photos 2005. Resolution may be less than when using Google Earth.

- Web Soil Survey (WSS) Web site: http://websoilsurvey.nrcs.usda.gov

See procedure described in Section 2.2.6 for accessing this information. A helpful feature is its Area of Interest (AOI) polygon tool for measuring area, which could be used to measure land cover polygons as well as those for soils.

- Oregon Explorer Imagery Web site: http://www.oregonexplorer.info/imagery/

The finest-resolution imagery (0.5 m) available to the public for all of Oregon will be found here, but must be downloaded into a GIS and the transfer is not rapid.

2.2.1.C Interpret Aerial Images

You will use aerial images at various scales to answer questions D4 through D18 on Form OF. While viewing the images you will need to roughly estimate four broad categories of land cover that are *not mutually exclusive*. The different land cover types are measured in different ways and at varied scales because of differing effects they have on different functions. Using a GIS is not essential although doing so may increase the precision of your estimates[2]. The estimates should be made prior to the site visit, recorded on Form OF, and then a copy printed and taken with you during the site visit. Upon visiting the site, your estimates should be modified, if appropriate, based on your observations of the site.

The four categories of land cover you will identify are:

<u>Natural Land Cover</u>: This is defined as wooded areas, sagebrush, vegetated wetlands, prairies, *as well as* relatively unmanaged lands such as untilled ryegrass fields, hayfields, lightly grazed pastures, and rangeland. It *does not include* water, row crops (vegetable, orchards, Christmas tree farms), residential areas, golf courses, recreational fields, pavement, recent clearcuts, bare soil, rock, bare sand, gravel or dirt roads. *Natural land cover is **not** the same as native vegetation or forest,* but it certainly may include those. It frequently includes a dominance of non-native plants (e.g., cheatgrass, Himalayan blackberry).

<u>Forest</u>: This is a subset of Natural Land Cover. It includes woody vegetation currently taller than 20 ft (i.e., trees) and with >70% canopy closure.

<u>Open Land & Wetland</u>: This includes unwooded areas that typically occur on flat ground, such as most herbaceous wetlands, grassy parts of airports, golf courses, recreational fields, irrigated and row crops, and other agricultural lands (e.g., hayfield, pasture, ryegrass, fallow fields) <u>if</u> they are known with certainty to be situated on flat land. It does not include water, developed areas, shrubland, orchards, or woodland.

<u>Ponded Areas</u>: This includes any water that is not obviously part of a river, stream, ditch, or tidal system. It includes lakes, reservoirs, ponds, and persistently inundated wetlands, regardless of size and regardless of whether the ponding is due to humans or natural processes.

You will assess these land cover types in the following 3 zones. Note that not all of the 4 land cover types will be assessed in *every* zone:

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[2] GIS staff at the Oregon Watershed Enhancement Board (OWEB) have prepared GIS scripts that automatically draw preliminary boundaries of a wetland's contributing area (CA) and improve measurement of some spatial indicators required by ORWAP. For more information contact Cyrus Curry at cyrus.curry@state.or.us

- Within a circle of radius 2 miles (10,560 ft or 3219 m)
- Within a circle of radius 0.5 mile (2640 ft or 805 m)
- Within 100 ft (30 m)

Note that some distances are measured from the center of the AA, and others from the wetland-upland edge. If you are viewing aerial images with Google Earth, you can use its *measure tool* to draw a line from the wetland outward to each of the specified distances, and visualize a circle from that. Even better, you can go to http://dev.bt23.org/keyhole/circlegen/ and input your coordinates and the circle radius you want. It will draw that circle on the Google Earth image and adjust it appropriately as you zoom in and out. Alternatively, use the Wetland Explorer Web site which automatically projects the circles on a map of wetlands, as well as on an aerial image (click on the Aerial tab) from which land cover may be interpreted, although perhaps not as definitively as with Google Earth.

To estimate the *percentages* of a given land cover, imagine all the patches of that type that fall within the circle being "squeezed together" and determine the approximate fraction of the circle they would occupy. Note that the questions for "natural land cover" and "open land and wetland" ask the percentage of the *land* area of the circle that is occupied by the specified land cover, whereas the questions for "forest cover" and "ponded water" use the entire circle.

In addition to assessing percentages of these land cover types, you will make two other estimates:

- Proximity (ft or mi) to the nearest land cover of the specified type and minimum size, and
- Tract size (acres) of the nearest land cover of the specified type

You may measure acreages by zooming to your location and using the area calculator tool at the USGS national map viewer: http://nationalmap.gov/viewer (click on "GIS Toolbox," "Advanced," "Measure Area" tool) or you may use the AOI tool at the Web Soil Survey Web site (see section 2.2.6). Less precisely, you may simply measure a representative width and length of the patch, using the Google Earth measure tool and specifying *miles* as units, then multiply:

Width (miles) x length (miles) x 640 acres/sq. mile = acres

In most cases this estimate will be precise enough for the intended purpose. If near a category threshold, repeat the measurement a few times.

2.2.2 Obtain a Topographic Map

You will need a topographic map on which to draw boundaries of the assessment area (see Section 2.2.4) and to estimate the boundaries of its contributing area (see Section 2.2.5). The topographic maps having the finest resolution and which are easiest to read are usually the hard copy versions (1:24,000 or finer scale) purchased from USGS or an outdoor supply store, or those from software containing these maps for Oregon (e.g., can be purchased from www.maptech.com or other sources). If this is not possible, then topo maps of sometimes poorer resolution can be viewed and printed from the Web Soil Survey (see Section 2.2.6B for instructions) This source has the advantage of allowing you to draw your AA or CA on an aerial image and it will automatically appear on the topo, but this Web site does not have topo maps available for all areas of Oregon. Another option is to go to http://terraserver-usa.com/ or http://mapserver.mytopo.com/homepage/index.cfm and navigate to your location, then view the relevant topographic map.

2.2.3 Obtain Wetland Map

To answer some of ORWAP's questions you will need a map showing the *entire* wetland (or wetland plus contiguous pond or lake, if a fringe wetland) that is associated with the AA you define and draw (see Section 2.2.4). A wetland delineation map that includes the entire wetland, not just a portion of the wetland (AA), is the best wetland map to use. If a wetland delineation of the entire wetland that includes the AA has not been completed, search for an existing map, if any, of the wetland by going to the Oregon Wetlands Explorer (www.oregonexplorer.info/wetlands/orwap) and inputting the geographic coordinates determined earlier as explained in Section 2.2.8. That Web site has incorporated wetland maps from the National Wetlands Inventory (NWI), Oregon's Local Wetlands Inventories (LWI's) and other sources. LWI maps and supporting information have been completed for more than 50 cities in Oregon. See: www.oregonstatelands.us/DSL/WETLAND/lwi.shtml

If no wetland maps are available for your location, or if existing wetland maps show no wetlands at that location, then assume (until you visit the site and can attempt to delimit boundaries with more certainty) that the wetland boundary coincides with that of surface water visible in the aerial image or mapped hydric soils (not those mapped as partially hydric) as shown in the Oregon Wetlands Explorer Web site.

2.2.4 Determine the Assessment Area (AA)

The AA is either the entire wetland or some portion of it as described below. The approximate AA boundaries will need to be delimited on the topographic map, aerial imagery, soils map, and on a wetland delineation map (if available). The AA boundaries may need to be adjusted during the field component, but for ORWAP's purposes you don't need to delineate the AA boundary with the high level of precision customary for jurisdictional delineations. Nonetheless, *where* you draw the boundaries of the AA can dramatically influence the resulting scores. If a wetland delineation has been submitted and approved by the responsible agencies, it should be used as the basis for delimiting the AA's upland edge.

*Note that a few questions **must** be answered in terms of the **entire** wetland, not the more limited portion defined by just the AA. Those questions are indicated by a large **W** in column D of the data forms. If the AA does not occupy all of a wetland, you must estimate and note on the CoverPg worksheet the approximate percent of the wetland it occupies. Similarly, you must estimate and note the approximate percent of the mapped AA you were able to visit (taking into account both physical restrictions and private property restrictions).*

2.2.4.1 General Guidelines for Drawing the AA

The AA preferably will consist of the entire wetland plus, in some cases, some or all of the adjoining unvegetated water (see below). However, ORWAP may be applied to an area comprising less than the entire wetland if any of three situations occur:

- The wetland extends across property lines and access permission to part of the wetland was not granted.
- The wetland is so large (e.g., >50 acres) and internally varied that an accurate assessment cannot be completed in a day.
- A project or activity will occur in only part of a wetland and the effect on functions of just that project or activity needs to be determined. For use in state and/or federal regulatory programs, see additional guidance in section 3.0.

Boundaries of the AA should be based mainly on ***hydrologic connectivity****.* They normally should not be based *solely* on property lines, fence lines, mapped soil series, vegetation associations, elevation zones, land use or land use designations.

2.2.4.2 Specific Guidelines

a. **Dissected Wetland.** If a wetland that once was a contiguous unit is now divided or separated from its formerly contiguous part by a road or dike (Figure 4), assess the two units separately unless a functioning culvert, water control structure, or other opening connects them, and their water levels usually are simultaneously at about the same level.

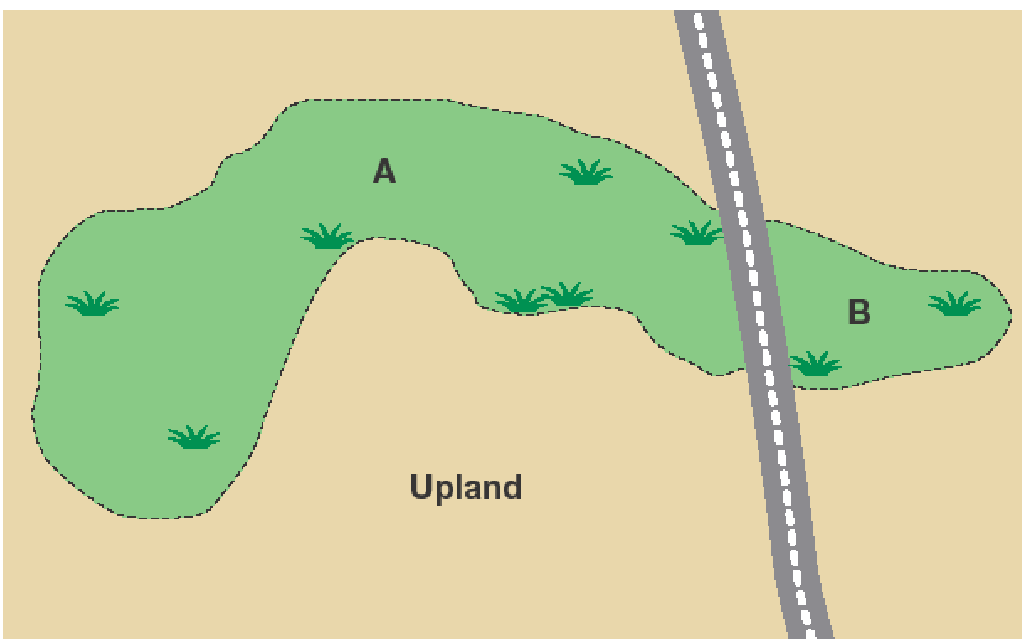

Figure 4. Dissected Wetland. *A wetland is crossed by a road or filled area. Separate the wetland into two AA's and assess separately if A and B have different water levels and circulation between them is significantly impeded.*

b. **Fringe Wetland**. If a wetland is a fringe wetland (that is, it borders a bay, estuary, pond, or river in which the contiguous stretch of open water is >3x wider than the wetland), the AA should include just the vegetated wetland, not the adjoining water (unless the method specifically directs you to answer a question about that). An exception is if the contiguous water body including the wetland is smaller than 20 acres, e.g., a pond. In that case, the water body itself (regardless of depth) should be included as well as the wetland (Figure 5).

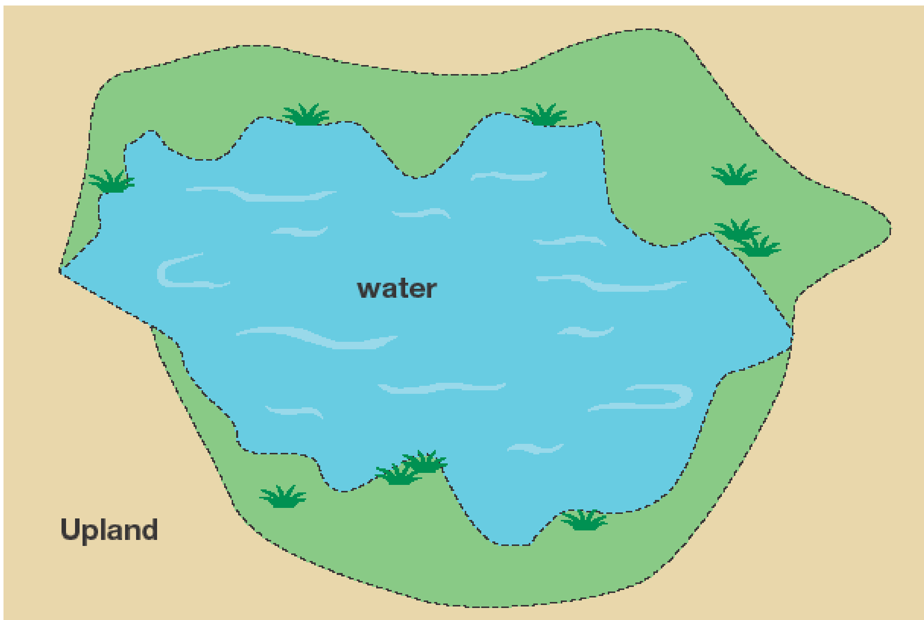

Figure 5. Fringe Wetland Type 1*. The average width of the open water area is more than 3x wider than the average width of the wetland, making this a fringe wetland. If the entire polygon is smaller than 20 acres, the AA should include the open water. If larger, the AA should include only the wetland.*

c. **Fringe Wetland Patches**. If patches of fringe wetlands share the same margin of a river, lake, or estuary and are separated from each other by non-vegetated shore (mud, sand, gravel, algae, pavement, upland) over a distance of greater than 100 ft, they should be assessed as separate AA's (Figure 6) unless they appear to be the same in nearly every aspect (dominant vegetation, soil texture, hydrology, landscape position, Cowardin classification, adjoining land use, etc.) and are within 1000 ft. of each other.

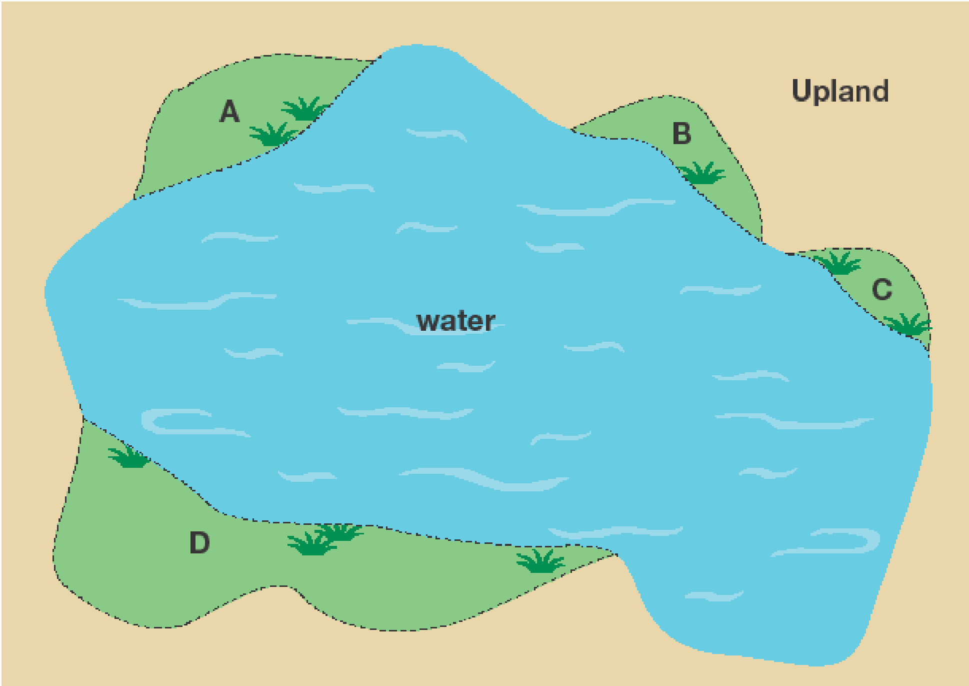

Figure 6. Fringe Wetland Type 2 (fringe wetland patches). *Wetland patches B and C would be included in the same AA if separated by no more than 100 ft. by water, bare substrate, algal flats, or upland. Wetland patches A and D would be in the same AA if separated by 100 ft or less, or if they are within 1000 ft of each other and their vegetation, soil texture, water regime, Cowardin classification and adjoining land use is the same.*

d. Lacustrine Wetland With Tributary. If a lacustrine wetland is intersected by an inflowing stream, the wetland should be considered lacustrine except for the part that is more subject to seasonal overflow from the stream than from fluctuations in lake levels. That part should be assessed separately.

e. Wetland Mosaic. If the wetland is a patch in a mosaic of wetlands within uplands or other non-wetland waters (Figure 7) and none of the above rules apply, the entire mosaic should be considered and delimited as one AA if:

- Each patch of wetland is smaller than 1 acre, and
- Each patch is less than 100 ft from its nearest neighboring wetland and is not separated from them by impervious surface, and
- The areas of vegetated wetland are more than 50% of the total area. The total area is the wetlands plus other areas that are between the wetlands (such as uplands, open water, and mudflats).

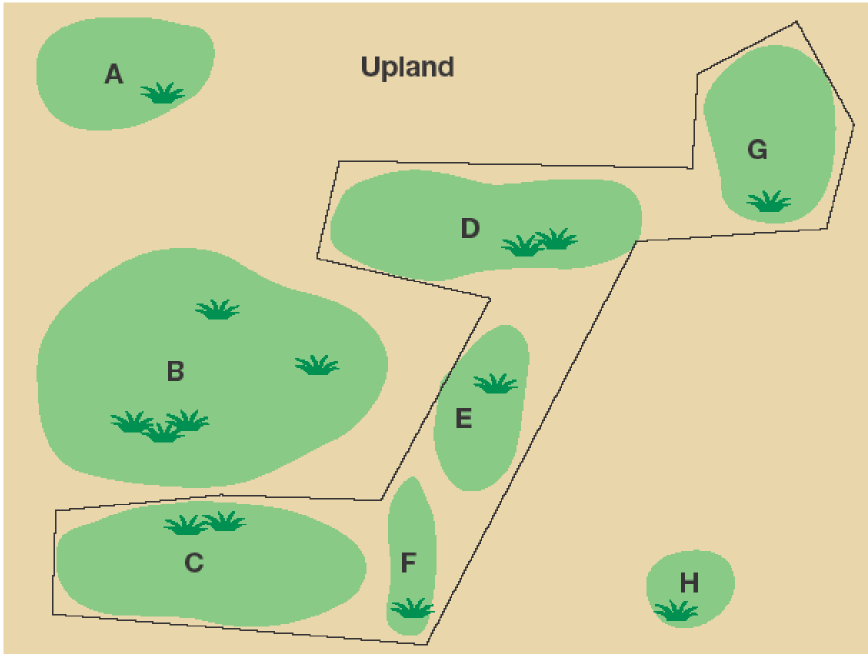

Figure 7. Wetland Mosaic Assessment Area (AA). *In this diagram the dark line defines the mosaic. The circles are wetlands and the areas between them are upland. Wetlands C, D, E, F, and G comprise a mosaic because they occupy more than 50% of the total area bounded by the dark line. Wetland B is excluded because it is larger than 1 acre. Wetlands A and H are excluded because each is >100 ft from its closest neighbor.*

f. Tidal/Non-Tidal Wetland. If any vegetated part of the AA is tidal (experiences fluctuating water levels as a result of tides) on any day during an average year, assess that part separately from the non-tidal part.

2.2.5 Determine the Contributing Area (CA)

Identifying the wetland's contributing area (CA) requires an ability to interpret topographic maps. Delimiting the wetland's CA is necessary to answer Form OF questions D36, 37, 38, and 39. The CA is the drainage area, catchment area, or contributing upland that feeds the wetland (Figure 8). It includes all areas uphill from the AA until a ridge or topographic rise is reached, often many miles away, beyond which water would travel in a direction that would not take it to the AA. The water does not need to travel on the land surface; it may reach the AA slowly as shallow subsurface seepage[3]. The CA's highest point will be along a ridgeline or topographic mound. The lowest point of a CA is the lowest point in the AA. Although it is possible that roads, tile drains, and other artificial features that run perpendicular to the slope may interfere with movement of runoff or groundwater into a wetland (at least seasonally), it is virtually

[3] There are often situations where subsurface flow (especially deep groundwater) that potentially feeds a wetland ignores such topographic divides, but due to the limitations imposed by rapid assessment, no attempt should be made to account for that process.

impossible to determine their relative influence without detailed maps and hydrologic modeling. Therefore, in most cases draw the CA as it would exist *without* existing infrastructure, i.e., based solely on natural topography as depicted in the topographic map. The only exception is where maps, aerial images, or field inspections show artificial ditches or drains that *obviously* intercept and divert a *substantial* part of the runoff before it reaches the wetland, or where a runoff-blocking berm or elevated road adjoins (is contiguous to) a wetland on its uphill side.

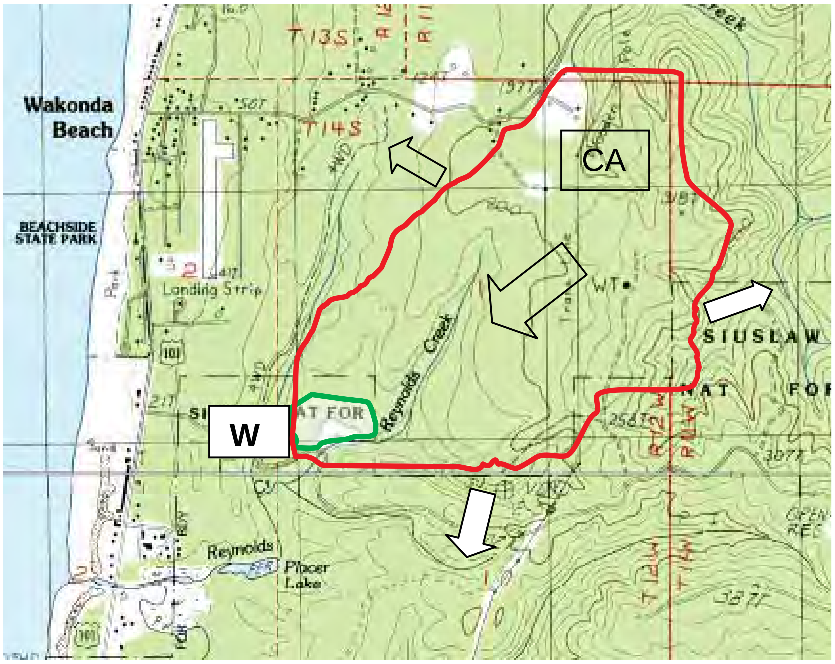

Figure 8. Delimiting a wetland's Contributing Area (CA). *Wetland (to the right of the "W") is fed by its Contributing Area (CA) whose boundary is represented by the red line. The dark arrow denotes flow of water downgradient within the CA. The light arrows denote the likely path of water away from the CA and into adjoining drainages, as interpreted from the topography. Note that the CA boundary crosses a stream at only one point, that being the outlet of the wetland.*

The upper limit of a CA is sometimes synonymous with the boundaries of "HUC6" watersheds (see Section 2.2.8, information obtainable via Wetland Explorer Web site). However, a wetland's CA will almost always be much smaller than the entire HUC6 watershed. A CA may include other wetlands and ponds, even those without outlets, if they're at a higher elevation. Normally, the boundary of a CA will *cross a stream at only one point*— at the CA's and AA's outlet, if it has one. Do not include contiguous perennial deep waters at the same elevation (such as a lake, river, or bay) unless so indicated in the question (e.g., D36). Especially in urban areas and areas of flat terrain, the CA boundaries can be somewhat subjective and estimation in the field may be preferable. However, for ORWAP's purposes a high degree of precision is not needed.

2.2.6 Obtain Information from the USDA's Web Soil Survey (WSS) Web Site

Uses of Specific Information You'll Obtain From This Web Site:
Soil map unit names, TRS for wetland and AA, Acreage of the AA → CoverPg
Erodibility of soils within 200 ft upslope of wetland → Form OF #D20
Dominant vegetative patch size → Form OF #D21
Boundaries of hydric soil map unit (if any), in and near the wetland → Form OF #D24
Topographic map (optional) → delimiting the CA as needed for several Form OF questions.

Procedure:

Step 1. Go to the Web Soil Survey (WSS) at http://websoilsurvey.nrcs.usda.gov

Step 2. Click on the green button labeled "Start WSS" after first reviewing the instructions.

Step 3. In the menu on the left, click Navigate By > Latitude and Longitude. Then enter the AA's coordinates and click View. If you want a larger map to work with, at the top right corner of the map click the far right box to get the "full width map layout."

Step 4. Click on the *polygon* tool (AOI) from the far right end of the toolbar above the image. After you click on the AOI, move the pointer to your first location on the edge of the AA and single-click. Continue to create multiple lines that enclose the AA by positioning the cursor and single clicking (Figure 9). On the last point, double-click to close the polygon and process your designated area.

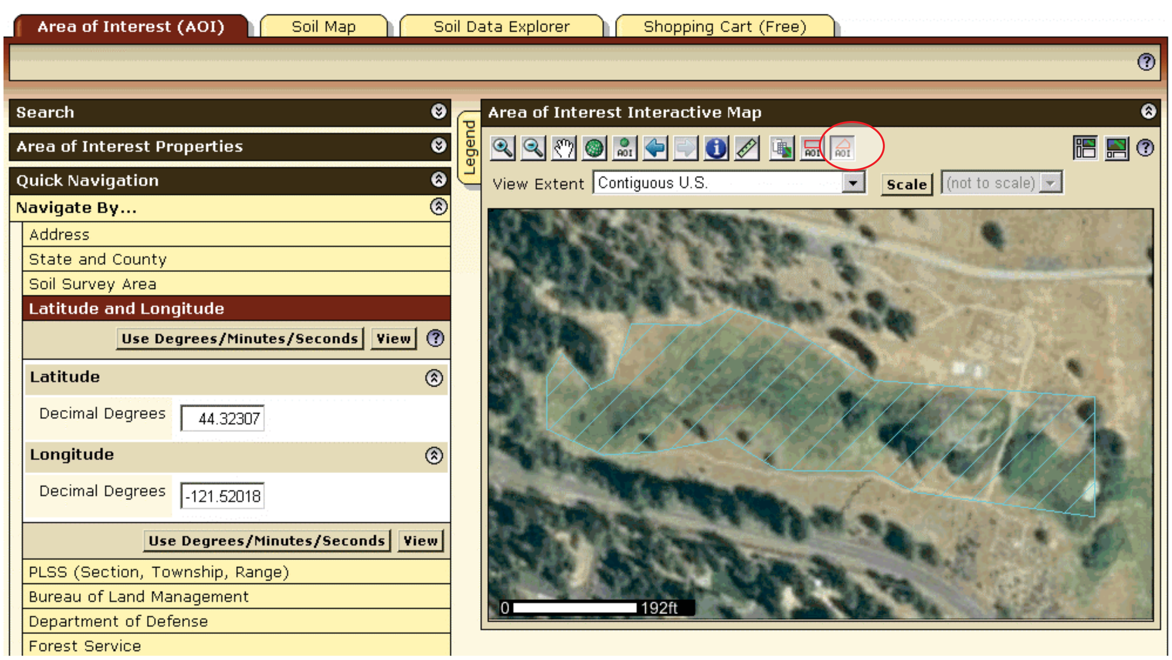

Figure 9. The NRCS Web Soil Survey (WSS) with the Area of Interest (AOI) polygon drawn online by the user for an AA.

Step 5. ORWAP's CoverPg requires you to list the township, range, and section (TRS) of the AA. To obtain this, notice the Legend tab in the upper left hand corner of the map (outside the map border). Click on the tab and when the legend appears, scroll down and check the PLSS Township & Range and the PLSS Section boxes. The TRS will now be identified on the map. Click the legend tab again to remove the legend box.

Step 6. Click on the Soil Data Explorer tab, which is one of four tabs above the map. In the menu that appears on left, click on Land Classifications, and then click on Hydric Rating by Map Unit. Click View Rating. A map unit legend will appear that indicates all the soil map units within the polygon, with their names, hydric rating, acres, and percent of polygon. The map will show these soil units (Figure 10). **Print the map** by clicking on the Printable Version box located in the upper right page (the map will be needed for the field component). On the CoverPg, write in the names and percentages of the soil map units occurring in the area you enclosed with the polygon tool. At the bottom of the table note the total "Acres in AOI" and enter it in the "approximate size of the AA" box on the CoverPg data form.

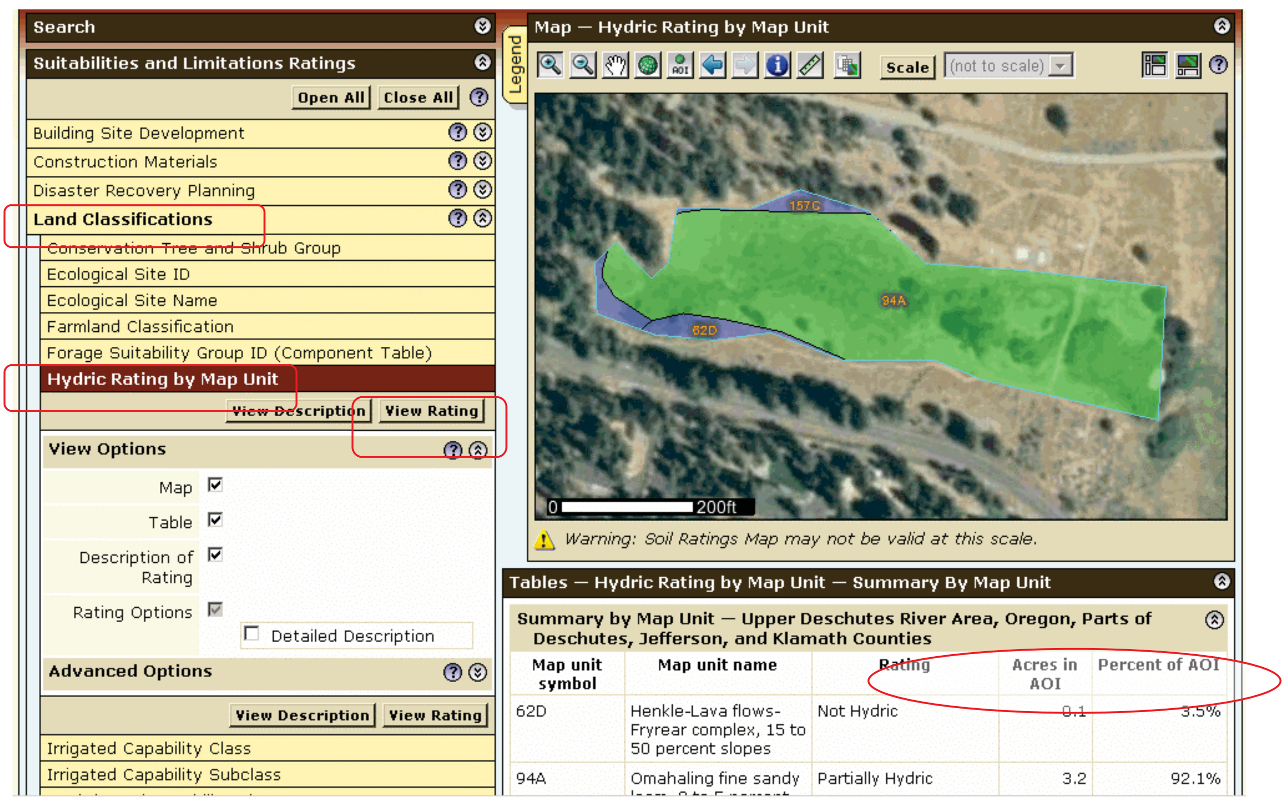

Figure 10. Soil map units within the AA and hydric rating from the online NRCS WSS tool.

Step 7. ORWAP's CoverPg requires you to list the soil map units that are surrounding and contiguous to the AA. To obtain this information, again click on the Area of Interest (AOI) tab at the top of the page. Then click on the *rectangle* AOI tool. Move the pointer to a starting point and left click your mouse and drag to draw a large rectangle that includes the AA and the area within at least 200 ft of it on all sides. Note that the map scale is at the bottom left of the aerial and that you may need to zoom out in order to encompass the desired area (Figure 11). The software only allows one AOI so the AA boundaries will be deleted when the new AOI is processed. Once the designated area is processed, click on the Soil Map tab, which is one of the 4 tabs at the top of the page. On ORWAP's CoverPg, write in the soil map units that are surrounding and contiguous to the AA (this could be hydric or non-hydric soils). If you want to print the map (optional), click on the Printable Version box located in the upper right page (the map may be useful during the field component if the AA's mapped soils don't agree with your field determination).

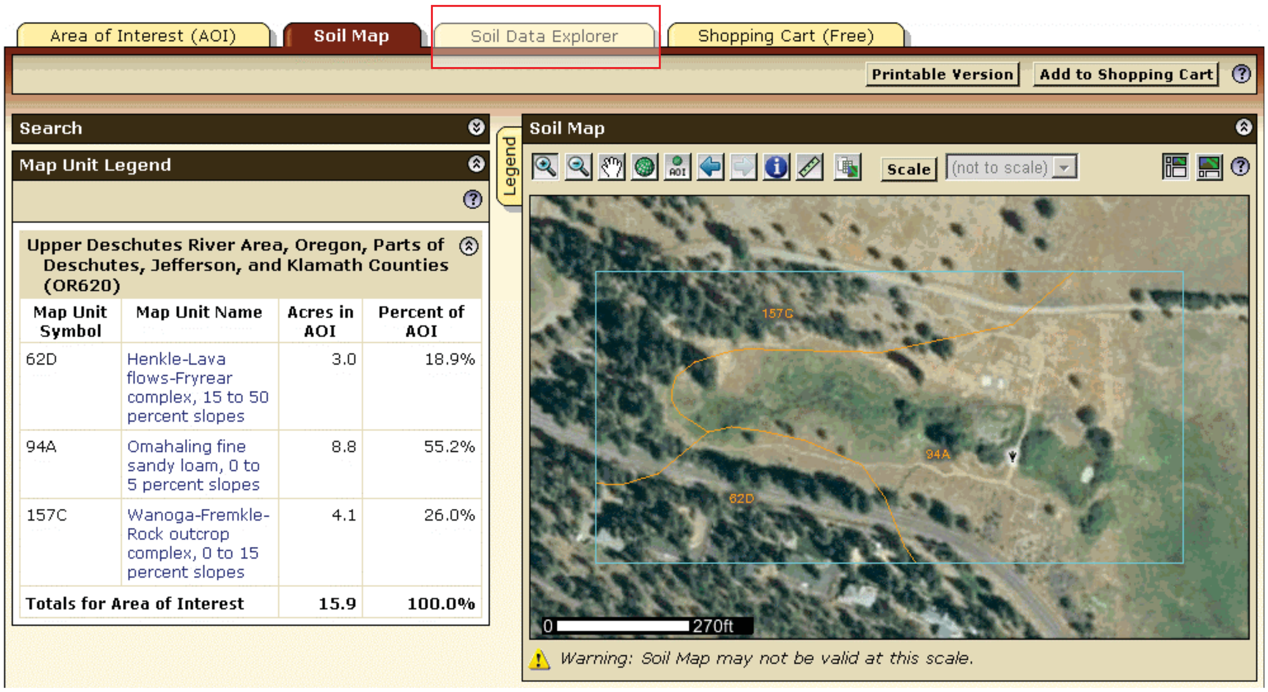

***Figure 11**. Soil map units within the rectangular AOI from the online NRCS WSS tool.*

Step 8. Next, click on the Soil Data Explorer tab. In the menu that appears on the left, click on Land Management> Erosion Hazard (Off-road, Off-trail). When a menu pops up beneath that, click View Rating. A table will appear beneath the image. In the map image, identify which soil map unit occupies the largest percentage of the area within 200 ft *upslope* of the AA, but exclude the AA itself. Then note the rating for that soil (e.g., "Slight") that appears in the third column of the table below the map image to answer ORWAP question D20.

Step 9. Click on the Area of Interest (AOI) tab in the upper left side of the screen. In the box to the left of the map, click Clear AOI (you may need to scroll down). Look at the aerial and determine the extent of the *entire wetland* of which the AA is a part (you may need to zoom out). Draw a polygon around the wetland (see directions in Step 4). Click on the Soil Data Explorer tab, which is one of four tabs above the map. In the menu that appears on left, click on Land Classifications, and then click on Hydric Rating by Map Unit. Click View Rating. A map unit legend will appear that indicates all the soil map units within the polygon (Figure 12). **Print the map** by clicking on the Printable Version box located in the upper right page (the map will be needed for the field component). At the bottom of the table, note the total "Acres in AOI" and use the total wetland acreage and the AA acreage (determined in Step 6) to determine the "AA as percent of entire wetland" box on the CoverPg data form.

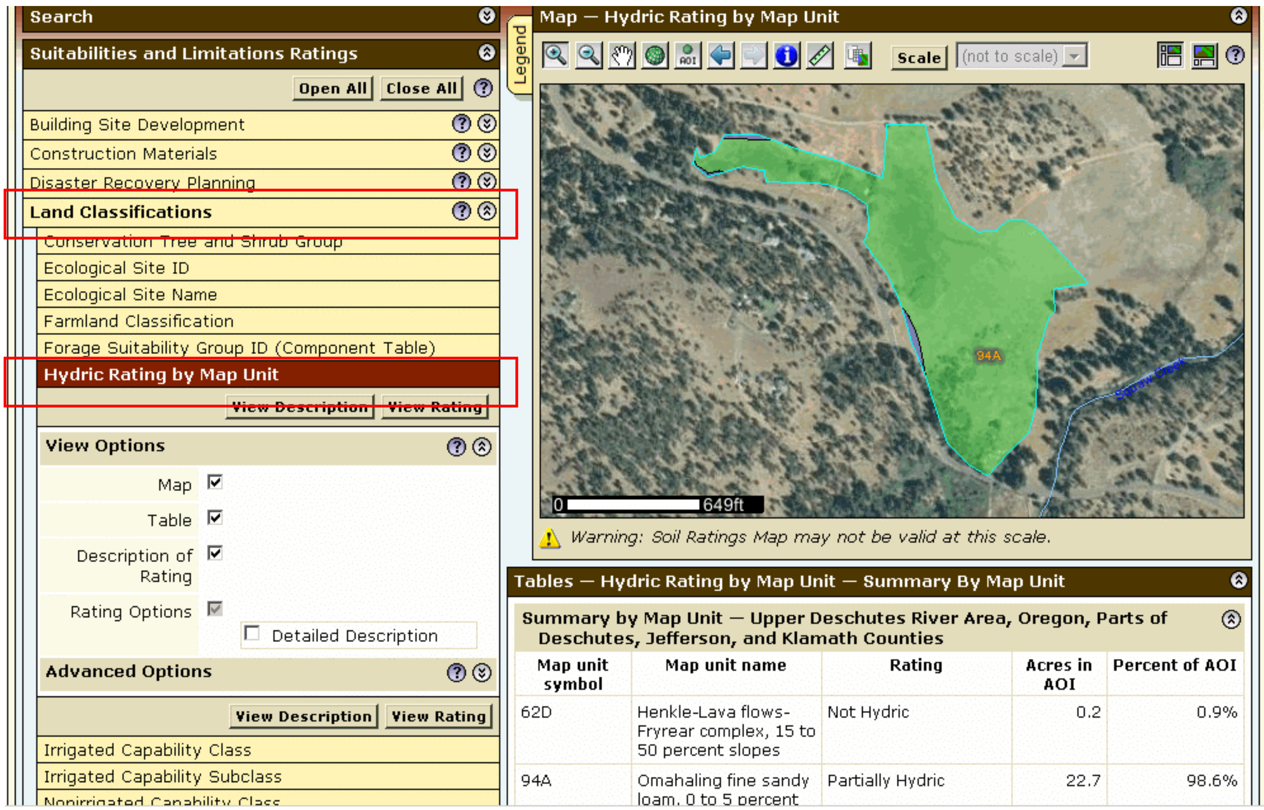

Figure 12. The estimated wetland boundary and the hydric soil rating from the online NRCS WSS tool.

Step 10. To answer question D21, click on the Area of Interest (AOI) tab in the upper left side of the screen. Look again at the wetland polygon and determine the area of the largest patch of emergent, shrub, or forest vegetation – using just the dominant class. You will need to draw a polygon around the patch (see directions in Step 4). Draw over top of the existing wetland polygon. When drawing the patch polygon, do not include areas of the patch that are within 100 ft. of its edge with upland or open water. Extend the polygon to include all contiguous vegetation of the same patch type only if not separated by a gap created by open water, a road, dike, or other upland that is wider than 150 ft. The polygon acreage will be shown in the Area of Interest Properties block to the left of the map (Figure 13).

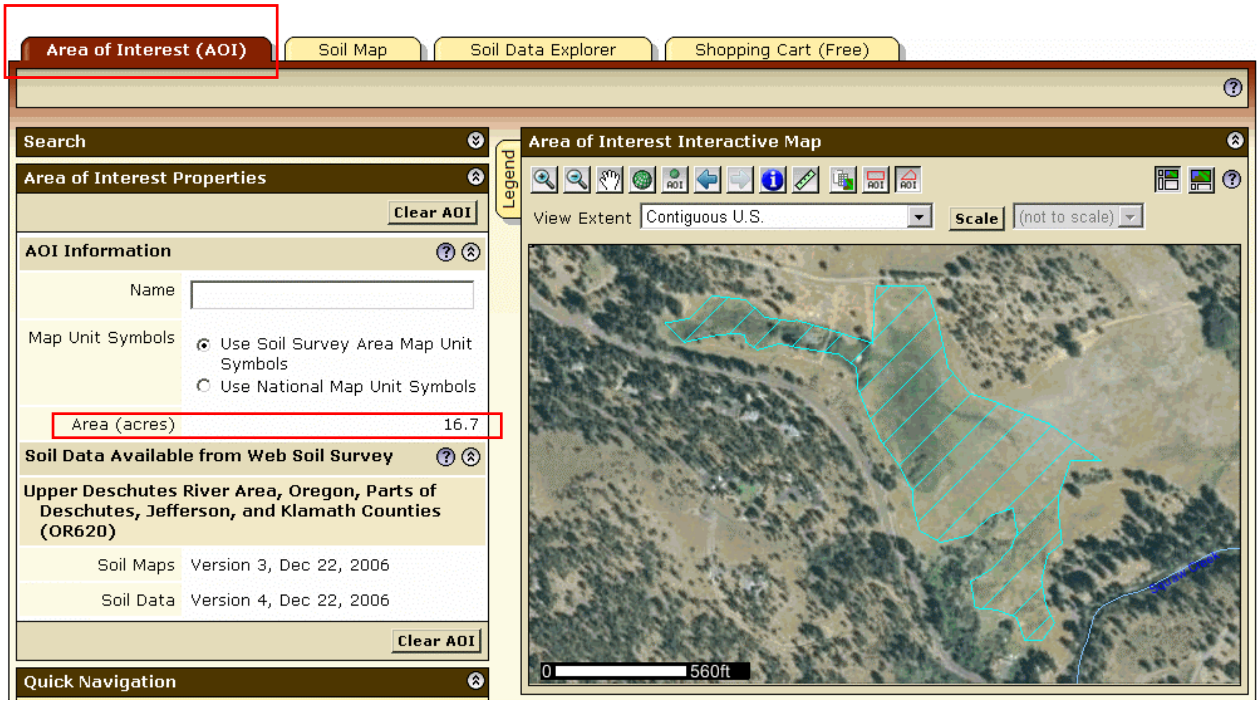

Figure 13. The dominant vegetated patch (emergent) within the entire wetland.

Step 11 (optional). If you do not already have a hard copy of this wetland's topographic map, you may view one at this WSS Web site. Click on the Area of Interest (AOI) tab in the upper left side of the screen. In the box to the left of the map, click Clear AOI. Do Step 4 above to draw your AA area. Once the designated area is processed, click on the Soil Map tab, which is one of the 4 tabs at the top of the page. Click on the Legend tab in the upper left hand corner of the map. When the legend appears, scroll down and look for the "topographic map" option. If you do not have this option, you will need to zoom out. Use the zoom tool in the upper left corner of the map to zoom out. You may need to try this several times until the appropriate scale is obtained. If after several tries the topo map option is not highlighted, then a topo map is not available for this area. **Print the map** by clicking on the Printable Version box located in the upper right page.

2.2.7 Obtain Information from Oregon DEQ LASAR Web Site

Uses of Specific Information You'll Obtain From This Web Site:
Water Quality Limited streams and lakes near your wetland → Form OF #**D40, 41**
Drinking Water Source Area (Surface, Ground)→ Form OF #**D43**
County Rank → Form OF **#D46, 47**

Procedure:

Step 1. Go to http://deq12.deq.state.or.us/lasar2/default.aspx Click on "A Map" under "Search for Sampling Data by."

Step 2. In the menu on the left click **lat/long** and input the wetland AA's coordinates. Then hit "Map It" (Figure 14).

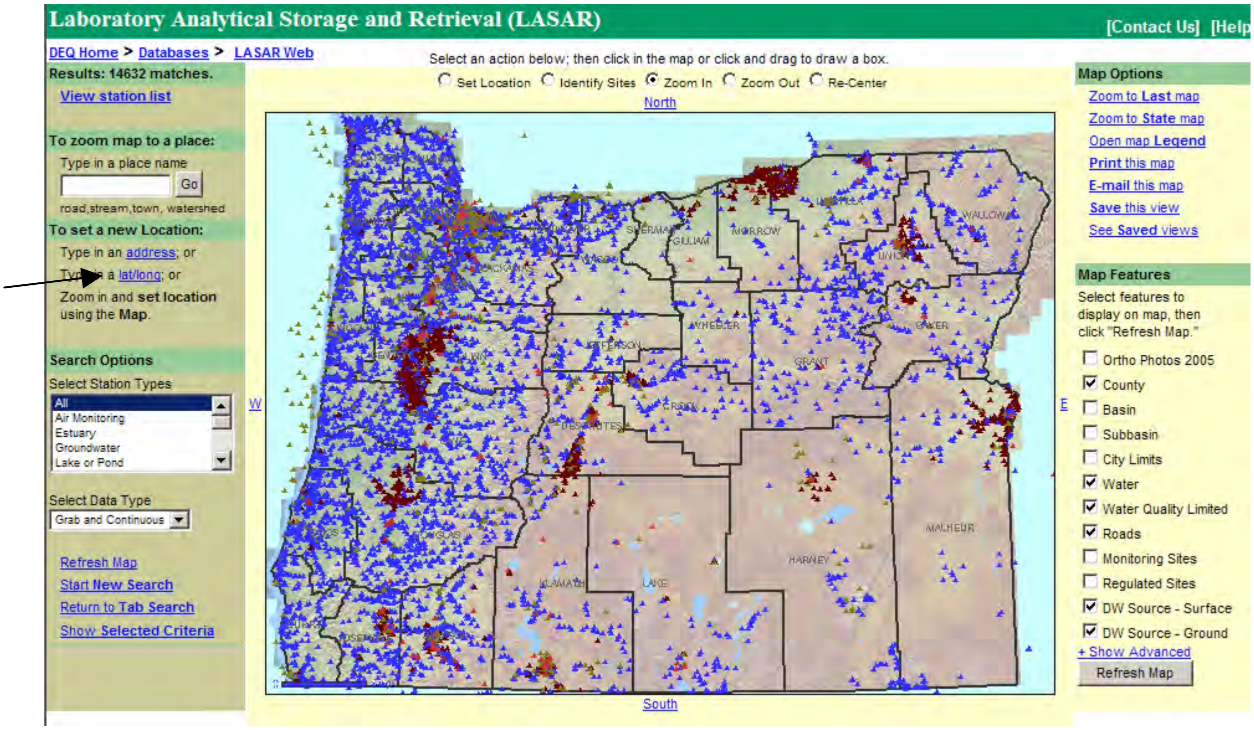

Figure 14. LASAR Web site frame showing options for inputting location information.

Step 3. The location you input will then be shown on the map with a blue pushpin marker (upper right corner of Figure 15). On the menu on the right, check the following: Water, Water Quality Limited, DW Source - Surface, DW Source - Ground, and Watershed (the last is accessed by clicking on "Show Advanced") and refresh the map.

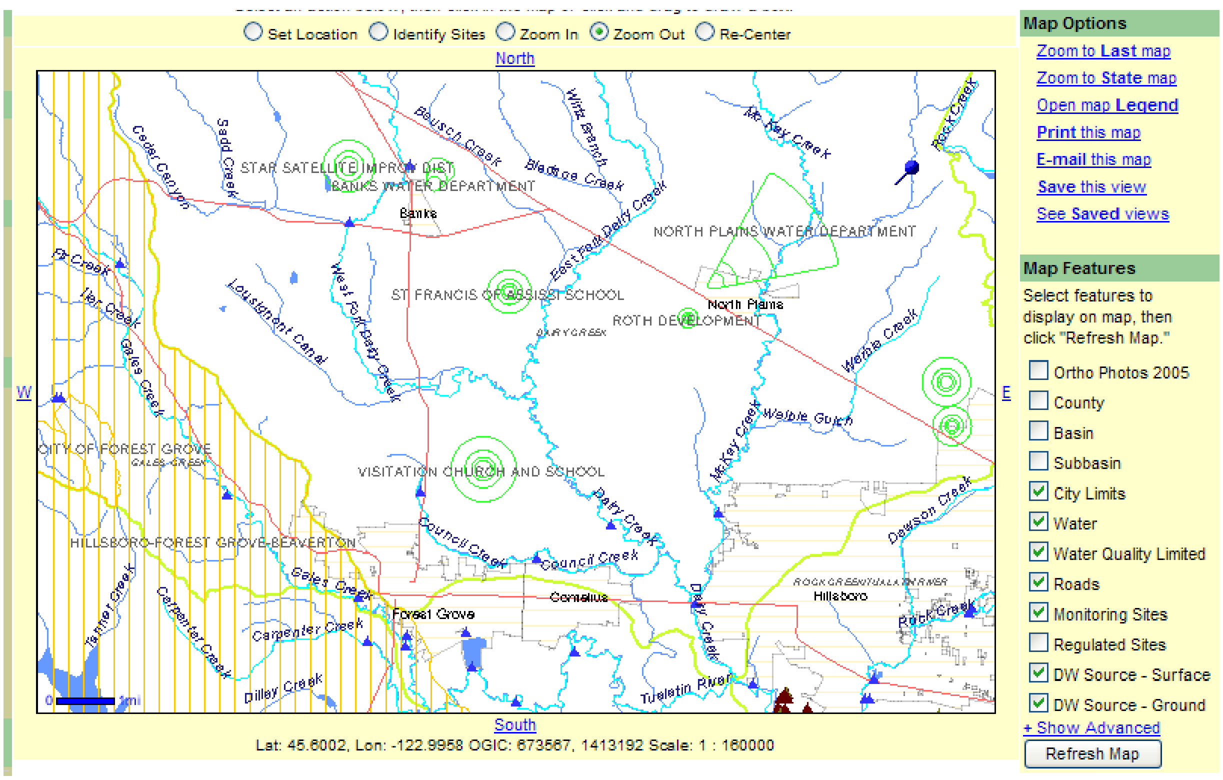

Figure 15. LASAR frame after entering geographic coordinates and zooming out. *The pushpin symbol in the upper right is the wetland whose coordinates were entered. Water quality monitoring points are the blue triangles (surface) or brown triangles (groundwater). Blue lines are streams and turquoise shading indicates segments that DEQ designated as Water Quality Limited. Light green lines (circles) are possible boundaries of source areas for drinking water obtained from wells. The lined area on the left is the potential boundary of a source area for drinking water obtained from surface sources.*

Step 4. In the menu above the map, click on the Zoom Out button and then move your cursor over the map and click repeatedly until the scale in the lower left says "1 mi." Now click on "Identify Sites" in the menu above the map. Click and refresh map. If you see a turquoise-shaded (Water Quality Limited) stream or lake within 1 mile of your site in any direction and in the same watershed, click on that stream and a table should appear (if you get an error message it means the stream is not water quality limited). Reviewing the table, if the reason for the water quality limitation is phosphorus, nitrate, ammonia, temperature, sedimentation, turbidity, or suspended solids, then respond accordingly to question D40 and/or D41. If the reason is "nutrients," "algae," or "aquatic weeds" check both phosphorus and nitrate. If the only reason is listed as bacteria (E. coli, fecal coliform, etc.), pH, dissolved oxygen, or habitat modification, select only "none of above" when you answer D40 and/or D41.

Step 5. Answering question D42 (Type of Outflow Connection to 303d) will require noting if there is a surface connection between the Water Quality Limited stream or lake and your AA. Do not rely only on the DEQ map for this; also review the topographic map and the wetlands map (see 2.2.8 below), as well as verifying with field observations.

Step 6. Note if your wetland is within an area mapped as DW (Drinking Water) Source - Surface (vertical brown lines) or DW Source - Ground (bright green circles or green lines). If so, answer affirmatively the relevant parts of D43 in Form OF.

Step 7. Finally, note which county your wetland is in. This is listed below and to the left of the map. Use that information and the tables in the WQprob worksheet (of the Excel spreadsheet) to answer questions D46 and D47 in Form OF.

2.2.8 Obtain Information from the Wetland Explorer Web Site

Uses of Specific Information You'll Obtain From this Web Site:
Presettlement Vegetation→ #**D3**
Special Protected Area → #**D25 (b)**
Wetland Priority Area → #**D25 (c)**
HUC 6 code number → #**D22 and 23**
Essential Indigenous Anadromous Salmonid Habitat (ESH) → #**D25 (a)**
Rare Species Value scores → #**D26 through D32**
100-yr Floodplain → #**D33** in Form OF.
Position in Watershed → #**D35** (zoom out and read guidance below to answer question about AA's relative elevation within its HUC4)
Springs → #**F17** in FieldF data form

Procedure:

Step 1. Go to the ORWAP part of the Wetland Explorer section of the Oregon Explorer Web site: http://oregonexplorer.info/wetlands/orwap

Step 2. Where prompted, enter the geographic coordinates of your AA. Be sure the longitude has a minus sign in front of it (e.g., -122 not 122). Click on "Get Report" and wait several seconds until notified (on the right) that all the information has loaded.

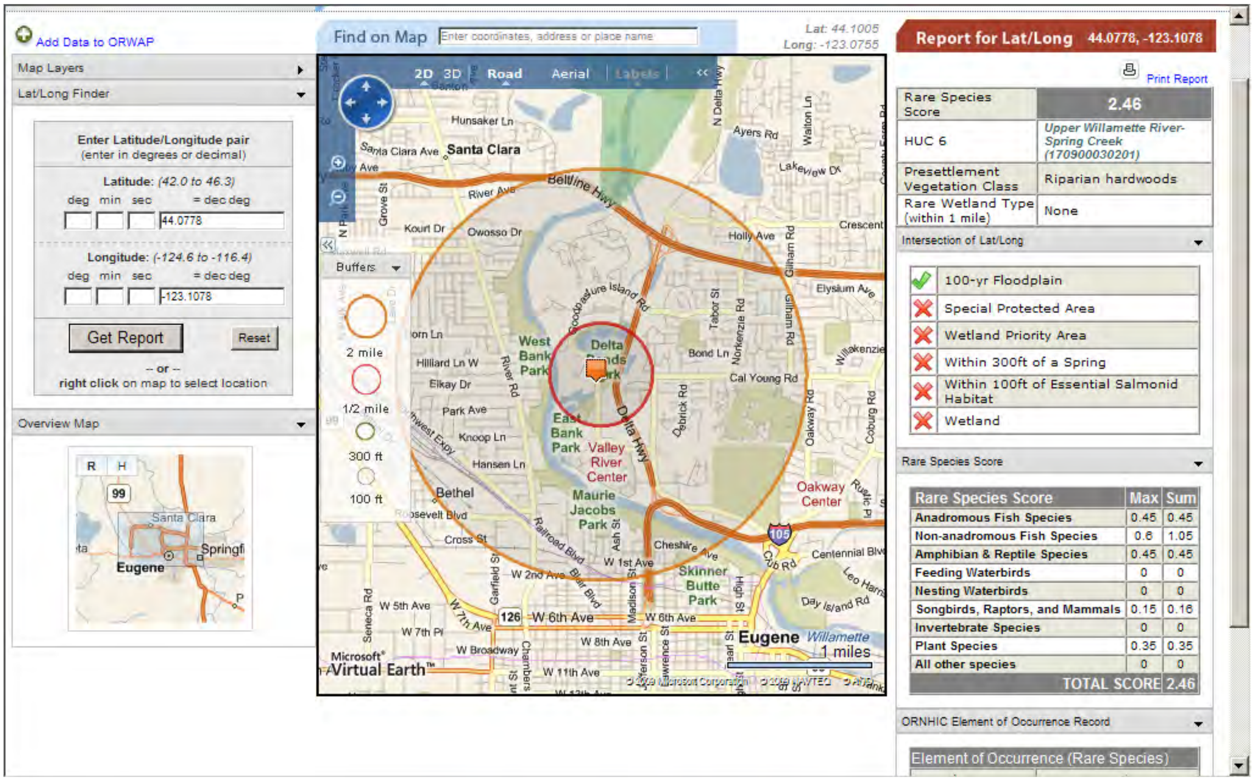

Figure 16. Wetland Explorer frame showing report information needed for ORWAP.

Step 3. To the right of the map you will find the following information (Figure 16):

a. The name and code number of the HUC6 within which your wetland is located. Use this plus the information in worksheets HUC4, HUC5 and HUC6 of the *ORWAP_SuppInfo* file to answer questions D22 and D23 on Form OF. You may need to adjust your answer after visiting the AA.
b. Presettlement Vegetation Class. Note if the point whose coordinates you entered was a non-wooded vegetation type. Use to answer question D3.
c. Rare Wetland Type within 1 mile. Use this to advise (but not necessarily determine) your response to question F2 on the FieldF data form.
d. Whether the AA is:
    - Within the 100-year Flood Plain. See Step 7.
    - Within a Special Protected Area. If you see a green checkmark in this box, answer affirmatively to question D25(b).
    - Within a Wetland Priority Area. If you see a green checkmark in this box, answer affirmatively to question D25(c).
    - Within 100 ft of Essential Salmonid Habitat (a stream reach or other water body designated as Essential Indigenous Anadromous Salmonid Habitat). See Step 5.
    - Within 300 ft of a mapped Spring. If you see a green checkmark in this box, answer affirmatively to question F17.
e. Rare Species scores for:
    - Anadromous Fish Species (FA)

- Non-anadromous Fish Species (FR)
- Amphibian & Reptile Species (AM)
- Feeding Waterbirds (WBF)
- Nesting Waterbirds (WBN)
- Songbirds, Raptors and Mammals (SBM)
- Invertebrate Species (INV)
- Plant Species (PD)

The rarity scores in the output boxes are used to answer questions D26 through D32 for the point location you entered. The scores have taken into account several factors for each rare species record contained in the official database of the Oregon Natural Heritage Information Center (ORNHIC): (a) the regional rarity of the species (S1, S2, etc.), (b) their proximity to the point defined by the coordinates you entered (up to within 1 mile and/or the HUC6), and (c) the "certainty" that ORNHIC assigns to each of those records. These 3 factors were combined, across all rare species in the vicinity, into the value score that the Wetland Explorer tool reports for each group.

You will also note a box “Element of Occurrence Record” in the lower right. This reports the number of rare species records (not the number of rare species) known from the exact coordinate you entered, and/or within 1 mile, and/or from other parts of the watershed (HUC6). The names of the particular rare species that have been tallied are reported only for the HUC6. A list of all wildlife species predicted to occur in the HUC6 can be viewed by clicking on the last row of the box.

CAUTION: For compliance with state and federal legal requirements related to rare species reporting, online querying of this Web site is <u>not</u> a substitute for submitting directly to the responsible agencies a written request for such information, or conducting required field surveys. A written request is important because the agency’s response may contain information that is more recent, spatially explicit, and/or complete than what is posted online.

CAUTION: Keep in mind that many areas will have low scores for Rare Species only because few or no prior attempts have been made to survey the area for such species, which may actually be present.

Step 4. Now click on the Map Layers tab to the left of the map. Check the boxes for Wetlands and Hydric Soils and wait for the map layers to fully load (Figure 17). This may take up to about 20 seconds. Answer question D24 on Form OF (Historical Hydrologic Connectivity) after viewing this overlay of hydric soils with mapped wetlands. Areas shown as hydric soil (not just partially hydric) but currently lacking wetlands may be considered to have once been wetlands for purposes of answering question D24.

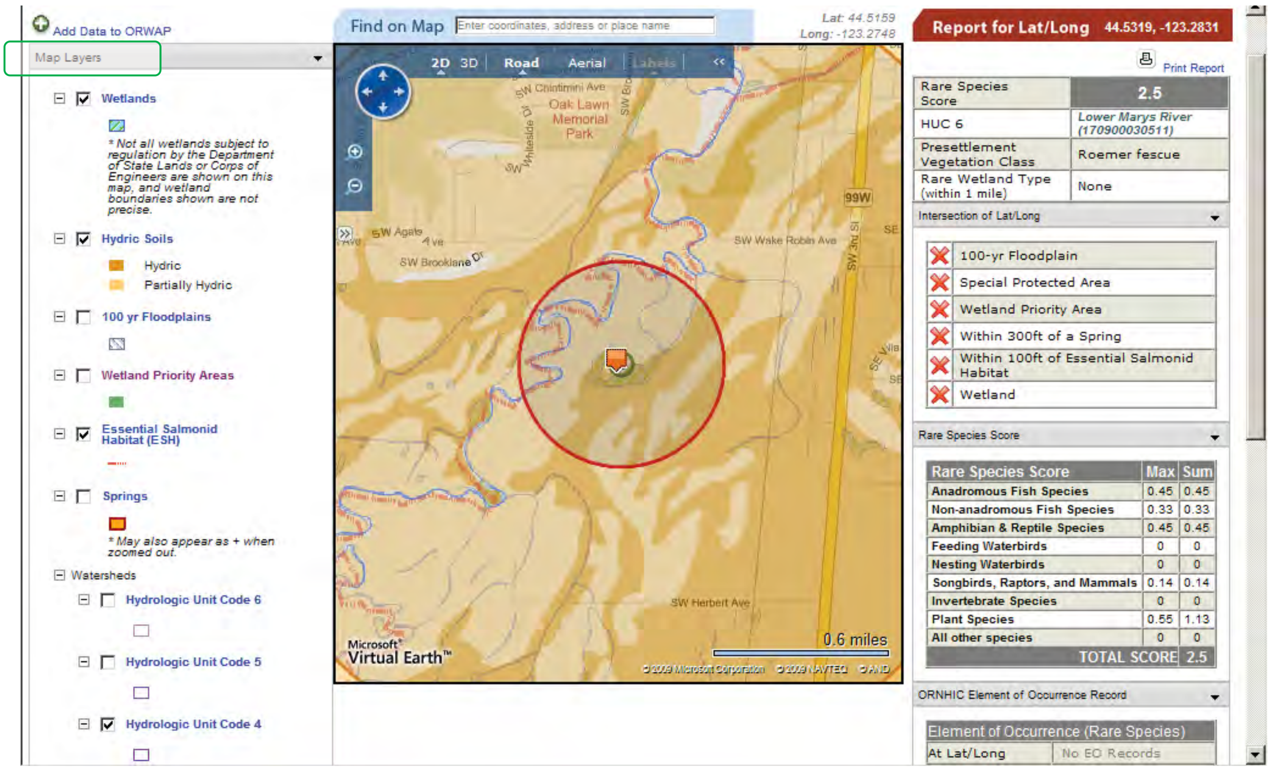

Figure 17. Wetland Explorer frame showing Map Layers activated for Wetlands, Hydric Soils, and Essential Salmonid Habitat (ESH). *Note that hydric soils in this example extend far beyond the mapped wetland boundary, suggesting that the wetland may have once been much larger but much of it has been eliminated by drainage, or that it actually is much larger than shown. Also note that even though the wetland is not shown as containing any ESH, it is within 0.5 mile of mapped ESH and a connecting channel is present.*

Step 5. Check the box for Essential Salmonid Habitat (ESH) and use the presence or absence of the ESH line on the map to help determine if your wetland is connected *(even seasonally)* to ESH and is *within 0.5 mile* of it (question D25a). There are several circles that overlay the map depending on how zoomed in or out the image is. Be sure you are referring to the 0.5 mile circle.

Step 6. As noted earlier in section 2.2.1.3, there are several ORWAP questions pertaining to surrounding land cover. If you did not already answer them using another source of aerial imagery, you may answer them here (in particular, this Web site may be the best for answering questions D16 and D17). First, uncheck all the map layers except Wetlands. Then click the Aerial tab above the map. Zoom in and out as needed to answer the land cover questions (mainly D6 through D18).

Step 7. Uncheck the Wetlands layer, then check 100-yr Floodplains and click on the Aerial tab above the map, if not already activated (Figure 18). Determine if it's likely that structures or cropland are located in a 100-yr floodplain downgradient from your wetland, even if the wetland itself is not within the 100-yr floodplain. Use this to answer question D33. Note: floodplain maps are not available statewide as of date of this document.

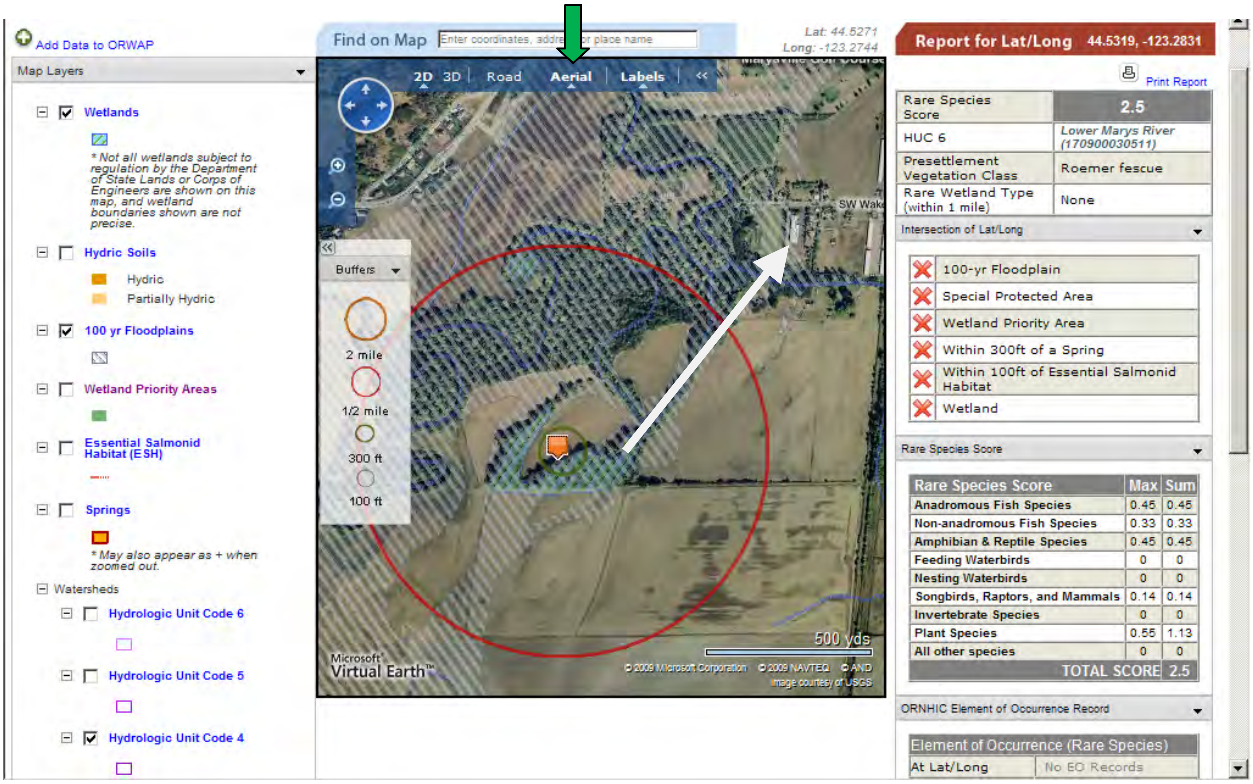

Figure 18. Wetland Explorer frame with aerial image activated and Map Layers for Wetlands and 100-year Floodplain activated. *Note that structures and cropland (upper right in image) are located in the floodplain (white cross-hatching) within 2 miles downgradient from the wetland. The circle shown is the ½ mile circle, not the 2 mile circle.*

Step 8. Next, determine the relative position of your wetland within its HUC4. Uncheck all the map layers except Wetlands. Then at the bottom of the map theme list where it says "Watersheds", click on the + box and then check only the HUC4 (Figure 19). Zoom out many times until the entire boundary of the HUC4 in which your wetland is situated is visible. Some judgment is required to decide if your wetland is in the upper, middle, or lower third of the watershed.

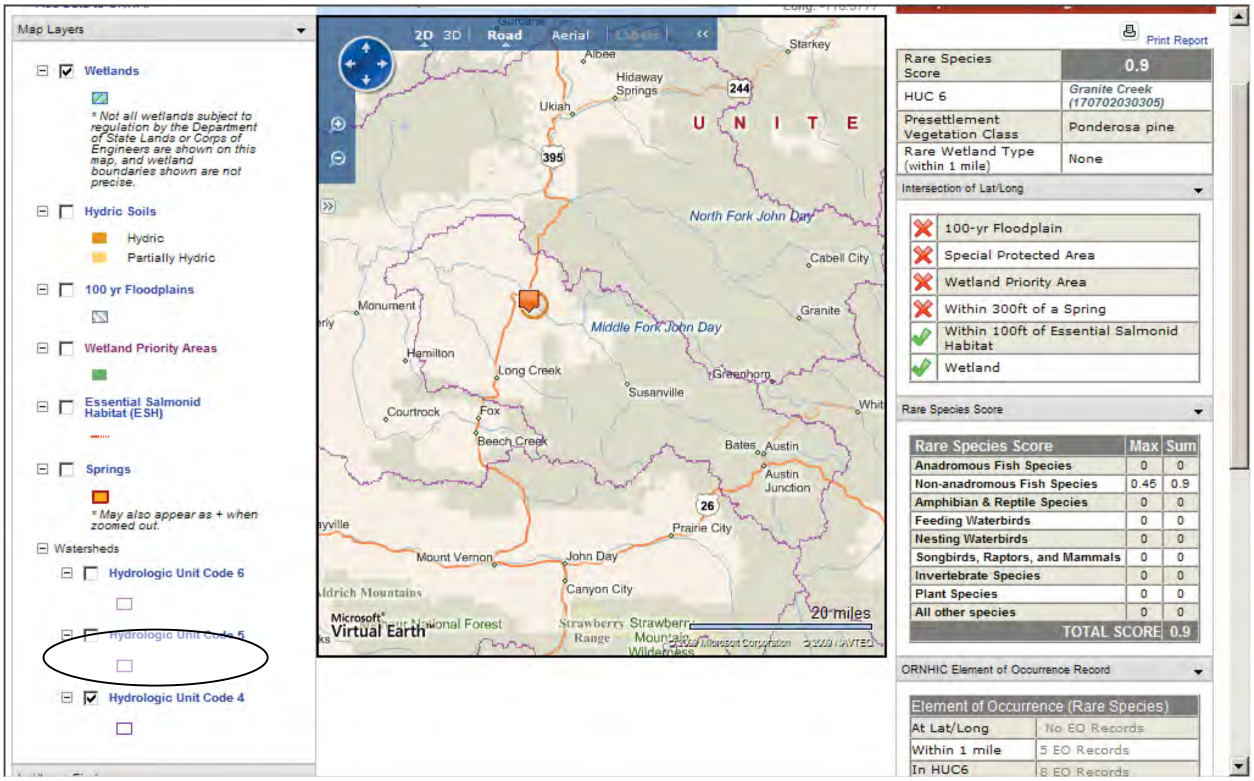

Figure 19. Wetland located in the lower 1/3 of a HUC4 watershed. *Note that HUC4 is checkmarked in the menu on the lower left. Also note that the pattern of the stream network indicates flow is from the southeast (lower right) to the northwest (upper left).*

Additional information on the Wetland Explorer and the sources of its data can be found in section 6.5.

2.2.9 Obtain Information from Other Web Sites

Mean Annual Precipitation (#D45). Go to the PRISM Data Explorer: http://gisdev.nacse.org/prism/nn/index.phtml
Then enter the longitude and latitude, click "annual" for Month, and then "Click for 1971-2000 Normals" (beneath the box). Take the number in the lower right box (ppt-Annual, inches) and use it to answer #D45.

Tax Lot (for CoverPg). Go to ORMAP: www.ormap.org/disclaimer.cfm
Accept the disclaimer. A map of counties will appear. Click on the desired county. On the right, a list of townships and ranges will appear. Click on the appropriate TR (from the TRS you determined earlier while visiting the WSS Web site). Then click on the TRS, open the tax map pdf, locate your wetland, and enter the Tax Lot identifier in the CoverPg data form.

2.2.10 Optional Information

Although not required by ORWAP, you may want to seek and obtain other types of background information on the wetland you're assessing in order to improve the accuracy of your responses to specific ORWAP questions. This could involve contacting the current or previous landowner, or other knowledgeable people, and local, state, and federal agencies. As appropriate, ask for information on land use, management, soils, contaminants, groundwater, runoff, other water sources, plants, and wildlife. Some of this information may be in wetland delineation reports for adjacent AAs, in Local Wetlands Inventory reports, or in watershed plans and similar documents. Information on past uses of the wetland and nearby areas is especially useful for answering question D24. A "Google search" on the name of a nearby feature can sometimes be productive. In the Portland metro area, useful site-specific natural resource data may be found by inputting an address at: www.oregonmetro.gov/index.cfm/go/by.web/id=8385 or www.portlandmaps.com

2.3 Instructions for Field Component

The field component of the assessment involves visiting as much of the AA as possible, given site access, filling out the two field forms (FieldF and FieldS), and verifying, as needed, answers on Form OF. Based upon the experience of many persons who tested ORWAP, this component will generally require less than three hours (large or complex sites may take longer). If circumstances allow, visit the AA during both the wettest and driest times of year. If you cannot, you must rely more on the aerial imagery, maps, other office information, field indicators, and discussions with the landowner and other knowledgeable sources. If assessing a tidal wetland, try to be at the AA during both the low and high tide of the day.

2.3.1 Items to Take to the Field

Take the following with you into the field:

- Blank data forms FieldF and FieldS
- Completed data Form OF (to verify answers)
- Aerial images (to verify AA and use as a base map, if no wetland delineation map available)
- Aerial image that includes entire wetland (to answer applicable questions)
- Wetland delineation map (if any, to verify AA and use as a base map)
- Sketch worksheet (if no aerial or delineation map available at appropriate scale or resolution)
- Topographic map with the CA boundary you drew tentatively (to verify)
- Soil maps (to determine if your field determinations match)
- Shovel
- Water (for texturing soil)
- Clip board, pencil, rag to clean hands and other items you'd normally take in the field
- The explanatory illustrations in Appendix A that includes the flow chart for texturing soils in the field
- Download and print the PDF versions of the plant worksheets from the *ORWAP_SuppInfo* file, as needed, to answer specific questions as follows:
    - Plant Wetland Indicator Status (P_WIS)

- Invasive Plants (P_INVAS worksheet) → for #F36, 41, 47, 76
- Plants Not Native to Oregon (P_EXO worksheet) → for #F37, 41, 47
- Wetland Plants Uncommon in Oregon (P_UnCom worksheet) → #F38, 43, 49
- Salt-tolerant and Low Tidal Marsh Plants (P_SALT worksheet) → #F1, 3
- Plants Reputed to Support Nitrogen Fixation (NFIX worksheet) → #F51

2.3.2 Conduct the Field Assessment

Step 1. Review the questions on the FieldF and FieldS forms to refresh your memory of what to observe during the field visit. Note that questions marked "**W**" on the FieldF form must be answered for the *entire wetland*. Also review data Form OF to see which questions you may have flagged during the office phase for checking during the field visit.

Step 2. Before answering all questions on the data forms, walk as much of the AA and wetland as possible. Plan your visit beforehand to visit each major vegetation type (these may be evident on the aerial imagery if the AA is large), each different soil map unit, each area with different topography, the wetland/upland edges and all wetland/water feature edges (e.g., ponds, lakes, streams). As you walk around, do the following:

Step 3. Create or revise a base map showing the AA boundary, location of inlets and outlets, open water, and major patches of the different vegetation forms (herbaceous, woody). If the scale and resolution are appropriate, an aerial image and/or wetland delineation map may be used as the base map. If not, use the gridded data form (the "Sketch" worksheet in the ORWAP spreadsheet) to draw a map less precisely. For larger wetlands, marking of "waypoints" along wetland boundaries using a handheld GPS can expedite mapping and improve precision.

Step 4. Generally note the extent of non-native plant cover within the AA and along its upland edge, as well as any plants you don't often encounter (i.e., are listed in the P_UnCom worksheet), and other indicators described on the field forms.

Step 5. If you have access to the entire wetland, look for inlets and outlets and other hydrologic characteristics for answering questions F4, 17, 18, 19 and 20.

Step 6. Read the instructions at the beginning of Forms FieldF and FieldS and then fill them out, paying attention to all the explanatory notes and definitions in the last column of the data forms, as well as referring to graphics in the Explanatory Illustrations appendix to this manual (Appendix A). As you answer the questions dealing with "percent of the area," pay particular attention to the spatial context (area) which the question is addressing. For example, in regard to a type of vegetation or land cover, be careful to note if it's asking what percentage is occupied within the:

- open water area, or
- vegetated area *of that type* (e.g., compare only with total wooded area), or
- total vegetated area, or
- upland edge, or
- assessment area (AA), or
- entire wetland, or

- contributing area (CA), or
- circle of specified radius
- circle of specified radius but excluding any water area (e.g., ocean)

Step 7. Determine the soil composition for question F58 by first digging a soil pit 12" deep. The pit should be in the currently unflooded part of the AA and within the AA's predominant soil map unit. Refer to the soil map you made of the AA's soil map units from the Web Soil Survey Web site (Section 2.2.6 Step 6). The depth of the pit should be measured from the soil surface, which is the top of the mineral soil or the top of the organic soil material that is at least slightly decomposed. "Slightly decomposed" means the organic material is decomposed enough so that the fibers can be crushed or shredded with the fingers. Exclude any duff, that is, fresh leaf, needle, twig, moss, dead roots and lichens that have not undergone observable decomposition.

You will be asked to categorize the pit's soil simply as *Organic, Clayey, Loamy,* or *Coarse*. If more than one composition category is encountered within the upper 12 inches, record only the upper surface composition (excluding the duff). Caution: Be aware that horizons (layers) can be thin and that there is no minimum horizon (layer) thickness requirement. For ORWAP's intended use, *Organic* includes organic soils (muck, mucky peat, and peat) and mucky mineral, which is a mineral soil with a high content of muck (>10% organic matter and < 17% visible fibers when rubbed).

Determine soil composition by using the ORWAP *Soil Composition by Feel* diagnostics flow chart in Appendix A. After you determine the soil composition in the pit's surface layer, compare it with the list of mapped soil units within the AA. Most map unit names indicate the texture of the surface layer [1] (e.g., Omahaling fine sandy loam). If the composition differs from that of all of the listed soil map units, dig a *second* soil pit at a different location in the wetland to check your original determination. The intent is to characterize the soil that comprises the majority of the wetland. Be aware that the soil map units do include small areas of other soil series. Since soil surveys are not intended to be used at a point/site scale, you may want to consider the soils that are mapped in the rest of the wetland (if the AA is a portion) and/or the nearby mapped soils. Refer to the soil maps from the Web Soil Survey Web site (section 2.2.6 Steps 7 & 9). Do not use the mapped soil unit texture class without verifying it with your own determination.

Step 8. Look uphill of the wetland to see if any artificial feature that adjoins the wetland *unmistakably* diverts *most* of the surface runoff away from it (e.g., high berm) during normal runoff events. If such is found, redraw the CA to exclude all areas that drain to that feature and not into the wetland.

[1] If the map unit name does not include a texture class (i.e., Henkle-lava flows-Fryrear complex) you can view a soil series profile description at http://ortho.ftw.nrcs.usda.gov/cgi-bin/osd/osdnamequery.cgi Enter only the soil series name (i.e. Henkle). Please note that soils of one series can differ in surface layer texture, which is one reason soil series are divided into soil phases (i.e., Omahaling fine sandy loam).

2.4 Instructions for Entering, Interpreting, and Reporting the Data

2.4.1 Data Entry

Enter data from the data forms (CoverPg, OF, FieldF, FieldS) into the corresponding Excel worksheets. The scores for the functions and other attributes will compute automatically and appear in the Scores worksheet. If you wish to see which factors contributed to each function or other attribute, click on the function's worksheet and you will see both those factors and your responses. For an overview of the scores of the individual indicators, see the Matrix worksheet. In that matrix, colored cells indicate which indicators are used for which functions. Cells that are colored but are blank (no numbers) indicate that indicator was not used to compute the score *in that particular wetland*, because the reported condition of another indicator rendered it irrelevant in that situation.

Check to be sure every question on all data forms was answered and entered, except where the form directed you to skip one or more questions. Completeness can be verified at a glance by scanning down the right margin of the data forms in the spreadsheet. If a box is still colored red, it indicates that a "1" should have been entered for one or more of that question's choices in column D. If the box is gray, it indicates no problem. If the box is yellow, you need to manually check to be sure that "0" is the response you intended, and is not a 0 just because it is the default value.

2.4.2 Evaluate Results

Before accepting the scores that were computed by *ORWAP_Calculator* and shown in the Scores worksheet, think carefully about those results. From your knowledge of wetland functions, do they make sense for this wetland and/or AA? If not, review the worksheet for that function or other attribute, as well as Appendix B (Narrative Descriptions of Scoring Models), to see how the score was determined. If you disagree with some of the assumptions that led to that score, write a few sentences explaining your reasoning on the bottom portion of the CoverPg form (add additional sheets if needed). Remember, ORWAP is just one tool intended to help the decision-making process, and other important tools are your common sense and professional experience with a particular function, wetland type, or species. Review again the caveats given in the Limitations section (Section 1.3).

If you believe some of the scores which ORWAP generated do not match your understanding of a particular wetland function or other attribute, first examine the summary of your responses that pertain to that by clicking on the worksheet with that attribute's code (e.g., NR for Nitrate Removal). Your responses are also automatically summarized in the Matrix worksheet. If you want to reconsider one of your responses (perhaps because you weren't able to see part of the AA, or view it during a preferred time of year), change the 0 or 1 you entered on *Form OF*, *FieldF,* or *FieldS*. Then check the Scores worksheet to see what effect that had. If the results still don't match your judgment of that attribute, you may write your reasons in the space provided at the bottom of the CoverPg form.

You may do the same (changing various 0's and 1's) if you'd like to simulate the potential effect of an enhancement or restoration measure on function scores, or the impact on those scores from some controllable or uncontrollable alteration or management activity within the AA or wetland, its contributing area, or surrounding landscape out to within 2 miles. However, understand that ORWAP is not intended to predict changes to an AA – only to estimate the likely direction and relative magnitude of those changes, if they occur, on various functions and other attributes.

Assigning the AA to an HGM class is necessary for some DSL regulatory purposes, but not for ORWAP. However, a space for recording the HGM class is provided in the CoverPg data form. To help you decide your AA's HGM class, the spreadsheet computes numbers shown in the Scores worksheet, which looks like this:

HGM Class - Relative Probabilities	
Estuarine	0.00
Riverine	4.22
Slope	2.07
Flat	0.00
Depressional	1.89
Lacustrine	0.00

In most cases, the HGM class to which you assign your AA should be the one with the highest score in this section. However, the scores should be used as a *guide*, not as an absolute answer. Although termed "relative probabilities," they are not that in a strictly statistical sense. If scores are close, it may mean that multiple HGM types are present within the AA.

You may notice that regardless of the wetland being assessed, the scores of some functions tend to trend high, others trend low, some have a wide range (0 to 10) whereas others a narrow range (e.g., just 4 to7). That is because the authors decided not to enable the spreadsheet to mathematically convert ("normalize") the raw scores from the models to a full 0-to-10 scale. There are both practical advantages and disadvantages to converting model outputs to such a scale. The "10" would ideally need to be represented by one of the highest-scoring and/or least-altered wetlands in Oregon for a particular function. Although the 221 assessed sites in the database is a relatively large number and their selection process attempted to encompass the full range of possible conditions present in Oregon, they probably do not include Oregon's highest-scoring and/or least-altered wetland for each function. In some scoring models, conditions of most of the indicators used (e.g., vegetation percent cover) are easily met in many wetlands whereas in the models for other functions, conditions of many of the *indicators* used tend to occur less commonly (e.g., evidence of springs). Output scores from those models would tend to trend lower, yet that does not necessarily mean that particular *function* is usually less prevalent or effective than others among Oregon wetlands. See related discussion in Section 6.4.

Although each scoring model has a *theoretical* minimum score of 0 and a maximum of 10 (even without scaling), the *actual* range may be narrower because the conditions of some indicators rarely or never occur together in the natural world. Thus, the output scores of all models will not necessarily have the same statistical distribution. That is, scores generated by some models will skew high (e.g., more than half the time they will be above 8 on the 0 to 10 scale) whereas the scores generated by other models will skew low (e.g., more than half the time they may be 0).

Because these are scoring models, not deterministic equations, the high or low skew could be due to either (a) one function tending to be inherently less effective than another among wetlands generally, or (b) the relative conservativeness (or lack thereof) of the particular indicators and their criteria as used in a model for a particular function or other attribute. It is not possible to determine which is more often the case. When formulating the scoring models, an attempt was made to use more conservative criteria for models of functions believed to be generally less effective among Oregon wetlands, e.g., Thermoregulation, so that their scores would skew low. One implication of the factors described in this paragraph is that ORWAP may be somewhat more reliable in distinguishing differences of levels of a single function *among wetlands*, than in distinguishing differences *among functions* in a single wetland, i.e., ranking correctly the effectiveness or value of those functions relative to each other.

2.4.3 ORWAP Products

A completed ORWAP assessment should include these products:

- Scores worksheet (computed by ORWAP)
- Completed forms on Excel spreadsheet (CoverPg, OF, FieldF, FieldS)
- Aerial photograph showing boundaries you drew for the AA and CA
- Topographic map showing AA and CA boundaries
- Soils map(s) showing soil units in AA (AA boundaries shown on map) and upslope within 200 ft.
- Base map created during field assessment (Section 2.3.2)

2.4.4 Archiving Your ORWAP Data

In addition to submitting the above to regulatory agencies, if pertinent, you are encouraged to voluntarily upload your completed spreadsheet to a permanent online repository of completed ORWAP assessments at the Oregon State University Library. Doing so is simple and instructions can be found at: www.oregonexplorer.info/wetlands/orwap . Due to the need for confidentiality that sometimes is necessary for assessments of wetlands on private property, users who wish to archive their spreadsheets need not identify the exact location—only the name of the county and the nearest town. Data from the spreadsheets will be used mainly to characterize the statistical distribution of scores for each function that can be expected from applying ORWAP in a wider array of sites than the 221 which are currently in the ORWAP database. Knowledge of that statistical distribution could eventually be used to add sensitivity to ORWAP's scoring and improve our ability to interpret the results of future ORWAP assessments. This will be particularly true if users are able to reveal exact locations, such as for sites on public lands, by providing geographic coordinates of those assessments. At this time the Web site has no provision for online data entry and processing, or for reporting the results of quality-assured ORWAP assessments done in other locations by other users.

3.0 Using ORWAP for Regulatory Applications

Assessing wetlands for purposes of state and federal permitting was the primary driver for developing ORWAP. However, assessing wetlands where impacts are proposed is just one step in a complex process of evaluating existing wetlands, assessing wetlands to be enhanced or restored for compensatory mitigation, evaluating potential effects of projects, and determining wetland function and value replacement. Because applying ORWAP is just one part, albeit a critical one, of this process, DSL initiated a parallel interagency effort to develop guidance for how ORWAP output may be used for permitting purposes.

The *Guidance for Using the Oregon Rapid Wetland Assessment Protocol (ORWAP) in State and Federal Permit Programs* (Oregon Department of State Lands, May 2009) resulted from that interagency effort. Its purpose is to provide guidance to permit applicants, consultants and regulatory staff for using ORWAP to meet state and federal wetland regulatory objectives and requirements. The guide specifically offers instruction on: (1) selecting the assessment area for regulatory application of ORWAP; (2) using the ORWAP outputs for wetland mitigation planning; and (3) presenting assessment results in the Joint Permit Application (JPA). The guide is available at http://www.oregonstatelands.us/DSL/PERMITS or by contacting DSL. Two elements from the guide are important to understand when assessing a wetland using ORWAP for purposes of a state or federal permit application. These two elements are described below. (See the guidance document for more detail.)

3.1 Delimiting the Assessment Area for Regulatory Uses

Repeatable functional assessment of a wetland using ORWAP depends greatly upon correctly delimiting the assessment area (AA). This manual generally instructs users to include the entirety of the wetland when determining the AA. However, in the regulatory setting, it may not be possible or practical to do so for reasons such as: the proposed impact area may only be a small part of a large wetland, the characteristics of the proposed impact site may not be representative of the whole wetland (e.g., be of substantially different condition), or large portions of the wetland may be inaccessible. Therefore, for regulatory uses of ORWAP, the following additional guidance is offered:

If the proposed project impact or mitigation area is the entirety of the wetland, then the AA should be defined as the whole wetland using the standard AA delimiting guidance in this manual. Normally, only one set of scores should be calculated for the entire wetland, regardless of the number of vegetation types, HGM classes, tax lots, or other factors.

If the proposed project impact or mitigation area is less than the entire wetland, then the AA may be defined based on the study area boundary identified in the wetland delineation report. However, if any additional wetland area, whether on or off the study area, could be adversely affected by the proposed project, then that area should be included as part of the whole wetland assessment (for example, any off-site wetland area that may be hydrologically altered by the proposed project). Most ORWAP indicator questions can be answered considering a limited AA. However, the indicator questions in Table 1 below must still be answered considering the entire wetland using the standard AA delimiting guidance. These indicator questions are denoted with a **W** in column D of the data forms OF and FieldF. These indicators are mostly ones that are likely to be subject to the most distortion if assessed in a limited area such as an AA.

Table 1. Indicators that must be applied considering the entire wetland

Data Form FieldF	
F1	Presence of specific wetland types
F2	Wetland type of conservation concern
F4	Tidal/non-tidal hydroconnectivity
F17	Groundwater
F18	Outflow duration
F19	Outflow confinement
F20	Inlet + Outlet
F27	Islands
F56	Upland edge shape complexity
Data Form OF	
D21	Wetland size
D22	Wetland size uniqueness in watershed
D24	Historical hydrologic connectivity
D36	Contributing area percent
D37	Unvegetated surface in the contributing area
D38	Upslope storage
D39	Transport from upslope
D40	Known water quality issues in the input water
D41	Known water quality issues below the wetland

If the proposed project impact or mitigation area includes more than one wetland, then all wetlands may be included in a single AA if all the following are true:
- they have the same predominant water source;
- they have a similar degree of alteration;
- they contain the same predominant mapped soil series; and
- they have similar abutting land uses.

If all of the above are not true, a separate assessment of each affected wetland will be necessary. However, DSL recognizes there are limits to this approach for very large projects and linear projects; DSL and Corps of Engineers staff should be consulted on AA determinations in these cases.

3.2 Replacement at the “Grouped Services” Level

For most permitting purposes, function and value replacement will be evaluated at the “grouped services” level, that is, in terms of these aggregated groups, of which all but one is defined by the maximum score of several component functions or values:
- Hydrologic Function

- Water Quality Support Group
- Fish Support Group
- Aquatic Habitat Support Group
- Terrestrial Habitat Support Group

The following attributes are currently considered to be of secondary importance for state and federal permitting in Oregon:

- Carbon Sequestration
- Public Use and Recognition
- Provisioning Services

4.0 Using ORWAP for Wetlands Planning and Protection

Although ORWAP was developed primarily for state and federal wetland regulatory program use, it was also designed to be suitable for wetlands planning by local governments and for wetland assessments by watershed councils and other entities. When used for these purposes, the AA should be the entire wetland, not portions of wetlands. Follow the "Determine the Assessment Area (AA)" guidance in Section 2.2.4.

DSL establishes the requirements that cities and counties must follow when inventorying and assessing wetlands (Local Wetlands Inventory) and using that information to designate Locally Significant Wetlands (OAR 141-086). These steps must be followed prior to adopting a local wetland protection program under Goal 5 or Goal 17 of the Statewide Land Use Planning Program. ORWAP is not currently required for this purpose, but it may be used in place of the Oregon Freshwater Wetland Assessment Methodology (1996) upon written approval by DSL. All portions of ORWAP must be completed.

Local Wetlands Inventories are generally conducted for all areas within a city's urban growth boundary. Not all property owners allow access to their property for this purpose, and due to time and funding constraints, not all wetlands can be visited. Therefore, much of the inventory and assessment work must be completed without benefit of onsite access to all wetlands or all portions of a wetland. Most ORWAP questions can be answered adequately by an experienced wetland professional using aerial photos and a variety of maps, and by viewing the wetland if possible from public roads and other properties. Optional information sources (see Section 2.2.10) may be very helpful, and newer imagery as it becomes available (e.g., LIDAR) may also provide valuable information. Inevitably, there will be some questions that will require best professional judgment. However, ORWAP is sufficiently robust that the final scores and the determination of Locally Significant Wetlands will not be adversely affected.

For additional guidance on using ORWAP for Goal 5 or Goal 17 wetlands inventories and planning, contact the wetlands program staff at DSL.

5.0 Using ORWAP for Wetland Assessments Under the Food Security Act

ORWAP may be used by Natural Resources Conservation Service (NRCS) staff for assessing wetland functions for implementation of the Wetland Conservation (a.k.a., Swampbuster) provisions of the Food Security Act of 1985 (e.g., minimal effects determinations, or functions to be replaced by mitigation for conversions). NRCS staff participated on both ORWAP Technical Advisory Committees (TACs) and assisted with field testing and other ORWAP development tasks to ensure that ORWAP would be suitable for their program needs.

When using ORWAP for Swampbuster purposes, the AA will ordinarily be the portion of the wetland that will be or has been affected, rather than the entire wetland. Refer to the guidance in Section 3.0 for determining the AA for regulatory programs.

ORWAP's values scores will not be used for Swampbuster and may be disregarded. If preferred and to save time, ORWAP questions that are used only to assess wetland values may be skipped. These questions' headings are denoted with italicized font in Form OF and Form FieldF.

6.0 How ORWAP Was Developed

6.1 Scoping by Original Technical Advisory Committee

ORWAP originated in the 2003 state legislative session. House Bill 2899 primarily addressed wetland mitigation, but one of the issues identified by a work group appointed by the committee chair was the need for rapid assessment methods that could be used statewide. The Department of State Lands (DSL) agreed to convene a Technical Advisory Committee (TAC) to scope out recommendations for addressing this need, and report back to the legislature.

An invitation explaining the project and inviting participation on the TAC was sent to all members of the HB 2899 work group, wetland consultants, several interest groups (ports, environmental, mitigation bankers, etc.) and to state and federal resource agencies with wetland-related responsibilities. DSL also requested a greater degree of participation from several state and federal agencies viewed as essential partners in the effort. Because these agencies have regulatory authority or commenting responsibility for wetlands and wetland permits, this group became known as the "steering group." The objective was to ensure that the recommendations coming out of the TAC process would result in a rapid wetland assessment method that could be endorsed and used by all agencies with a wetland regulatory role in Oregon.

Five TAC meetings were held between February and July in 2005. EPA Region 10 provided funds that allowed DSL to contract with the principal author, to provide expertise on rapid assessment methods to the TAC. At the April 21 TAC meeting, three existing methods were tested in the field to get a better understanding of how different approaches work, and their strengths and weaknesses. TAC members also completed a questionnaire about midway through the process to help flesh out the leanings of the group and identify areas where we had broad agreement, and areas where more discussion was needed.

The final report—*Recommendations for Developing a Statewide Rapid Wetland Assessment Protocol for Oregon*, January 23, 2006—included 18 detailed recommendations for ORWAP design and development and a separate section of policy and implementation recommendations. All TAC members agreed to support the final recommendations in the report. The report was submitted to the legislature on April 24, 2006, in fulfillment of the commitment made by DSL. In October 2006, DSL obtained a Wetland Program Development Grant from EPA to develop ORWAP. The ORWAP recommendations report has provided the guidelines for ORWAP development.

6.2 Development Phase Technical Advisory Committee

One requirement for members of the scoping TAC was that they commit to the process from start to finish; also, new members were not added after the first TAC meeting. This was necessary because the TAC took the lead in researching options and developing consensus recommendations, which required working as a team.

In contrast, the Development Phase TAC started small and grew over time as more individuals became involved and were added to the TAC (see acknowledgments). Whether listed as TAC members or not, in effect all participants in summer field testing, independent field testing or repeatability testing are TAC members. In addition to helping with field testing, members of the Development Phase TAC provided guidance and feedback on draft products. TAC meetings were held on January 29, 2008; May 16, 2008; October 16, 2008; and March 31, 2009.

6.3 Regulatory Implementation Team

Although ORWAP is designed to be used for many purposes, the primary driver for developing ORWAP was the need for a rapid assessment method that was suitable for assessing all types of wetlands, statewide, for state permitting purposes. In order to ensure that ORWAP design and output would work well within the regulatory framework, DSL assembled a small team to develop agency guidance on how to use ORWAP output for permitting, before ORWAP was completed. One recommendation from that parallel effort was that functions and values also be aggregated into a smaller number of into closely related "groups." Another recommendation was that users be allowed to compute scores for areas that are smaller than the entire wetland (see Section 3.0). The guidance document—*Guidance for Using the Oregon Rapid Wetland Assessment Protocol (ORWAP) in State and Federal Permit Programs* (Oregon Department of State Lands, May 2009)—is available from DSL.

6.4 Development of Indicators and Scoring Models

Indicators for scoring wetland functions, values, and other attributes were mainly derived from the principal author's experience developing many previous wetland methods within similar purposes. Indicators used by other regional methods were also considered. The particular mathematical-logic formulas used in ORWAP's scoring *models* were drawn initially from the principal author's understanding of wetlands, with consideration for the usual importance of different indicators and their relative contribution to ecosystem processes that determine specific wetland functions (i.e., whether and when a given indicator is likely to be controlling/ limiting or simply additive/compensatory). Also considered was each indicator's potential interactions with other indicators and its likely repeatability.

After ORWAP's models had been developed, an alternative set of models was programmed into a spreadsheet and applied to the same data from the 221 wetlands. Those alternative models, rather than combining indicators with a complex set of logic rules, simply give each indicator equal weight and then averaged all indicators that contribute to a given function (after first grouping the indicators by wetland type), in order to calculate an alternative score for the function. For nearly all functions, the results generated by those simpler models seemed less accurate, i.e., their ranking of the 221 wetlands seemed counterintuitive in far more cases than those generated by the original more-nuanced models.

In addition, in the specific case of the Stressor score, an alternative calculation approach was investigated using data from the six "repeatability test" wetlands. Rather than use the 0-5 score value recommended by users for each stress category (Wetter, Drier, Soil Disturbance, etc.), the *number of different types* of stressors checked among all stressor categories was tallied and used to compute the overall Stressor score. However, it was apparent that the number of different types of stressors that was checked was highly variable among people who independently assessed the same wetland—even more variable than the scores different users assigned to each stressor category.

6.5 Development of the Oregon Wetlands Explorer Web Site

The growing availability of spatially-explicit natural resource data on the internet has greatly expanded the opportunity for agencies to use such data to improve the accuracy and comprehensiveness of their resource assessments, including wetlands. Noticing this potential, the Institute for Natural Resources (INR) at Oregon State University received a grant from the USEPA to develop a Wetlands Explorer Web site ("portal") as part of the Oregon Explorer Web site they had previously established. The portal provides information to support the conservation and restoration of Oregon's wetlands (see: www.oregonexplorer.info/wetlands). The INR intends to add new features and data layers as funds allow. A key feature of the portal is its "online GIS" capability, created so that users who don't have the software or skills to do GIS queries in their own office may do so online with digital maps that are most relevant to wetlands. The portal will be maintained permanently at the Oregon State University Library as part of its Oregon Explorer Web site, and will be updated periodically. The Oregon Explorer presently contains more readily-accessible online information pertaining to spatial distribution of Oregon's natural resources than perhaps any other Web site.

The ORWAP portion of the Oregon Wetlands Explorer was developed as a support tool for ORWAP. As was explained in detail in Section 2.2.8, ORWAP users go to this part of the portal: www.oregonexplorer.info/wetlands/orwap and locate any point in Oregon either by inputting its geographic coordinates or by right-clicking, scrolling, and zooming on a map of the state. Themes (see Appendix C) may then be overlaid via a Map Layers tab (metadata for each may be accessed by clicking on its title). Users should keep in mind that the spatial precision of the theme boundaries shown on these maps may be no better than a few hundred feet, and (in the case of wetlands, floodplains, and hydric soils) many areas are not shown.

7.0 Quality Assurance

7.1 Testing ORWAP for Clarity and Regional Relevance

ORWAP testing began in September 2007 with a first draft of the data forms. About 20 DSL staff were given a brief introduction to ORWAP as it existed then, and tried out the data forms on a single wetland. This early feedback from future users greatly helped clarify the indicator questions and procedures. ORWAP scoring models and the Wetland Explorer ORWAP tool had not yet been developed. Field testing was continued through the fall by Tyler Beemer, a graduate student at Oregon State University. After being trained in that early version of ORWAP, he visited and applied it to 36 Willamette Valley wetlands, all of which had been scored in 1999-2000 using DSL's Willamette Valley HGM method. Subsequently, the data forms were revised to address inconsistencies and vagueness that Beemer noted when assessing some of the indicators in particular situations.

By June 2008, the principal author had defined and programmed the first version of the scoring models for all functions and values. At that time, he began field-testing a revised version of ORWAP throughout Oregon, spending about one week in each region[4] of the state until mid-September. The primary purpose of the statewide field testing during the summer of 2008 was to ensure that ORWAP indicator questions were clearly worded and relevant to the wide range of wetland types in Oregon. Before visiting each region, the principal author asked local land managers and natural resource agency personnel familiar with wetlands to suggest local wetlands that (a) were on public lands or on private lands to which access permission had been granted, (b) spanned a range of natural and human disturbance and perceived level of function, as well representing different water regime and vegetation types, and (c) were perceived as most different from wetlands in neighboring regions already visited. Arguments could be made for instead selecting the test wetlands in a statistically random but spatially-distributed manner (e.g., Stevens & Olsen 2004, Stevens & Jensen 2007). However, time, resources, and the specific objectives of this field testing did not allow for that. In most regions, the land managers and agency personnel who the author had contacted accompanied him during the site visits and provided feedback. The feedback was incorporated into ORWAP before the testing continued in the next region. Many other individuals assisted for one or more days with the statewide field testing, and that helped the authors further refine the field indicators, questions and explanations that accompany the questions (see acknowledgments).

[4] In sequence: South Coast, Blue Mountains (LaGrande, Baker City), Basin-Range (Burns), Blue Mountains (John Day), East Cascades (Bend), East Cascades (Klamath Lakes, Summer Lake, Lakeview), Central & North Coast (Newport-Astoria), Columbia Basin (Umatilla, The Dalles), Roseburg-Medford, Southern Willamette (Eugene), Northern Willamette (Portland)

Due partly to limited time and the emphasis on improving ORWAP clarity and usability, observations of plants and wildlife in the visited wetlands were made only incidentally so were not recorded. Also, soils usually were not textured and the checklist of stressors was not filled out—only the score for each stressor category was estimated. The office phase of all of the 2007-2008 assessments was conducted only after all sites had been visited, because only then could the data required from the Wetland Explorer Web site be obtained.

In August 2008, DSL contracted with six wetland consultant firms to independently examine ORWAP's clarity and determine the time required per wetland to complete an ORWAP assessment. After being trained for 2 hours by the principal author, each consultant selected three wetlands in his or her region and assessed them with ORWAP. Feedback from these independent testers was used to further refine the data forms and procedures before beginning the repeatability testing (Section 7.2).

Because the ORWAP field data forms were continually evolving throughout the testing, much of the field data collected during testing (Tyler Beemer's sites, sites visited around the state by the principal author, sites assessed by the six independent testers, and sites assessed as part of repeatability testing described below) had to be translated by the principal author into the final version of the field forms. Once that had been done and all data and scoring models were in final form, the data were processed in March 2009 using a version of the ORWAP spreadsheet that had been adapted to process data from multiple sites simultaneously, i.e., in batch mode. In all, ORWAP was applied to 221 wetlands statewide during the testing phase (Figure 20). Although exact locations of many of these wetlands cannot be disclosed (because many were on private land), the complete data set is included in the AllSites worksheet of the *ORWAP SuppInfo* file.

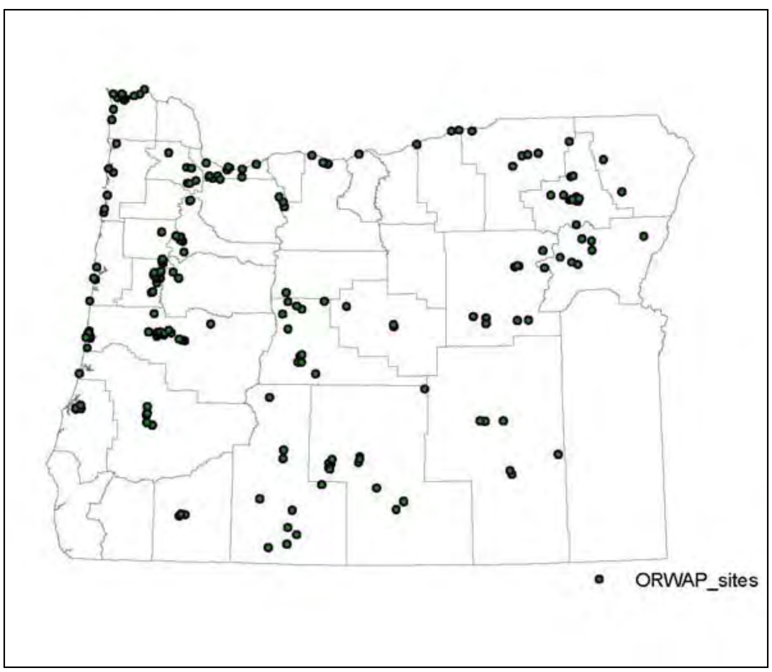

Figure 20. Approximate locations of ORWAP field testing sites during 2008.

7.2 Testing ORWAP for Repeatability

Repeatability testing quantifies the tendency of different people, using a standardized protocol, to independently select the same answers and arrive at the same score when assessing the same wetland. DSL undertook repeatability testing of ORWAP to quantify variation among users with regard to (a) each indicator question, and (b) score for each function, value, and other attribute. The purpose of the testing was to improve ORWAP repeatability by using the results to target and adjust specific ORWAP questions before ORWAP was finalized.

DSL selected six Willamette Valley wetlands for repeatability testing. Although the number of wetlands was small and represented only one geographical region, they were selected to encompass differences in water regime, land use, and vegetation and were typical of wetlands that will be assessed for regulatory purposes. A pool of volunteers—mostly wetland specialists from consulting firms, along with several DSL wetland specialists and permit staff (22 persons in total)—received six hours of training from the principal author, who did not participate in the repeatability testing. The testers used the November 18, 2008 version of ORWAP.

Testers were provided with some basic information about the site(s) they were to assess, including a site location map and an aerial photo with the AA indicated, to minimize this potential source of variation common to all assessment methods. If a wetland delineation had been completed, the delineation map was also provided. In some but not all cases, the AA was the entire wetland. Each wetland was assessed independently by nine to 12 persons. They were asked to read thoroughly the draft manual and complete the office data form (Form OF) before going to a site. Testers then visited (as a group) one or more of the six wetlands during late November and early December 2008. Testers were monitored closely to ensure no information-sharing occurred. After the field assessment, testers were allowed to take their field forms with them in order to adjust their Form OF responses based upon insights from the field visit, and to allow opportunity to review supplemental information, such as the plant list, before turning in the completed forms. Data from all the hard-copy data forms were entered into ORWAP's calculator spreadsheet by a single DSL employee. Results are presented in Section 7.5.1.

In addition to completing the ORWAP forms, testers were asked to make notations about the questions on the forms: Was the question confusing? Were there enough choices for the wetland being assessed? Was it too hard to decide which choice was best? Could the question be phrased more clearly? They were also asked to make suggestions on the draft manual and to record the time they spent completing each wetland assessment. This information was used in a qualitative way to improve the questions and the manual.

7.3 Testing ORWAP's Sensitivity

One component of testing the sensitivity of an assessment method is to determine which indicators have the greatest influence on the output scores for each function across a range of wetlands. This, of course, depends on the situation: in some wetlands one indicator may be pivotal whereas given another set of conditions, a different indicator may hold greater influence. Thus, a large number of *theoretical* or *actual* scenarios must be examined. For the former, a spreadsheet developed by the Corps of Engineers – Environmental Research Division that involves iterative automatic substitution of alternative scores of each variable was considered. However, that software was found to be unsuitable for our objective because (a) it only handles fewer than 15 indicator variables whereas most ORWAP models have more, and (b) it only demonstrates the *theoretical* influence of an indicator variable and does so by counting many combinations of indicators that rarely or never occur in nature. To examine *actual* scenarios, stepwise regression could potentially be used, wherein for each function, the score from the 221 assessed wetlands could be regressed against the scores of its component indicator variables. However, the commercial software that was used identified characteristics of the data set that were incompatible with the assumptions of the statistical tests the software uses, so it did not process the data. Thus, our sensitivity analysis focused on a second component of sensitivity testing, which involves examining whether the scores from each function's model provide enough numeric spread to meaningfully distinguish most wetlands. Results of that part of the sensitivity analysis are summarized in Section 7.5.2.

7.4 Peer Review of Indicators and Scoring Models

DSL solicited a detailed review of the indicators and scoring models from TAC members in May 2008 and from the six independent consultants in August 2008. A few responded. Subsequently, voluntary reviews were sought in December 2008 from scientists (listed in Acknowledgments section) who are familiar with Oregon wetlands and are considered experts on particular functions. Their suggestions were used to modify the structure of some of the scoring models, and did not require the addition of any indicator variables not already included in the data forms.

7.5 Test Results

7.5.1 Results of Repeatability Testing

Repeatability testing of ORWAP was undertaken to quantify variation among users with regard to (a) the score for each function, value, and other attribute (Tables 2 and 3) and (b) each indicator question (Table 4). The first is of most interest because it is those scores, not the scores for individual indicators, that will be used most often to help shape wetland decisions.

As regards (a), the repeatability of scores was analyzed statistically and expressed as confidence intervals around the mean for each function in each of the six wetlands. Table 2 presents the results. Averaged across all six sites, the confidence intervals for function scores ranged from ±0.4 (around a mean score of 2.9 for the function, Songbird, Raptor, & Mammal Habitat) to ±1.3 (around a mean score of 4.3 for the function, Organic Matter Export). Across all six sites and their functions, the average confidence interval was ±0.7 (on a theoretical scale of 0 to 10 for the mean). These confidence intervals might have been even narrower if the data from one or two "outlier" testers had been excluded, or if a full two days of training and field practice had been provided beforehand. Confidence intervals based on the final version of ORWAP are anticipated to be better as a result of feedback given by these repeatability testers and used subsequently to clarify some indicator questions. In any case, most wetland decisions will not be based on very small differences in scores.

Table 2. Repeatability of scores among independent users in six Willamette Valley wetlands, November-December 2008, using a pre-final version of ORWAP.

The C.I. for each site and function is the + or - confidence interval around the mean of that function (alpha<0.05).

	Mill Creek		Turner		Fairview B		Fairview C		Corvallis		Seavy		**OVERALL**	
	mean	C.I.	mean	C.I.	mean	C.I.	mean	C.I.	mean	C.I.	mean	C.I.	mean	C.I.
FUNCTIONS:														
Water Storage & Delay (WS)	3.4	1.1	3.1	0.7	3.7	0.5	2.3	0.8	3.8	0.6	2.1	1.1	3.1	0.8
Sediment Retention & Stabilization (SR)	7.2	2.0	4.8	0.8	6.3	0.8	5.5	1.0	5.1	0.4	8.2	1.5	6.2	1.1
Phosphorus Retention (PR)	8.2	1.5	7.3	0.7	7.2	1.0	6.0	1.1	7.3	1.1	8.2	1.9	7.4	1.2
Nitrate Removal & Retention (NR)	6.7	2.2	3.8	0.4	4.6	1.2	4.7	0.5	4.6	0.5	7.2	2.1	5.3	1.1
Thermoregulation (T)	0.1	0.1	2.5	1.1	1.7	1.0	0.2	0.4	4.2	1.5	0.0	0.0	1.5	0.0
Carbon Sequestration (CS)	1.8	0.4	2.7	0.5	2.6	0.2	1.8	0.7	2.7	0.3	1.3	0.6	2.1	0.5
Organic Matter Export (OE)	2.5	2.1	5.9	1.2	5.4	1.1	4.5	1.8	7.1	0.5	0.5	0.9	4.3	1.3
Aquatic Invertebrate Habitat (INV)	3.4	0.2	4.9	0.7	4.2	0.4	4.7	0.8	4.8	0.7	3.9	0.5	4.3	0.5
Anadromous Fish Habitat (FA)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-anadromous Fish Habitat (FR)	0.6	0.6	2.8	1.1	3.8	0.9	1.8	1.2	2.9	1.1	0.3	0.2	2.1	0.8
Amphibian & Reptile Habitat (AM)	2.5	0.5	5.9	0.3	3.8	1.1	3.4	1.1	4.2	1.1	1.6	0.3	3.6	0.7
Waterbird Feeding Habitat (WBF)	4.6	0.6	3.9	0.3	4.9	0.4	3.8	0.4	4.3	0.6	3.5	0.5	4.1	0.5
Waterbird Nesting Habitat (WBN)	1.4	1.1	0.0	0.0	3.0	1.0	1.9	0.9	0.0	0.0	0.3	0.5	1.1	0.0
Songbird, Raptor, & Mammal Habitat (SBM)	2.7	0.3	4.0	0.3	2.5	0.5	2.7	0.4	3.6	0.4	2.0	0.4	2.9	0.4
Pollinator Habitat (POL)	2.6	0.4	4.7	0.5	3.8	0.4	4.1	0.5	4.3	0.6	2.7	0.5	3.7	0.5
Native Plant Diversity (PD)	3.4	0.3	4.9	0.7	5.2	0.7	4.7	0.6	4.8	0.6	4.2	1.0	4.6	0.6
GROUPED FUNCTIONS:														
Water Quality Support (aggregated score)	8.3	1.4	7.4	0.6	7.6	0.8	6.3	1.1	7.7	0.6	8.9	1.1	7.7	0.9
Fish Habitat Support (aggregated score)	0.6	0.6	2.8	1.1	3.8	0.9	1.8	1.2	2.9	1.1	0.3	0.2	2.1	0.8
Aquatic Support (aggregated score)	5.4	0.9	6.8	0.6	5.9	0.3	6.3	0.7	7.2	0.5	4.1	0.4	5.9	0.6
Terrestrial Support (aggregated score)	3.4	0.3	5.3	0.6	5.3	0.7	4.9	0.6	4.9	0.5	4.3	1.0	4.7	0.6
OTHER ATTRIBUTES:														
Ecological Condition	6.1	0.5	3.5	0.5	5.3	0.7	5.6	0.4	4.3	0.6	5.7	0.3	5.1	0.5
Stressors	7.4	0.2	6.6	0.3	7.7	0.2	7.7	0.2	7.3	0.3	7.8	0.5	7.4	0.3
Ecological Sensitivity	5.3	0.4	5.5	0.7	4.7	0.3	5.6	0.6	3.8	0.3	5.8	0.5	5.1	0.5
VALUES:														
Water Storage & Delay (WS)	7.3	0.2	7.5	0.2	7.5	0.3	7.7	0.4	7.5	0.5	7.1	0.5	7.4	0.4
Sediment Retention & Stabilization (SR)	5.0	0.4	4.8	0.3	3.1	0.6	3.3	0.5	5.0	0.5	4.2	0.4	4.2	0.5
Phosphorus Retention (PR)	6.0	0.4	5.2	0.4	3.7	0.6	3.8	0.5	6.4	0.5	5.4	0.6	5.1	0.5
Nitrate Removal & Retention (NR)	5.9	0.3	5.9	0.3	5.4	0.4	5.3	0.5	4.9	0.5	4.2	0.5	5.3	0.4

	Mill Creek		Turner		Fairview B		Fairview C		Corvallis		Seavy		**OVERALL**	
	mean	C.I.	mean	C.I.	mean	C.I.	mean	C.I.	mean	C.I.	mean	C.I.	mean	C.I.
Thermoregulation (T)	2.0	1.2	2.1	0.8	2.3	1.0	1.3	1.1	3.6	1.1	0.3	0.5	1.9	0.9
Aquatic Invertebrate Habitat (INV)	7.9	0.6	7.4	0.6	8.6	0.4	6.8	1.0	7.9	0.9	7.0	0.0	7.6	0.6
Anadromous Fish Habitat (FA)	4.6	0.6	3.9	0.3	4.9	0.4	3.8	0.4	4.3	0.6	3.5	0.5	4.1	0.5
Non-anadromous Fish Habitat (FR)	6.7	0.0	1.9	0.2	6.7	0.0	6.7	0.0	6.7	0.0	6.7	0.0	5.9	0.0
Amphibian & Reptile Habitat (AM)	4.5	0.3	6.9	0.2	3.5	0.6	3.6	0.7	5.5	0.9	6.7	0.0	5.1	0.0
Waterbird Feeding Habitat (WBF)	4.5	0.3	4.0	0.0	3.5	0.6	3.6	0.7	4.5	0.3	10.0	0.0	5.0	0.0
Waterbird Nesting Habitat (WBN)	4.5	0.3	4.0	0.0	3.5	0.6	3.6	0.7	4.5	0.3	4.7	0.0	4.1	0.0
Songbird, Raptor, & Mammal Habitat (SBM)	10.0	0.0	6.0	0.0	5.3	0.8	5.5	0.9	6.8	0.5	10.0	0.0	7.3	0.0
Pollinator Habitat (POL)	4.2	1.3	5.3	0.6	1.7	0.4	2.0	0.9	3.2	1.2	2.4	1.2	3.2	0.9
Native Plant Diversity (PD)	7.0	0.1	6.1	0.1	6.8	0.1	6.8	0.1	10.0	0.0	7.0	0.0	7.3	0.0
Public Use & Recognition (PU)	1.0	0.7	2.4	0.7	4.7	0.6	4.0	0.7	4.6	0.8	3.7	0.8	3.4	0.7
Provisioning Services (PS)	0.0	0.0	0.7	0.6	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.7	0.3	0.0
GROUPED VALUES:														
Water Quality Support (aggregated score)	6.3	0.3	6.0	0.3	5.4	0.4	5.5	0.5	6.4	0.5	5.4	0.6	5.8	0.4
Fish Habitat Support (aggregated score)	6.7	0.0	3.9	0.3	6.7	0.0	6.7	0.0	6.7	0.0	6.7	0.0	6.2	0.0
Aquatic Support (aggregated score)	7.9	0.6	7.7	0.4	8.6	0.4	6.8	1.0	8.1	0.6	10.0	0.0	8.2	0.0
Terrestrial Support (aggregated score)	10.0	0.0	6.1	0.2	6.8	0.1	6.8	0.1	10.0	0.0	10.0	0.0	8.3	0.0

Table 3. Pairs of wetland sites whose scores for a given function differed significantly after accounting for variability among users of a pre-final version of ORWAP.

Statistically significant differences (bullets) were identified by Scheffe's Multiple Comparison Test (a procedure used in Analysis of Variance, ANOVA), alpha<0.05. See other tables for definitions of function codes in first column.

	Wetland Sites: MC= Mill Cr., T= Turner, S= Seavy, FB= Fairview B, FC= Fairview C, CC= Corvallis														
	MC-T	MC-S	MC-FB	MC-FC	MC-CC	T-S	T-FB	T-FC	T-CC	S-FB	S-FC	S-CC	FB-FC	FB-CC	FC-CC
WSf															
SRf						•									
PRf						•									
NRf						•									
TRf	•				•	•		•				•			•
CSf						•				•		•			
OEf	•				•	•				•	•	•			
INVf	•														
FAf															
FRf			•			•				•		•			
AMf	•					•	•	•		•		•			

	Wetland Sites: MC= Mill Cr., T= Turner, S= Seavy, FB= Fairview B, FC= Fairview C, CC= Corvallis														
	MC-T	MC-S	MC-FB	MC-FC	MC-CC	T-S	T-FB	T-FC	T-CC	S-FB	S-FC	S-CC	FB-FC	FB-CC	FC-CC
WBFf										●					
WBNf							●	●		●					
SBMf	●					●	●	●				●		●	
POLf	●		●	●	●	●					●	●			
PDf			●												
WSv															
SRv			●	●			●	●						●	●
PRv			●	●			●	●		●	●			●	●
NRv		●				●	●			●	●				
TRv												●			
INVv													●		
FAv										●					
FRv	●					●	●	●	●						
AMv	●						●	●	●	●	●			●	●
WBFv		●	●			●				●	●	●			
WBNv			●							●					
SBMv	●		●	●	●	●				●	●	●		●	
POLv			●			●	●	●							
PDv	●				●	●	●	●	●			●		●	●
PUv		●	●	●	●		●		●						
PSv		●								●	●	●			
Cond															
Stress	●					●	●	●	●						
Sens					●				●			●			●
WQf										●					
FISHf			●			●				●		●			
AQf	●					●						●			
TERRf	●		●												
WQv															
FISHv	●					●	●	●	●						
AQv		●				●					●	●	●		
TERRv			●	●		●	●	●	●	●				●	●

Table 4. Percent of users independently agreeing with the modal response to each indicator question when applying ORWAP to six Willamette Valley wetlands.

The modal response for each indicator is the choice that a plurality of the users selected. For example, if at a particular wetland 12 users were asked to assess the percent of the surrounding landscape within 2 miles that is openland and of the available choices (<5%, 5-20%, 20-50%, 50-80%, >80%), 4 users selected the first choice, 3 selected the second, 2 selected the third, and none selected the other choices, then the modal response is the first choice, and 25% (4 out of 12 users) selected that one. Indicators below are ranked from lowest to highest rates of agreement with the modal response. Not all indicators needed to be assessed in every wetland. Procedures for indicators with the lowest ranks were clarified prior to preparation of the current data forms. See ORWAP data forms for full wording and description of each indicator and its choices.

INDICATOR:	Average among all 6 sites	Minimum among all 6 sites	Maximum among all 6 sites
Openland in Landscape	44%	33%	58%
Size of Nearby Forest	45%	33%	56%
Seasonal Water Extent	48%	36%	67%
Natural Vegetation in Buffer	50%	40%	83%
Shrub & Vine Native vs. Non-native Cover	51%	33%	63%
Natural Vegetation Extent	51%	36%	78%
History of Fire or Vegetation Removal	53%	33%	67%
Distance to Nearest Busy Road	55%	25%	78%
Bare Ground & Plant Litter	55%	42%	80%
Size of Largest Nearby Tract of Natural Vegetation	56%	42%	67%
Transport From Upslope	56%	45%	75%
Downslope Storage	57%	44%	78%
Onsite Surface Water Isolation (Wet Season)	57%	40%	100%
Weed Source Along Upland Edge	58%	33%	73%
Core Area 1	58%	40%	83%
Core Area 2	58%	44%	83%
No Scum	60%	50%	75%
Known Water Quality Issues Below the AA	60%	38%	92%
Herbaceous Extent	62%	40%	89%
Historical Hydrologic Connectivity	62%	55%	75%
Ponded Water Proximity	63%	42%	88%
Buffer Slope	64%	38%	91%
Type of Outflow Connection to 303d	64%	36%	100%
Ground Irregularity	64%	44%	83%
Depth Class Distribution	64%	50%	75%
Herbaceous Native vs. Non-native Cover	65%	44%	90%
Graminoid vs. Forb Cover	65%	56%	89%
Walking/Bicycling is PhysicallyPossible	65%	50%	75%
Upslope Storage	65%	10%	100%
Public Access	66%	25%	100%
Interannual Water Dynamics	66%	55%	75%
Type of Landscape Alteration	66%	44%	83%
Ponded Water in Landscape	67%	45%	100%
Floodable Property	67%	50%	100%
Large Ponded Water Proximity	67%	42%	92%
Height Uniformity of Dominant Stratum	67%	55%	92%
Nesting or Roosting Structures	68%	50%	100%
Tree Stand Isolation Within the AA	68%	44%	100%
Forest Landscape Extent	69%	50%	75%
Predominant Water Fluctuation Range	69%	45%	100%
Contributing Area (CA) Percent	69%	36%	91%
Groundwater, Runoff, and Direct Precipitation	70%	50%	92%
Edge Slope	70%	36%	92%
Internal Gradient	70%	50%	100%
Woody Extent Along Water Edge	71%	33%	100%

INDICATOR:	Average among all 6 sites	Minimum among all 6 sites	Maximum among all 6 sites
Non-Native Amphibians (e.g., bullfrog) or Reptiles	71%	50%	100%
Nutria	71%	50%	100%
Sheltering of Water	71%	40%	100%
Shrub & Vine Species Dominance	71%	50%	100%
Wetland Elevation in Watershed	72%	50%	80%
Known Water Quality Issues in the Input Water	72%	50%	100%
Unvegetated Surface in the Contributing Area	72%	55%	100%
N Fixers	72%	55%	89%
Outflow Confinement	73%	57%	90%
Maintained Foot-trails, Roads, or Parking Areas	74%	50%	100%
Soil Composition in the Soil Pit	74%	58%	89%
Groundwater Risk Designations	74%	50%	110%
Outflow Duration	74%	55%	100%
Other Non-Native Fish	75%	58%	100%
SAV Invasive vs. Non-invasive Cover	75%	50%	100%
SAV Native Species Dominance	75%	50%	100%
Type of Land Cover Alteration in Buffer	76%	50%	100%
Onsite Surface Water Isolation (Dry Season)	76%	44%	100%
Ice-free	76%	50%	92%
Valuable Aquifers	76%	33%	100%
Vegetated Zone Absolute Width	77%	56%	100%
Visibility	77%	50%	100%
Independently Sustainable Hydrology	77%	36%	100%
Throughflow Complexity	77%	40%	100%
Upland Edge Shape Complexity	77%	45%	92%
Extent of Persistent Surface Water (Dry Season)	78%	50%	90%
Herbaceous Species Dominance	78%	57%	100%
Predominant Depth Class	78%	50%	100%
Waterfowl Food Plants	78%	67%	92%
Undercut Banks	78%	56%	100%
Shorebird Feeding Habitats	79%	36%	100%
Woody Distribution	79%	67%	100%
Devegetation	79%	50%	100%
Drinking Water Source (DEQ)	79%	53%	100%
Fish Access From Offsite	81%	50%	100%
Mean Annual Precipitation	83%	73%	100%
Upland Inclusions	84%	55%	100%
Openland Proximity	84%	70%	100%
Local Wetland Uniqueness	85%	54%	100%
Sustained Scientific Use	86%	75%	100%
Natural Vegetation Proximity	86%	73%	100%
Groundwater	87%	64%	100%
Flow Moving in Channels or Ditches	88%	75%	100%
Inlet+Outlet	88%	75%	100%
Downed Wood	88%	80%	100%
Abovewater Wood	88%	67%	100%

INDICATOR:	Average among all 6 sites	Minimum among all 6 sites	Maximum among all 6 sites
Cliffs, Banks, or Beaver	89%	67%	100%
Waterborne Pest Vectors	90%	60%	100%
Submerged & Floating-leaved Aquatic Vegetation	90%	78%	100%
Conservation Investment	91%	83%	100%
Ponded Threshold	92%	50%	100%
Surface Water Occurrence	92%	92%	92%
Mitigation Investment	92%	73%	100%
Upslope Soil Erodibility Risk	93%	86%	100%
hunting or trapping	93%	58%	100%
None of the above	93%	58%	100%
Vegetated Zone Relative Width	94%	80%	100%
Woody Extent Within the AA	94%	82%	100%
Islands	94%	64%	100%
Carp	96%	83%	100%
Commercial Harvesting of Hay etc.	96%	75%	100%
Sediment Removal	96%	88%	100%
Herbaceous Plant Species Ubiquity	96%	86%	100%
Accessible to People in Wheelchairs	97%	92%	100%
Forest Tract Proximity	98%	89%	100%
Deep Spots	98%	91%	100%
Non-Native Invertebrates	99%	92%	100%
Low-Impact Grazing	99%	92%	100%
Normal Seasonal Timing of Water	100%	100%	100%
Waves	100%	100%	100%
SAV Species Ubiquity	100%	100%	100%
Shrub & Vine Species Ubiquity	100%	100%	100%
Ownership	100%	100%	100%
Low-Impact Commercial Timber Harvest	100%	100%	100%
Fishing (including shellfish harvest)	100%	100%	100%
Tidal Proximity	100%	100%	100%
County Rank for Phosphorus Loading	100%	100%	100%
County Rank for Nitrogen Loading	100%	100%	100%

Finally, there are many factors—other than the method being tested—that potentially contribute to lower repeatability among independent users, including:

- Users not remembering key details from the Manual
- Overlooking Definitions/ Explanatory notes on data forms
- Delimiting the Assessment Area (AA) differently
- Delimiting the Contributing Area (CA) differently
- Not noticing the spatial context of the question
- Not consulting the database worksheet or the Wetlands Explorer Web site when required
- Differences in the parts of the site that were walked
- Differences in visual interpretation (vs. when to measure)
- Differences in skills at identifying plants and texturing soils

- Differences in prior knowledge of the particular wetland
- Differences in willingness and ability to make informed judgments
- Data entry errors
- Fatigue

7.5.2 Results of Sensitivity Testing

When evaluating a method's repeatability and sensitivity, perhaps the most important question is: *Is the variation among independent users assessing the* ***same*** *site generally less than the variation in scores* ***among*** *sites*? If it is, then the scores can be judged to be relatively sensitive and the repeatability relatively high. When this standard is applied to the repeatability testing data from the pre-final version of ORWAP, it is apparent that estimates for *Fish Support* and *Aquatic Habitat Support* fared better than estimates for the *Water Quality Support* and *Terrestrial Habitat Support* (Table 5). Also, estimates of *values* were better (had lower coefficients of variation) than estimates of *functions*. There is no certainty that the same results will be found if ORWAP is tested again in a different set of wetlands (especially if they are more varied in their characteristics) or if a newer version of ORWAP is used in the testing.

Table 5. Primary source of variation for function and value scores among 6 test sites at which the repeatability of a pre-final version of ORWAP was tested.

CV= Coefficient of Variation. The preferred situation is when the number in the first CV column is greater than the number in the second. That implies ORWAP's ability to sense differences among wetlands is greater than the variation among users. Such a situation is indicated by the word "Site" in the last column. Models and indicators of ORWAP functions that had the lowest among-user repeatability (i.e., highest CV in third column, labeled "User" in the last column) were subsequently clarified or modified to improve repeatability.

	Average among-Site CV	Average among-User CV	Main Source of Variation
FUNCTIONS:			
Water Storage & Delay (WS)	0.25	0.48	User
Sediment Retention & Stabilization (SR)	0.29	0.28	Site
Phosphorus Retention (PR)	0.16	0.28	User
Nitrate Removal & Retention (NR)	0.43	0.33	Site
Thermoregulation (T)	2.30	1.80	Site
Carbon Sequestration (CS)	0.20	0.41	User
Organic Matter Export (OE)	0.79	0.99	User
Aquatic Invertebrate Habitat (INV)	0.14	0.21	User
Anadromous Fish Habitat (FA)			N/A
Non-anadromous Fish Habitat (FR)	1.10	0.91	Site
Amphibian & Reptile Habitat (AM)	0.40	0.36	Site
Waterbird Feeding Habitat (WBF)	0.17	0.19	User
Waterbird Nesting Habitat (WBN)	1.10	1.40	User
Songbird, Raptor, & Mammal Habitat (SBM)	0.21	0.24	User
Pollinator Habitat (POL)	0.21	0.23	User
Native Plant Diversity (PD)	0.16	0.24	User
GROUPED FUNCTIONS:			

	Average among-Site CV	Average among-User CV	Main Source of Variation
Water Quality Support (WQ)	0.15	0.20	User
Fish Support (FISH)	1.10	0.91	Site
Aquatic Habitat Support (AQ)	0.17	0.16	Site
Terrestrial Habitat Support (TERR)	0.16	0.22	User
VALUES:			
Water Storage & Delay (WS)	0.33	0.08	Site
Sediment Retention & Stabilization (SR)	0.18	0.19	User
Phosphorus Retention (PR)	0.21	0.17	Site
Nitrate Removal & Retention (NR)	0.16	0.13	Site
Thermoregulation (T)	1.12	1.22	User
Aquatic Invertebrate Habitat (INV)	0.15	0.13	Site
Anadromous Fish Habitat (FA)	0.17	0.19	User
Non-anadromous Fish Habitat (FR)	0.31	0.02	Site
Amphibian & Reptile Habitat (AM)	0.41	0.17	Site
Waterbird Feeding Habitat (WBF)	0.48	0.14	Site
Waterbird Nesting Habitat (WBN)	0.16	0.14	Site
Songbird, Raptor, & Mammal Habitat (SBM)	0.16	0.11	Site
Pollinator Habitat (POL)	0.69	0.54	Site
Native Plant Diversity (PD)	0.06	0.02	Site
Public Recognition & Use (PU)	0.72	0.46	Site
Provisioning Services (PS)		1.21	N/A
GROUPED VALUES:			
Water Quality Support (WQ)	0.11	0.12	User
Fish Support (FISH)	0.26	0.02	Site
Aquatic Habitat Support (AQ)	0.14	0.11	Site
Terrestrial Habitat Support (TERR)	0.05	0.02	Site
OTHER ATTRIBUTES:			
Ecological Condition	0.18	0.17	Site
Stressors	0.13	0.06	Site
Ecological Sensitivity	0.16	0.16	Site

7.5.3 Correlations Among Scores for Functions, Stressors, and Condition

Are wetlands that are in better ecological condition more effective for performing all or most functions than those that are degraded? Popular opinion is that they are, but it remains unknown how consistently this is the case, and whether it can be demonstrated using the definitions, rapid indicators, and scoring models that comprise wetland assessment methods.

To partly address this question, ORWAP's score for *Stressors* from the 221 wetlands was first compared with ORWAP's score for *Ecological Condition* from the same wetlands, using the Spearman Rank Correlation procedure ($p<0.05$ significance level). This comparison showed a statistically significant inverse correlation between scores for *Stressors* and *Ecological*

Condition, despite their sharing no indicators, thus supporting (or at least not invalidating) the indicators and procedures ORWAP uses to estimate each of those (Figure 21).

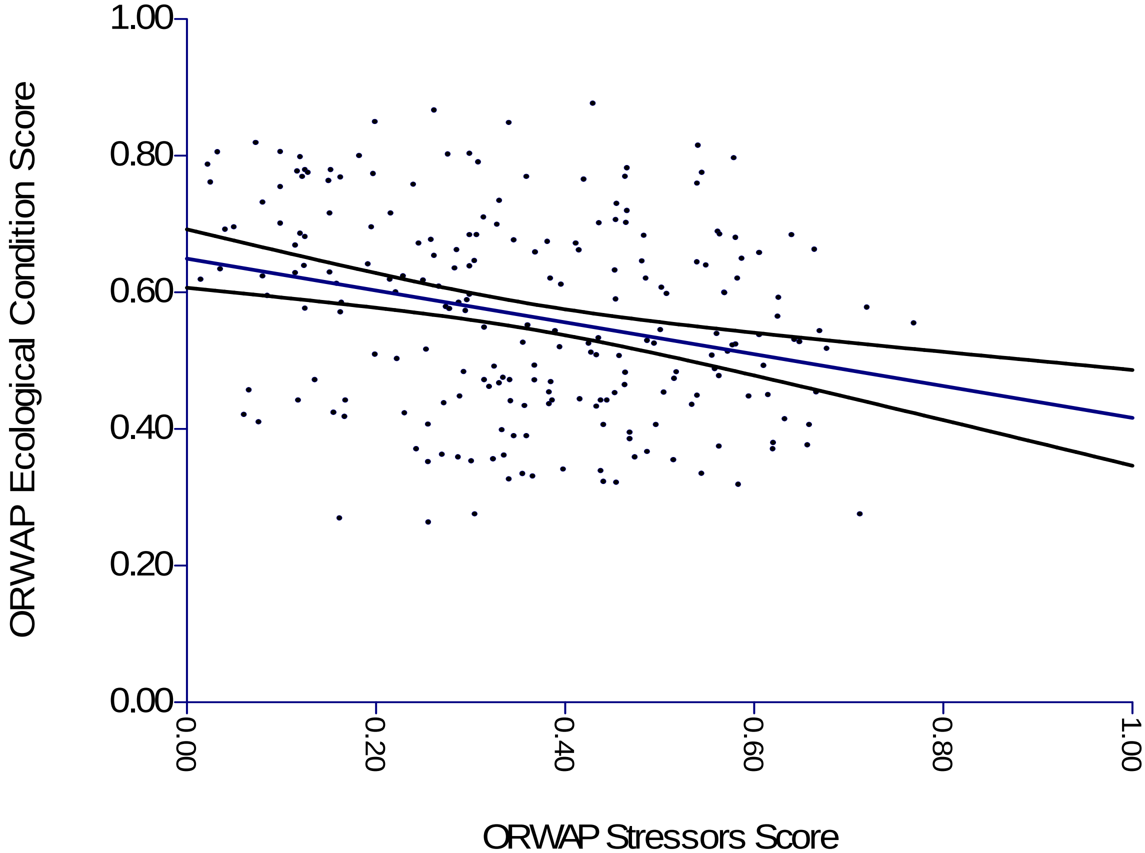

Figure 21. Relationship between ORWAP Condition score and ORWAP Stressors score.

Next, ORWAP's score for *Ecological Condition* was compared with scores for each of the functions from the same 221 wetlands. This comparison showed that the scores of nearly all of ORWAP's 16 wetland functions and 21 values were not correlated with the scores for *Ecological Condition* (Figures 22 and 24). These results lead to two important observations:
1) Several functions were inversely correlated with each other (Figures 22 and 23), implying that efforts to enhance one function or service in a wetland may often unintentionally reduce another function or service[5]. Likewise, several values were inversely correlated (Figure 24). This suggests that a prioritization of wetlands based only on values such as rarity of species or historical losses of particular wetland types will not adequately protect all wetland functions and their associated values and services.

[5] In ORWAP's scoring models, in no case is the score for one function used to partly determine that of another, and in no case is the score for one function's value used to help determine the value of another function. Thus autocorrelation (mathematical "double counting") among both functions and values was avoided. There are, however, several instances where ORWAP models use *function* effectiveness scores for one function to partially estimate the *value* of another function.

2) *Ecological Condition* alone, as estimated by ORWAP, does not consistently predict the levels of most functions and values present in the assessed Oregon wetlands. Thus, functions and values should be assessed in addition to *Ecological Condition*.

	WS	SR	PR	NR	TR	CS	OE	INV	FA	FR	AM	WBF	WBN	SBM	POL	PD	Cond	Sens
WS		+	+	+	-	-	-		-	-		+			-			
SR			+	+	-	-	-		-			+	+	-	-			+
PR				+	-		-	-	-	-	-	+		-	-	+		
NR					-		-				-	-						+
TR							+	+						+				
CS							+		+		-				+	+		
OE									+	+				+	+			-
INV									-		+	+	+	+	+	+	+	
FA										+		+						
FR											+		+		+			-
AM												+	+	+	+	+		
WBF													+	+				
WBN														+				
SBM															+	+	+	
POL																+	+	
PD																	+	
Cond																		
Sens																		

Figure 22. Statistical correlations among scores for functions, ecological condition, and ecological sensitivity, based on ORWAP assessments of 221 Oregon wetlands.

(+) means that as scores for the function in the row increased, so did those in the column (and vice versa).
(-) means that as scores for the function in the row decreased, the ones in the column increased (and vice versa).
Only the correlations that were statistically significant ($p<0.05$, Spearman rank correlation) are noted. In no case was the score of one function used in the model of a different function. See other tables for definitions of codes in first column.

	WQ	FISH	AQ	TERR	Condition	Sensitivity	Stressors
WQ		–	–	+			
FISH			+				
AQ				+	–		
TERR					+		–
Condition							–
Sensitivity							
Stressors							

Figure 23. Statistical correlations among scores for function group effectiveness, ecological condition, sensitivity, and stressors based on ORWAP assessments of 221 Oregon wetlands.

WQ= the greater of Sediment Retention, Phosphorus Retention, Nitrate Removal, and Thermoregulation
FISH= the greater of Anadromous Fish or Resident Fish

AQ= the greater of Organic Export, Aquatic Invertebrates, Amphibians, Feeding Waterbirds, and Nesting Waterbirds
TERR= the greater of Songbirds & Mammals, Plant Diversity, and Pollinator Habitat

	WS	SR	PR	NR	TR	INV	FA	FR	AM	WBF	WBN	SBM	POL	PD	Cond	Sens	Stress
WS								-	+						-		
SR				+					+								
PR																	
NR					-		-		+			+			-	+	+
TR							+	+						-			
INV								+	+	+	+	+		+			-
FA								+				-		-		-	
FR									-					-	-	-	
AM										+	+	+	+	+	-		
WBF													+	+			
WBN														+			
SBM													+	+			
POL														+	-		
PD																	-
Cond																	-
Sens																	
Stress																	

Figure 24. Statistical correlations among scores for values, ecological condition, sensitivity, and stressor index based on ORWAP assessments of 221 Oregon wetlands.

(+) means that as scores for the function in the row increased, so did those in the column (and vice versa).
(-) means that as scores for the function in the row decreased, the ones in the column increased (and vice versa).
Only the correlations that were statistically significant (p<0.05, Spearman rank correlation) are noted. See other tables for definitions of codes in first column.

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Appendix A: Additional Explanatory Illustrations

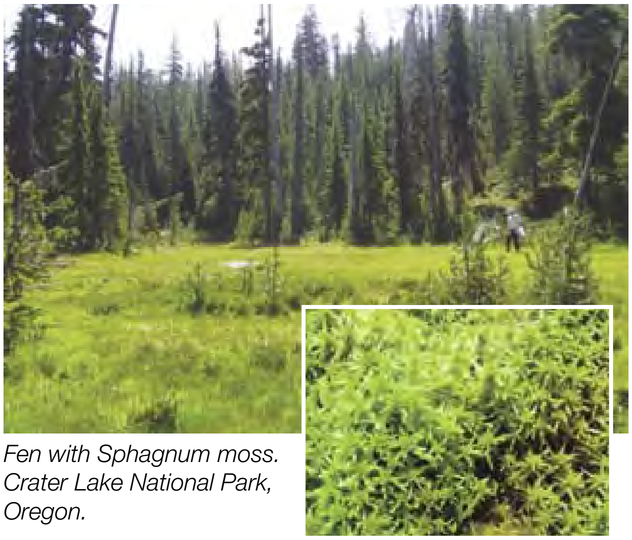
This appendix contains photographs, drawings and maps that illustrate many of the indicators used by ORWAP. These are provided only as examples of some of the many conditions that may be encountered while assessing the indicators; not all indicators are illustrated.

The illustrations are intended to augment the definitions and explanations on the data forms and in section 2.0 of the manual. The illustrations are presented in numerical order, beginning with the FieldF and FieldS data forms, and ending with the Office data form (OF). Users getting accustomed to ORWAP may wish to print these illustrations and refer to them frequently while performing their first several wetland assessments. Printing in color is recommended.

Data Form FieldF Illustrations

F2 Wetland Type of Conservation Concern

Bog or Fen



Fen with Sphagnum moss. Crater Lake National Park, Oregon.

Sphagnum

Playa or Salt Flat

Salt crust on soil in a seasonal salt flat wetland. Haines, Oregon

Native Wet Prairie, West of Cascades

Wet prairie with Camas in bloom, Willamette Valley, Oregon.

Vernal Pool

Vernal pool over hardpan, part of a complex of dozens of vernal pool wetlands. White City, Oregon.

Vernal pool in the dry season, White City, Oregon.

Vernal pool over basalt bedrock terrace above the Columbia River, The Dalles

F2 Continued…

Interdunal Wetland

Interdunal wetland. South Jetty, Florence, Oregon.

Interdunal wetland, Coos Bay, Oregon.

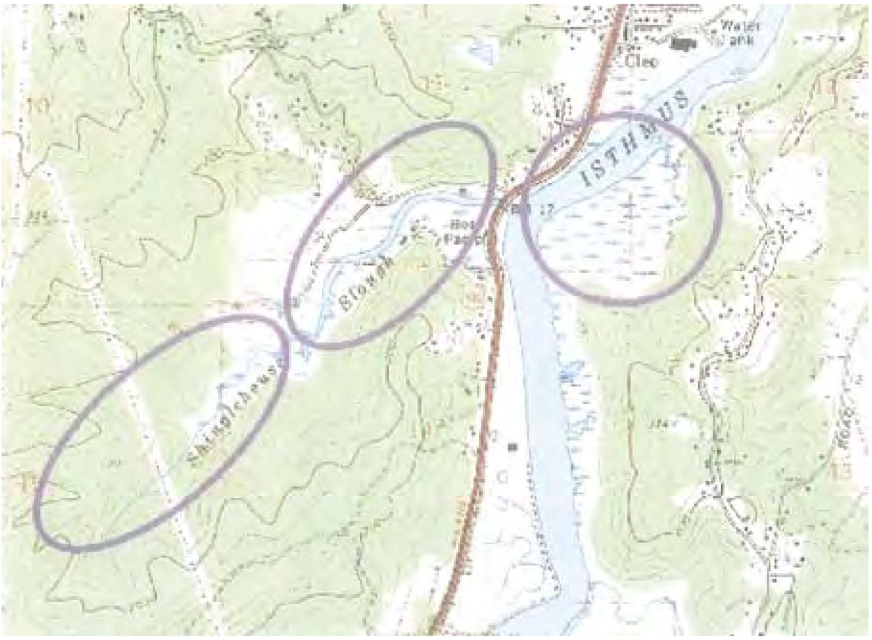
Interdunal wetland. Newport-South Beach, Oregon.

F3 Low Marsh

Along Siuslaw River, Cushman, Oregon.

Salicornia virginica, a succulent forb characteristic of low tidal marsh

F4 Tidal-Nontidal Hydroconnectivity



The tidal wetland in the middle is contiguous to the non-tidal wetland on its left, and fish can access parts of both wetlands. In question F4, the first choice would be the correct one. The tidal wetland circled on the right is not contiguous to a non-tidal wetland and has no inflowing stream. In question F4, the last choice would be the correct one.

This tidal wetland is not contiguous to a non-tidal wetland. Although it has an inflowing stream, the stream does not connect it to a non-tidal wetland. In question F4, the last choice would be the correct one.

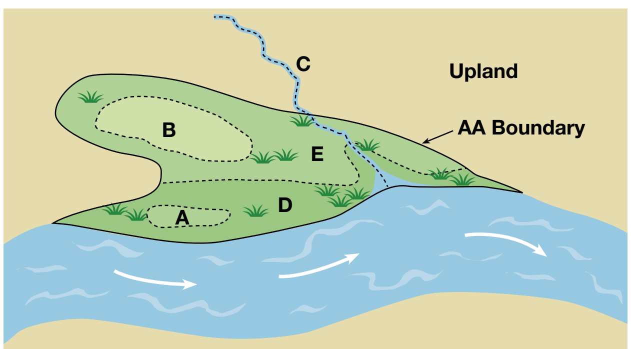
F7 Seasonal Water Extent

Cattails often indicate parts of a wetland where surface water persists for much of the spring and early summer.

F9 Onsite Surface Water Isolation (Dry Season)

Surface water that persists in pools or channels for much of the spring and early summer provides feeding and sometimes nesting opportunities for many waterbird species. Summer Lake Wildlife Management Area, Oregon.

F10 Onsite Surface Water Isolation (Wet Season)



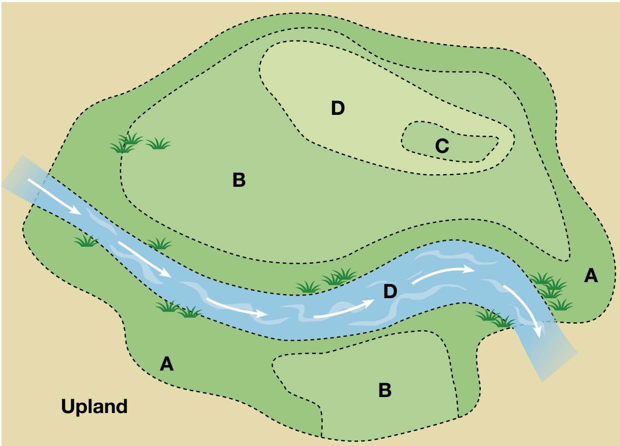
During the dry season, more of the surface water is in pools (A & B) than in the AA's internal channels (C). During the wet season, pool A and area D are flooded by the river, so more of the area within the AA is connected to channels than isolated in pools.

F11 Predominant Water Fluctuation Range

Water line on lichen-covered rocks, indicating extent of seasonal fluctuation in vernal pool water level. Also, different lichen species grow above and below the water line. The Dalles, Oregon.

Stranded algae in foreground indicates extent of seasonal fluctuation in water level. Interdunal wetland, Newport/ South Beach, Oregon.

F12 Predominant Depth Class and
F13 Depth Class Distribution



The depth in most of this AA is Class B during most of the time surface water is present. No depth class comprises > 90% of the AA's inundated area, but Class B comprises > 50%.

F15 Open Water Interspersion with Partly Inundated Vegetation

Slight variations in water depth and topography can create greater interspersion of vegetation and open water, which benefits many waterbird species. In this photo, open water comprises >70% of the AA, in many small patches. Summer Lake Wildlife Management Area, Oregon.

In this example, open water is 1-30% of the AA, mostly in one or a few patches. Willamette Mission State Park, Marion County, Oregon.

F15 Continued…

In the wetland above, open water comprises 30-70% of the wetland, and is in many small patches (during wet season). Florence, Oregon.

F17 Groundwater

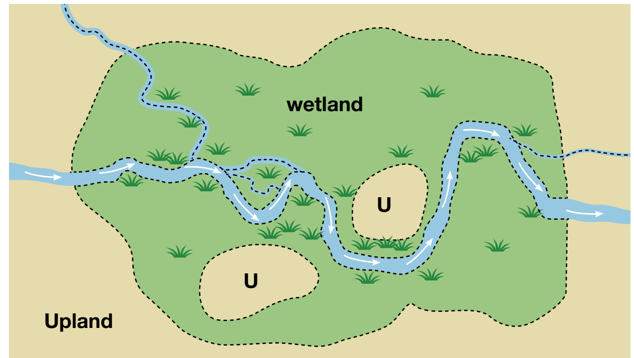
Groundwater is likely to be a major source of water to wetlands that are near the toe of naturally steep slopes, especially in eastern Oregon. Jack Lake, Lake County, Oregon.

F18 Outflow Duration

Seasonal outlet channel in the Warner Basin, Lake County, Oregon.

A small outlet channel that carries water only seasonally.

F21 Throughflow Complexity



Throughflow complexity in this example is great (sinuous and braided channel, indirect flow path). U = upland inclusion.

F26 Abovewater Wood

Abovewater wood provides perches for cormorants and other wetland birds, as well as turtles and frogs. Wood River, Klamath County, Oregon.

Mike Miller Park, Newport, Oregon.

F28 Shorebird Feeding Habitats

For brief periods during spring or early fall, recently plowed or flooded soils in farmed wetlands provide important feeding opportunities for migratory shorebirds. Coburg, Oregon.

F31 Non-native Aquatic Animals

Large populations of carp, such as these dead ones, can deplete dissolved oxygen and light in many wetlands, thus limiting the habitat available for many native fish species. Malheur Lake, Harney County, Oregon.

F34 No Scum

Mats of algae that almost completely cover a wetland's surface are often an indicator of accelerated enrichment, and can reduce the diversity of aquatic plants and invertebrates. La Grande, Oregon.

F35 Submerged and Floating-leaved Aquatic Vegetation (SAV)

F54 Height Uniformity of Dominant Stratum

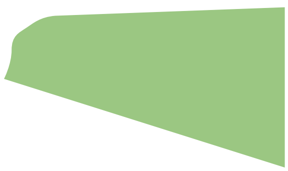
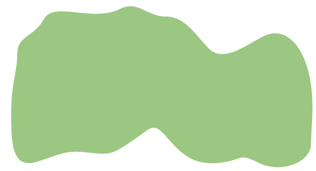
Varied plant heights within one stratum (the herbaceous layer in this photo) increases the suitability for many wetland species. Summer Lake Wildlife Management Area, Oregon.

F55 Bare Ground and Plant Litter

In this photo, much (20-50%) bare ground or plant litter is visible and stem density is low.

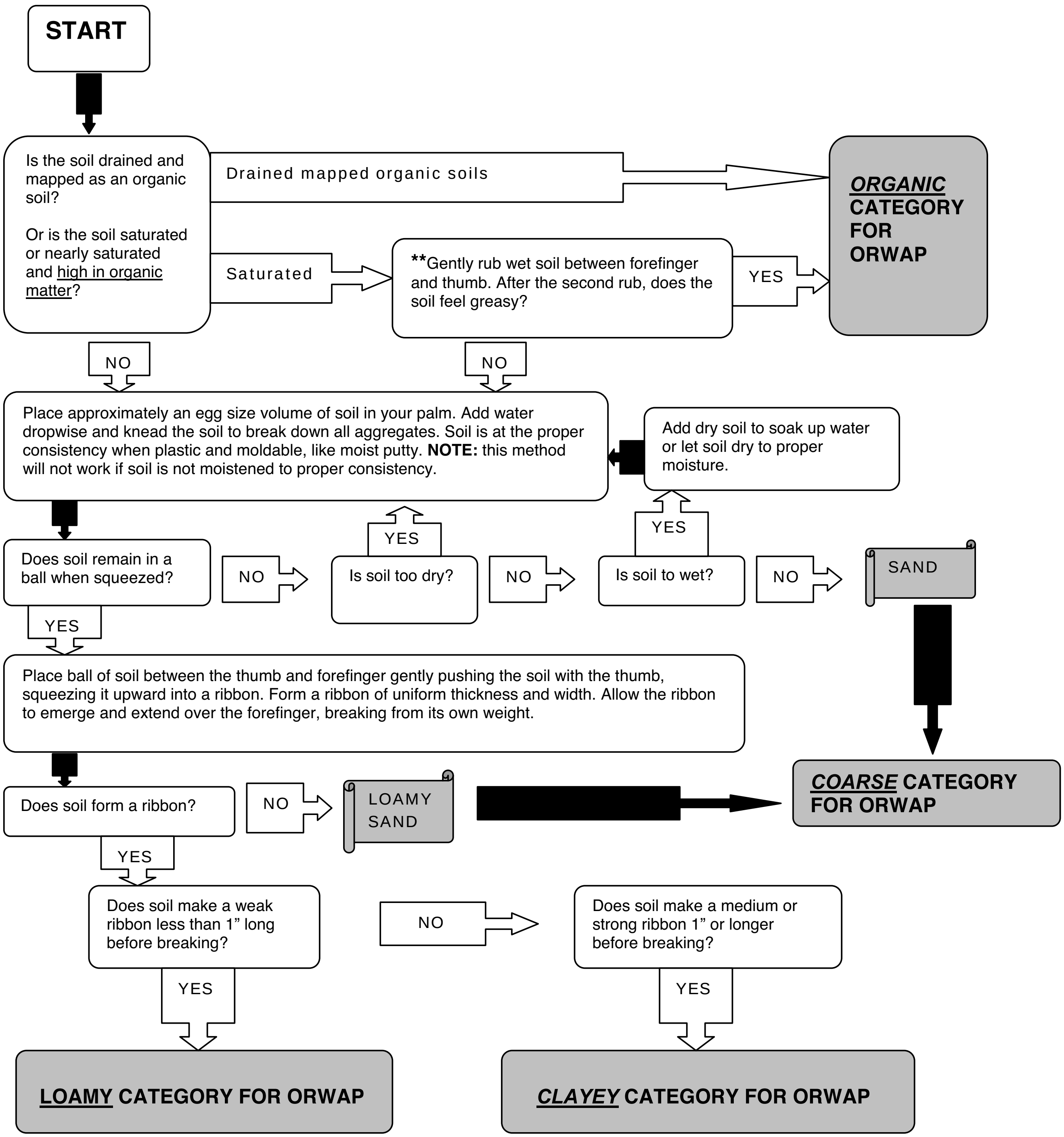
This AA exhibits mostly (>50%) bare ground or plant litter.

F56 Upland Edge Shape Complexity

Linear	Convoluted	Intermediate
		(a) mildly convoluted:  (b) mixed 

F58 Soil Composition in the Soil Pit

Use this flow chart to estimate the soil composition in your soil pit. Also read the explanation in Section 2.3.2 of this Manual.



**This method may be inconclusive with loamy or clayey textured soils.

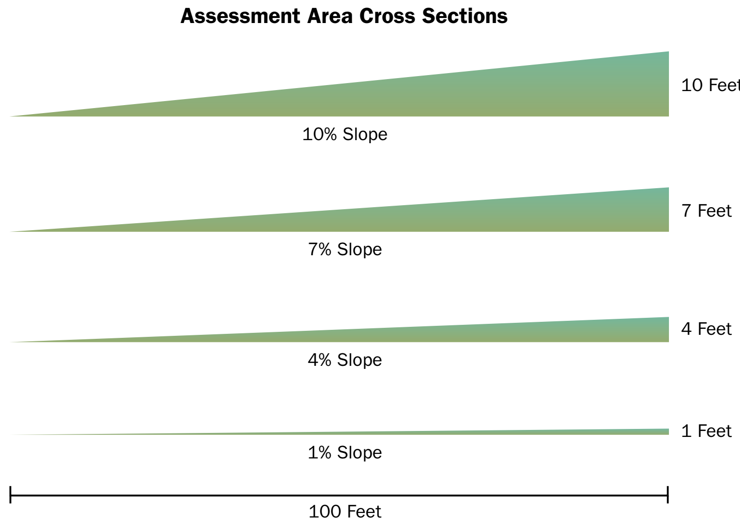
F60 Ground Irregularity

Microtopographic relief resulting from livestock.

Ground nesting ant mounds raised above wet soils create microtopgraphic relief. Corvallis, Oregon.

Microtopography resulting from tidal action. Seaside, Oregon.

F61 Internal Gradient



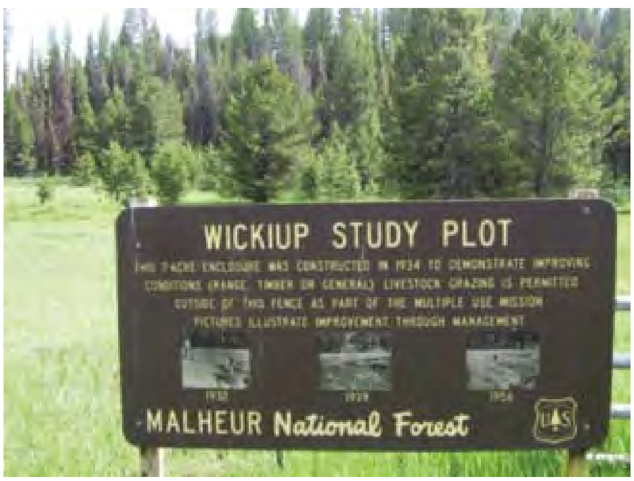
F64 Cliffs, Banks, or Beaver

High vertical banks and cliffs can provide important nest sites for wetland-dependent birds and mammals. La Grande, Oregon.

F68 Non-consumptive Uses - Actual or Potential

This wetland can be accessed most of the year by boat (non-consumptive use), and fishing is popular (consumptive use). Wood River wetland, Klamath County, Oregon.

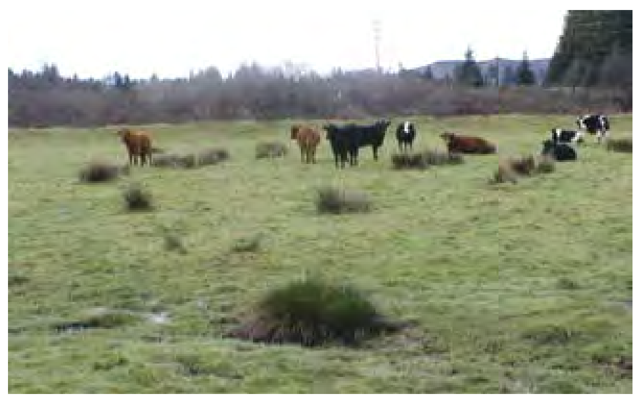
F69 Sustained Scientific Use



Evidence of sustained research in a riparian wetland. Grant County, Oregon.

F73 Devegetation

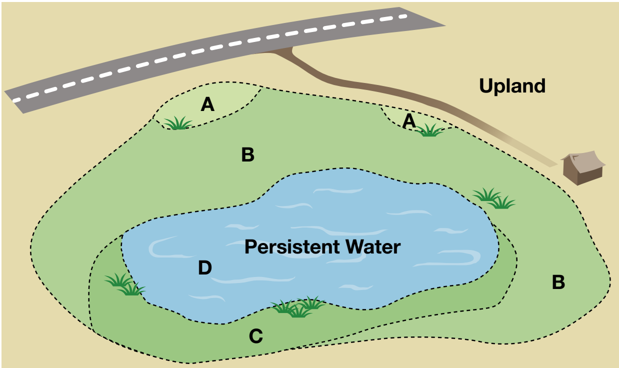
Intensely grazed seasonal wet depression with persistently reduced vegetation height. Near Sycan Marsh, Lake County.



Intensively grazed wetland pasture near the Oregon coast.

Wetland area regularly maintained as lawn. St. Helens, Oregon.

F74 F75 Core Area 1

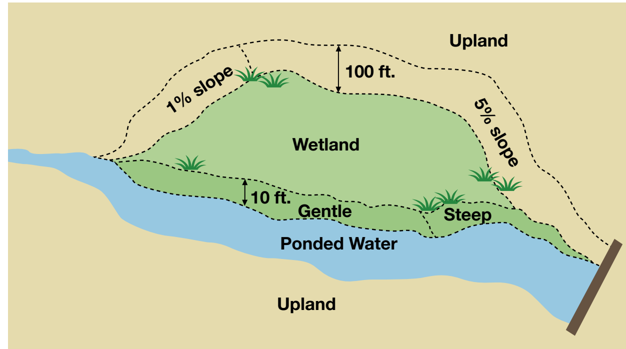


Both wetland areas denoted "A" are visited almost daily for several weeks of the year because they are near a road and soil is saturated-only (never any standing water). Area D is almost never visited because water is too deep and inaccessible by boat. Area C is almost never visited because it is too distant from roads and trails, and vegetation is very dense. Area B fits neither category. Although A and B together comprise <5% of the AA, an inhabited building is within 300 ft of the AA, so the third choice in question F74 is the correct one.

F79 Buffer Slope

Much of the land cover within 100 ft of the uplslope side of this wetland is lawn and buildings, rather than having a natural buffer. Wood River wetland, Klamath County, Oregon.

F79 F80 Buffer Slope, and Edge Slope



F79: Gentle (<5%) slope comprises about 25% of the wetland-upland edge. F80: Steep slope comprises about 25% of the vegetated edge that borders ponded water.

Data Form FieldS

S3 Drier Water Regime - Internal Causes

A newly excavated drainage ditch creates a drier water regime.

A relict ditch, now mostly overgrown. Logan Valley fen, Grant County, Oregon.

S5 Altered Timing of Water Inputs, and
S6 Accelerated Inputs of Nutrients, Contaminants, and/or Salts

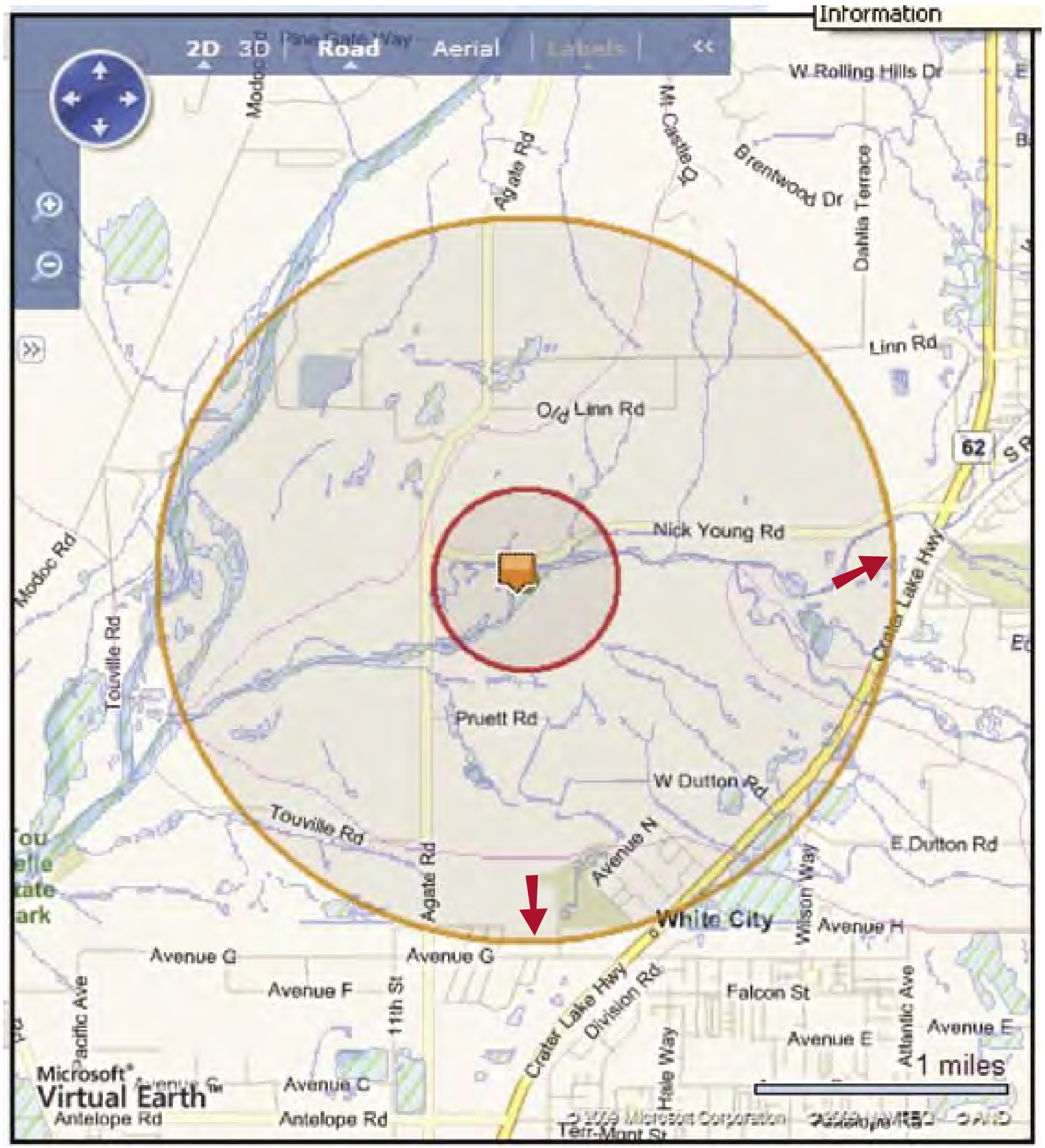
Buildings, roads, and road ditches alter the timing of runoff entering wetlands, and may shift the wetland's predominant source from groundwater to surface water. Even when sewered, residential areas contribute and accelerate inputs of nutrients and contaminants. Hillsboro, Oregon.

S7 Excessive Sediment Loading from Contributing Area

Washed out forest roads are a potentially significant source of accelerated sediment movement into wetlands. Grant County, Oregon.

Data Form OF

D4 Enclosed by Roads



Note that the wetland in the circle center is almost but not entirely enclosed by roads within 2 miles (the larger circle is the 2-mile radius circle). Arrows denote gaps within 2 miles of the wetland, assuming all paved roads are shown.

D8 Size of Nearby Forest

Forest that is contiguous with the marked wetland extends far to the north and south along a stream corridor, making the contiguous forested area 100-1000 acres. Riparian forest outside the 0.5 mile circle counts towards this total, because it is contiguous with the wetland and doesn't narrow to less than 150 ft wide. The forested area on the lower left of the photo exceeds 1000 acres and would be considered the largest if it were not separated from the wetland by gaps created by a field and a wide paved road.

D8 Continued…

The marked wetland is within 0.5 mile of a large forested patch, but it is separated from it by a field wider than 150 ft. Question D8 would be answered, "less than 1 acre of forest."

D14 Open Land and Wetland in Landscape

Flat cropland near wetlands provides excellent feeding habitat for many wetland species, such as Sandhill Crane. Summer Lake Wildlife Area, Lake County, Oregon.

Flat land in valley bottoms includes pasture, grass fields, cropland and herbaceous wetland and provides feeding habitat for migratory shorebirds and other species. Open land on hill slopes, as shown in the background, is not considered "open land" for indicator D14.

D25-D35 Information from Wetland Explorer Web Site.

See Section 2.2.8 of the manual.

D36 Contributing Area (CA) Percent

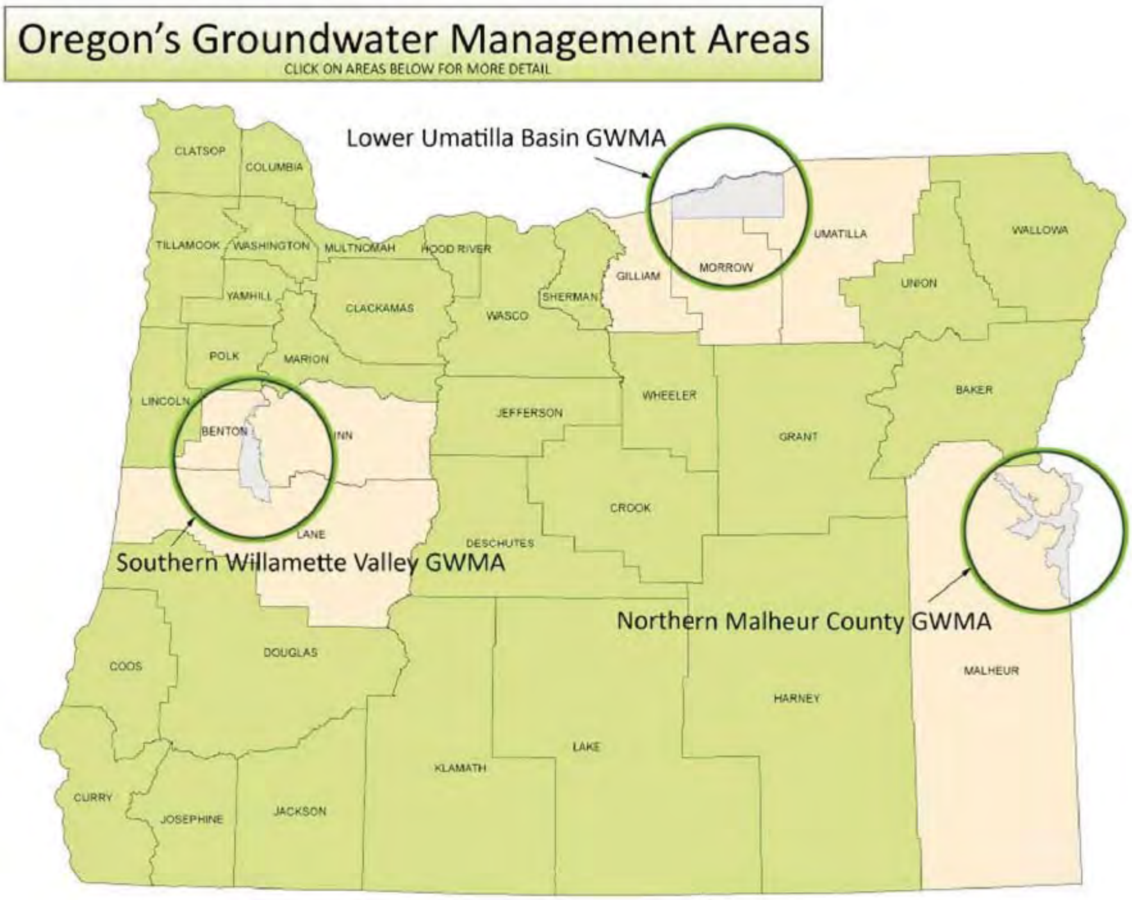
See Section 2.2.5 of the manual.

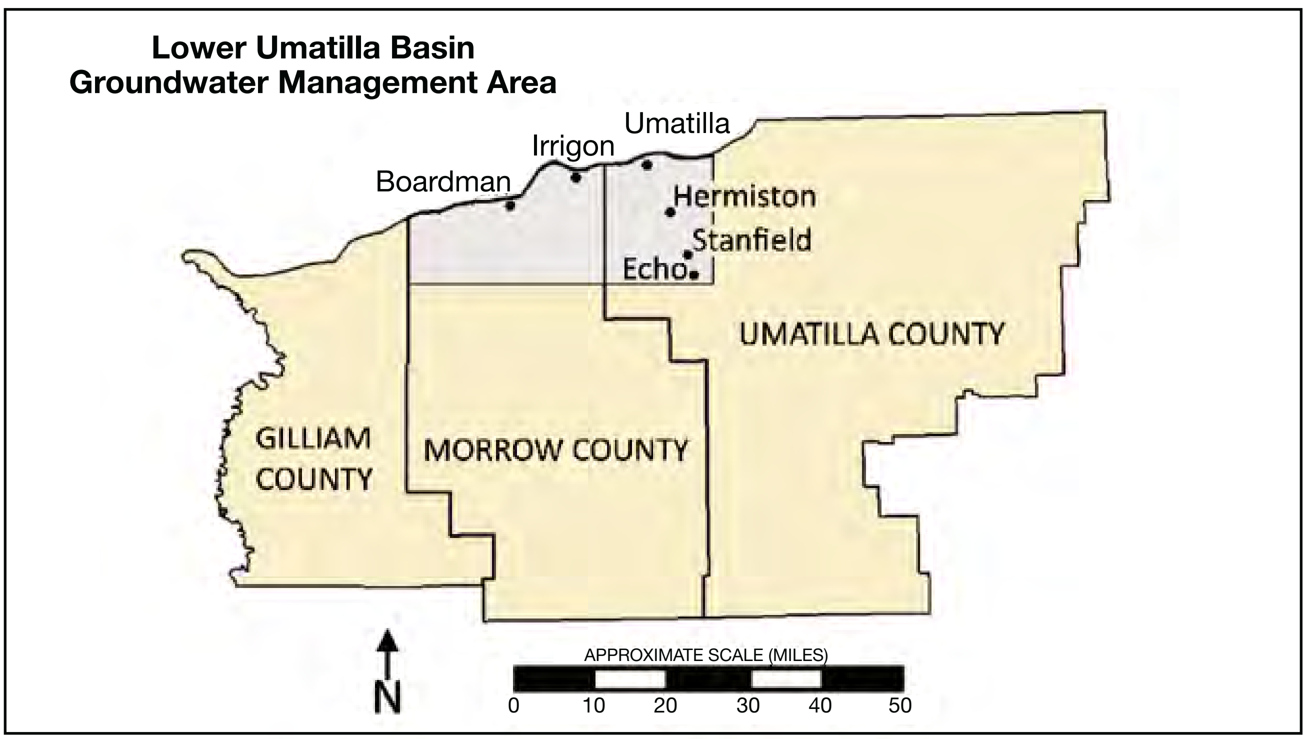
D40 Known Water Quality Issues in the Input Water

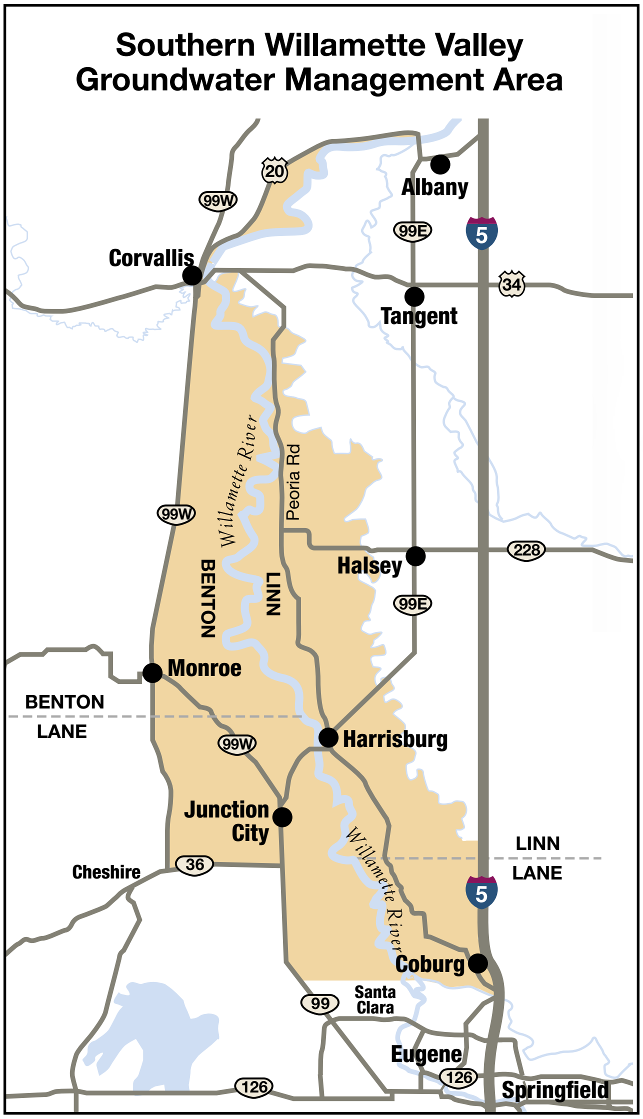
D41 Known Water Quality Issues Below the AA

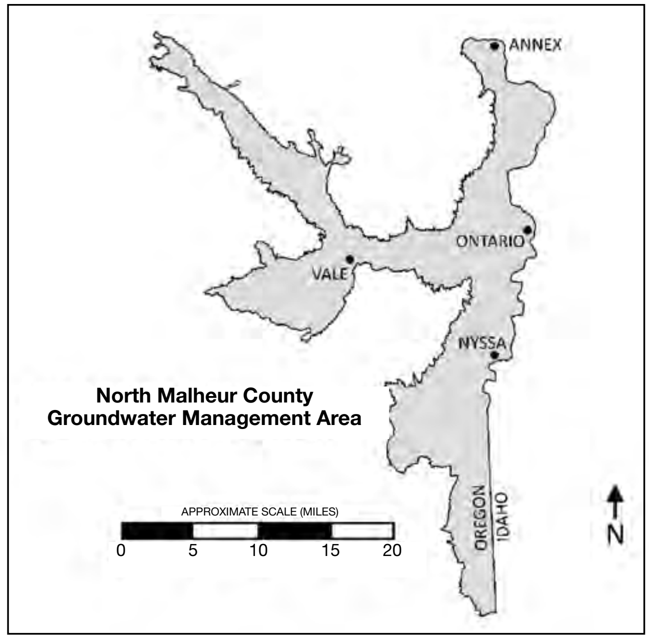
See Section 2.2.7 of the manual.

D44 Groundwater Risk Designations









D49 Salinity

View maps at DSL Web Site:
http://www.oregonstatelands.us/DSL/WETLAND/technical_resources.shtml

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APPENDIX B. Narrative Descriptions of the ORWAP Scoring Models

This appendix attempts to describe, in a narrative manner, the indicator variables (questions in data forms) that ORWAP uses to assess each function and its value, and how they are combined in scoring models. The indicators mentioned in the descriptions below are shorthand versions of indicators that are defined and explained fully in the ORWAP data forms (worksheets FieldF, FieldS, and OF). In the *ORWAP_Calculator* spreadsheet, rationales (and where feasible, citations of supporting literature) for the indicators are provided in column E of the worksheet pertaining to that wetland function. In the "Pts" column of each of the Excel worksheets, understand that a weight of "0" does not necessarily mean the named condition is of no importance at all to the function—it is only a relative measure. For more information on the modeling process, see section 6.4. The narratives below also describe, by function, the relative amount of scientific support for the existence of that function in wetlands generally; for more documentation see Adamus et al. 1992 and Adamus 2001. Finally, under the heading, "Potential for Future Validation," this appendix describes, for each function, some of the types of measurements that might be taken to validate each model if that should be desired in the future.

WATER STORAGE (WS)

<u>Function Definition:</u> The effectiveness of a wetland for storing water or delaying the downslope movement of surface water for long or short periods (but for longer than a tidal cycle), and in doing so to potentially influence the height, timing, duration, and frequency of inundation in downstream or downslope areas.

<u>Scientific Support for This Function in Wetlands Generally</u>: Moderate to High. Being flat areas located low in the watershed, many wetlands are capable of slowing the downslope movement of water, regardless of whether they have significant storage capacity. When that slowing occurs in multiple wetlands, flood peaks further downstream are muted somewhat. When wetlands are, in addition, capable of storing (not just slowing) runoff, that water is potentially available for recharging aquifers and supporting local food webs.

FUNCTION MODEL

<u>Structure</u>:

- A wetland is automatically scored "0" for this function if more than half the site is "low marsh," or if located in the lower third of a major estuary. If the site is in the upper estuary but nonetheless is tidal, the site is scored higher if the outlet is not partially blocked (e.g., by a breached dike), outflow occurs daily, most of the site is high marsh, and some of the surface water occurs in pools that remain isolated at mean high tide. These 3 variables are averaged and then multiplied by a discounting factor of 0.2 which is intended to reflect the much reduced ability of tidal wetlands to store water meaningfully.
- If the site is not tidal and lacks a surface outlet, the score is based only on annual water level fluctuation and the percent of the assessment area (AA) that is inundated only seasonally.
- If the site is not tidal and surface water is never present, the only water storage that may be occurring would be happening underground. This is estimated from presence of flat wetland gradient and ice-free conditions in winter, and lack of artificial drainage. The average of these is multiplied by 0.1 to account for the relatively small amount of subsurface water storage that usually can be assumed to be occurring.
- In all other cases the score is the average of two groups of indicators. One group is the average of 3 indicators: greater annual fluctuation in water levels, a larger percent of the site being inundated only seasonally, and an artificial (thus presumably more constricted) outlet. The other group, which is multiplied by 0.5 to account for its usually being less effective than wetlands that completely lack outlets, is the average of 9 indicators: artificial outlet, flatter gradient, more-complex surface throughflow patterns (if applicable), complex microtopography, greater isolation of both wet and dry season surface water in pools, not covered with ice for long duration, wetter as a result of outlet alteration or berms, and not artificially drained.

Formula:
IF(low marsh or lower estuary or too steep),0,
IF((other Tidal=1), (0.2*(AVERAGE(LowMarsh,OutDura,Constric,IsoWet))),
IF((NoOutlet=1),AVERAGE(Fluctua,SeasPct),
IF((NoWater=1), (0.1*(AVERAGE(Gradient,Freeze,Drier))),
ELSE:
((AVERAGE(OutDura, Fluctua, SeasPct)) + (0.5*(AVERAGE(Constric,Gradient,ThruFlo,Girreg,IsoDry, IsoWet,NoFreeze,Wetter,NoDrainage)))) /2))))

Repeatability Analysis: Among the 6 wetlands where repeatability was tested, the confidence interval for this function was ±0.8 around a mean score of 3.1 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, function scores ranged from 0 to 8.00 (median= 3.30, mean= 3.14). The scores were correlated positively and significantly with those for the sediment and nutrient retention functions, and negatively with Thermoregulation, Carbon Sequestration, Organic Export, the two fish habitat functions, and Pollinator Habitat. They did not correlate significantly with scores for wetland Condition.

Potential for Future Validation: The volume, duration, and frequency of water storage could be measured in a series of wetlands that encompass the scoring range, and flows could be measured at their outlets if any, and at various points downstream. Measurements should especially be made during major storm or snowmelt events. Procedures are partly described by Warne & Wakely 2000, US Army Corps of Engineers 2005, and NJ Dept. of Environmental Protection 2007.

VALUES MODEL

Structure: A wetland's increasing value for the Water Storage function is influenced the most by closer proximity to floodable property located downstream or downslope, and secondarily by the average of: location in the upper part of a watershed (or proportionally small contributing area), more high-runoff surfaces upslope, greater transport efficiency upslope, little storage between the wetland and downslope floodable property, and the wetland's anticipated long-term sustainability.

Formula:
(FloodBdg + (AVERAGE(Sustain,(AVERAGE(ShedPos,CApct)),CAunveg,UpStore,Transport,DownStore))) /2

Repeatability Analysis: The average repeatability among independent users for this function's value score was ±0.4 around a mean score of 7.4 over a potential score range of 0-10.

Sensitivity Analysis: Among the 221 wetlands, value scores for this function ranged from 1.00 to 8.96 (mean= 3.76, median= 3.00).

SEDIMENT RETENTION AND STABILIZATION (SR)

Function Definition: The effectiveness of a wetland for intercepting and filtering suspended inorganic sediments thus allowing their deposition, as well as reduce current velocity, resist erosion, and stablize underlying sediments or soil. The performance of this function has both positive values (e.g., reduction in turbidity in downstream waters) and negative values (e.g., progressive sedimentation of productive wetlands, slowing of natural channel migration).

Scientific Support for This Function in Wetlands Generally: High. Being flat areas located low in the landscape, many wetlands are areas of sediment deposition, a process facilitated by wetland vegetation that intercepts suspended sediments and stabilizes (with root networks) whatever sediment has been deposited.

FUNCTION MODEL

Structure:
- If the site is tidal, the score is higher if the site has many isolated pools during high and low tide, a outlet constriction, complex through-flow, large ground irregularity (microtopography), flat gradient, dense ground

cover, not persistently grazed or mowed, a wide vegetated area, and intermediate or high salinity (which facilitates precipitation of clay particles).

- If the site is not tidal and an outlet is lacking, the site is automatically scored a "10".
- If the site has an outlet but surface water is never present, the score is the average of flatter gradient, more extensive ground cover, lack of persist grazing or mowing, and a small contributing area relative to wetland size.
- If both an outlet and surface water are present, then the score is the average of the same 4 indicators as well as shorter annual duration of outflow, greater constriction of the outlet, many isolated pools (both wet and dry season), inundation that mostly is seasonal-only, greater surface throughflow complexity, greater water depth, greater width of vegetated areas, and greater microtopography.

Formula:
IF((Tidal=1),
(AVERAGE(IsoDry,IsoWet,Constric,ThruFlo,Girreg,Gcover,Deveg,Gradient,WidthRel,WidthAbs,Salinity)),
IF((NoOutlet=1),1,
IF((AllDry=1),(AVERAGE(Gradient,Gcover,Deveg,CApctF)),
ELSE:
AVERAGE(Gradient,Gcover,Deveg,CApctF,OutDur,Constric,IsoWet,SeasPct,DepthC,Girreg,ThruFlo,WidthAbs)

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was ±1.1 around a mean score of 6.2 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, function scores ranged from 1.93 to 10 (median= 5.78, mean= 6.33). The scores were correlated positively and significantly with those for Water Storage, Phosphorus Retention, Nitrate Removal, Waterbird Feeding, Waterbird Nesting, and Wetland Sensitivity. They correlated negatively with Thermoregulation, Carbon Sequestration, Organic Export, Anadromous Fish Habitat, Songbird-Mammal Habitat, and Pollinator Habitat. They did not correlate significantly with scores for wetland Condition.

Potential for Future Validation: The volume of accreted sediments could be measured in a series of wetlands that encompass the scoring range. This might be done with sediment markers, with isotopic analysis of past sedimentation rates, or with SET tables (Boumans & Day 1993)). Suspended sediment could be measured at inlets and outlets if any, with simultaneous measurement of changes in water volume and flow rate (e.g., Detenbeck et al. 1995).

VALUES MODEL

Structure: A wetland's value for the Sediment Retention & Stabilization function is reflected by the average of 4 factors: (1) lack of wetland dependence on artificial structures or water subsidies, (2) headwater location (or proportionally small contributing area) and wetland is wide relative to adjoining waters, (3) greater proximity to turbidity or sedimentation problems upstream, (4) greater proximity to turbidity or sedimentation problems downstream, and (4) the average of 13 indicators: more of the wetland is persistently inundated (or low marsh if tidal), more high-runoff surfaces upslope, less storage upslope, greater transport efficiency upslope, intrinsically high sediment delivery potential (based on slope and soil type), more extensive undercut banks, numerous significant sediment sources in contributing area, greater risk of erosion from waves, large water level fluctuations, need for dredging of downstream harbors, contributing area with limited natural vegetation, and sparse ground cover within 100 ft of the wetland.

Formula:
AVERAGE of 4:
(Sustain,
(AVERAGE(TurbUp,DownDistExceedSS)),
(AVERAGE(ShedWet,CApct,WidthRel)),
(AVERAGE(ImpervPctSS,UpStoreSS,TransportSS,ErodibleSS,Undercut,SedIn,LoMarsh,PersistPct,Fluc,
Wave,Shoal,CAnatPct))))

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was ±0.5 around a mean score of 4.2 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, value scores for this function ranged from 1.99 to 7.72 (median= 4.90, mean= 4.86).

PHOSPHORUS RETENTION (PR)

Function Definition: The effectiveness for retaining phosphorus for long periods (>1 growing season) as a result of chemical adsorption, or from translocation by plants to belowground zones with less potential for physically or chemically remobilizing phosphorus into the water column.

Scientific Support for This Function in Wetlands Generally: Moderate to high. Many wetlands do not retain phosphorus for long periods, but may be significant by converting inorganic to organic forms. Sediment dynamics (erosion-deposition) and local geology largely determine whether a wetland is a source, sink, or converter of phosphorus over the long term.

FUNCTION MODEL

Structure:

- If the site is tidal, higher scores are determined by three factors weighted equally: (1) the site is in the upper estuary or has low salinity, (2) soils are clayey, and (3) the average of 6 indicators (PR5), all counted equally: narrower outlet constriction, more complex throughflow, greater width of vegetated areas, greater irregularity of overall site topography, and greater irregularity of the ground surface.
- If the site is not tidal and lacks an outlet, it is automatically scored "10" for this function.
- If nontidal, and always lacking surface water, its score depends on soil chemistry as predicted by texture (finer soils being better) and equally, (2) the average of gradient flatness, greater density of ground cover, absence of recent fire or hay removal, and headwater location.
- If nontidal, and surface water is present during at least part of the year, higher scores are determined by the average of 2 indicator groups. One group is either fine-textured soils or playa/ alkaline condition. The other is the average of 3 subgroups. One of those (PR2) is the average of greater water depth, larger areas of persistent inundation, minimal water level fluctuation, and headwater location. A second (PR3) is the average of decreasing outflow duration, narrower outlet, flatter gradient, and no recent fire or harvesting of hay. A third (PR4) is the average of greater channel complexity, greater width of vegetated areas, greater ground cover density, greater irregularity of the ground surface, more surface water that is isolated in pools, lack of prolonged freezing, and lack of algal blooms.
- If the site does not have an inlet and outlet and is not a fringe wetland, then vegetation width is not used in any of the calculations.

Formula:
IF((Tidal =1), AVERAGE(PR5,AVERAGE(EstuPos,Salin),SoilTex)
IF((NoOutlet=1), 1,
IF((NoWater=1), PR6
ELSE: [MAX(SoilTex,Playa) +AVERAGE(PR2, PR3, PR4)] /2
where :

PR2=AVERAGE(Persis, DomDepth, Fluctu, CApct)
PR3=AVERAGE(OutDura,Constric, IsoWet, Gradient, FireHay)
PR4 =AVERAGE(ThruFlo, VegWabs,VegWrel, Gcover, Girreg, IsoDry, Freeze, Scum)
PR5= AVERAGE(Constric,ThruFlo,Girreg,IsoWet,Gcover,VegWabs)
PR6= AVERAGE(Gradient,Gcover,FireHay,CApct)) + SoilTex) /2

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was ±1.2 around a mean score of 7.4 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, function scores ranged from 0.32 to 10 (median= 5.86, mean = 6.38). The scores were correlated positively and significantly with those for Water Storage, Sediment Retention, Nitrate Removal, Waterbird Feeding Habitat, and Plant Diversity. They correlated negatively with Thermoregulation, Carbon Sequestration, Organic Export, Anadromous Fish Habitat, Songbird-Mammal Habitat, and Pollinator Habitat. They did not correlate significantly with scores for wetland Condition.

Potential for Future Validation: Among a series of wetlands spanning the scoring range, total phosphorus could be measured simultaneously at wetland inlet and outlet, if any, and adjusted for any dilution occurring from groundwater or runoff (or concentration effect from evapotranspiration) over the intervening distance. Measurements should be made at least once monthly and more often during major runoff events (e.g., Detenbeck et al. 1995). A particular focus should be on the relative roles of soil composition vs. vegetation, as they affect chemical adsorption vs. uptake.

VALUES MODEL

Narrative for Values Model: A wetland's value for the Phosphorus Retention function is reflected by the average of 4 factors: (1) lack of wetland dependency on artificial structures or water subsidies, (2) headwater location (or proportionally small contributing area) and/or wetland is wide relative to adjoining waters, (3) greater proximity to phosphorus problems upstream or downstream (or downslope), or if no data, then the average of higher county rank for phosphorus loading and more potential nutrient sources observed near the wetland, and (4) the average of 6 indicators: more high-runoff surfaces upslope, less storage upslope, greater transport efficiency upslope, intrinsically high sediment delivery potential (based on slope and soil type), contributing area with limited natural vegetation, and sparse ground cover within 100 ft of the wetland.

Values Model Formula:
(Sustain3 + (AVERAGE(PosShed,CApct,VegWidthRel))+
(AVERAGE(PdataUpDis,PdownDis,Prank, Pload))+
(AVERAGE(ImpervCA,UpStore,Transport,ErodScore,NatCApct,BuffVpct))) /4

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was ±0.5 around a mean score of 5.1 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, the value scores for this function ranged from 2.67 to 8.22 (median= 5.44, mean= 5.51).

NITRATE REMOVAL AND RETENTION (NR)

Function Definition: The effectiveness for retaining particulate nitrate and convert soluble nitrate and ammonia to nitrogen gas, primarily through the microbial process of denitrification, *while generating little or no nitrous oxide* (a potent "greenhouse gas"). Note that most published definitions of Nitrate Removal do not include the important restriction on N_2O emission.

Scientific Support for This Function in Wetlands Generally: High. Wetlands are perhaps the most effective component of the landscape for removing nitrate from surface water.

FUNCTION MODEL

Structure:
- If the site is tidal, the score is the average of 12 indicators (NRE5): site with a narrow outlet, larger throughflow complexity (if applicable), greater ground cover density, greater irregularity of the ground surface, flatter gradient, wider vegetated area, a convoluted upland edge, many upland inclusions within the site, stressors that have recently made the site drier, more soil disturbance, and larger proportion of the surface water that does not connect to channels or the estuary during mean low or mean high tide.
- If nontidal and lacking an outlet at any season, the maximum score of 10 is assigned.

- If nontidal, and always lacking surface water, a higher score depends on the average of 9 indicators: soil composition (finer soils scoring higher), flatter gradient, greater density of ground cover, irregularity of the upland edge, presence of many upland inclusions, no recent fire or hay removal, no stressors that have recently made the site drier, less soil disturbance, and/or the site is a bog.
- If nontidal, and surface water is present during at least part of the year, a higher score results from the average of 4 indicator groups: NRE1: the average of greater water level fluctuation and greater seasonal expansion of surface water area, as well as a smaller proportion of surface water that persists through the summer, and no recent abnormal drawdowns or floods. NRE2: the average of soil composition (organics being best), groundwater input is likely substantial, not a created wetland, and/or site is a bog. NRE3: the average of shorter outflow duration, narrower outlet, flatter gradient, larger proportion of surface water is in isolated pools at highest and/or lowest annual water levels, and the average of: greater surface throughflow complexity, greater interspersion of vegetation with water, greater width of vegetated areas, greater ground cover density, and greater microtopography. And NRE4: The average of ratings for: recent fire or hay removal, low likelihood of prolonged ice cover, no stressors that have recently made the site drier, less soil disturbance, convoluted upland edge, and presence of many upland inclusions.

Formula:
=IF((Tidal =1), NRE5
IF((NoOutlet=1), 1,
IF((NoWater=1),AVERAGE(SoilTex,Gradient,Gcover,UpEdgeShape,Inclus,Fire,Drier,SoilDisturb,Bog),
ELSE AVERAGE(NRE1,NRE2,NRE3,NRE4))))
where:
NRE5=(Constric,ThruFl,Girreg,Gcover,Gradient,VwidthAbs,UpEdgeShape,Inclus,Drier,SoilDisturb,ISOwet,ISOdry))
NRE1=(AVERAGE(Fluctu,SeasWpct,PermWpct,Interannual))
NRE2=(AVERAGE(SoilTex, NotCreated, Bog, Groundw))
NRE3=(AVERAGE(OutDura,Constric,Gradient, IsoWet,IsoDry,NRE3a))
where NRE3a=AVERAGE(ThruFlo,Interspers, Gcover,Girreg,VwidthAbs)
NRE4=AVERAGE(Fire,Freeze,Drier,SoilDisturb,UpEdgeShape,Inclus)

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was ±1.1 around a mean score of 5.3 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, function scores ranged from 2.85 to 10 (median= 5.33, mean= 6.22). The scores were correlated positively and significantly with Water Storage, Sediment Retention, Nitrate Removal, and Wetland Sensitivity. They correlated negatively with Thermoregulation, Amphibian Habitat, and Waterbird Feeding Habitat. They did not correlate significantly with scores for wetland Condition.

Potential for Future Validation: Among a series of wetlands spanning the function scoring range and a range of wetland condition (integrity), nitrate and ammonia could be measured simultaneously at wetland inlet and outlet, if any, and adjusted for any dilution occurring from groundwater or runoff (or concentration effects from evapotranspiration) over the intervening distance. Measurements should be made at least once monthly and more often during major runoff events (e.g., Detenbeck et al. 1995). Denitrification rates (at least potential), the nitrogen fixing rates of particular wetland plants, and nitrous oxide emissions should also be monitored.

VALUES MODEL

Structure: A wetland's value for the Nitrate Removal function is represented by the average of 5 factors: (1) greater anticipated long-term sustainability of the wetland, (2) headwater location (or proportionally small contributing area) and wetland is wide relative to adjoining waters, (3) greater proximity to excessive nitrate upstream or downstream (or downslope), or if no data, then the average of higher county rank for nitrate loading and more potential nutrient sources observed near the wetland, (4) the average of 5 indicators: more high-runoff surfaces upslope, less storage upslope, greater transport efficiency upslope, contributing area with limited natural vegetation, and sparse ground cover within 100 ft of the wetland, and (5) the average of 2 indicators: closer proximity to drinking water wells and aquifers with a special designation.

Formula:
(Sustain+
(AVERAGE(ShedPos,CApct,VegWidthRel))+
(AVERAGE(WQNdisUp,WQdisDown,Nrank,Nsource))+
(AVERAGE(Imperv,UpStore,Transport,CAnatPct,BuffVpct))+
(AVERAGE(Aquifer,GWrisk))) /5

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was ±0.4 around a mean score of 5.3 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, value scores for this function ranged from 2.03 to 7.09 (median= 4.97, mean= 4.88).

THERMOREGULATION (T)

Function Definition: The effectiveness of a wetland for maintaining or reducing summertime water temperature, and in some cases, for moderating winter water temperature.

Scientific Support for This Function in Wetlands Generally: Low to moderate. Most wetlands are areas of groundwater discharge, and ground water tends to be cooler than surface water, so wetlands have the potential to mediate wide daily and seasonal fluctuations in surface water temperature. However, wetlands are also wide flat areas with long water retention times, and the influence of those factors on surface water temperature can sometimes offset the influence of groundwater input.

FUNCTION MODEL

Structure: A score of "0" is assigned if the wetland is tidal, or if it lacks an outlet and is not lacustrine, or never contains surface water, or is fed by a hot spring. For all other sites the score is simply the average of four indicators, with higher scores implying the potential for greater summertime cooling: deeper water depth, greater shade, increased likelihood of significant groundwater input, and more water in channels than in isolated pools during the summer.

Formula:
=IF((Tidal=1),0,
IF((TMO1=TRUE),0,
IF((NoOutlet=1),0,
ELSE: AVERAGE(Depth,Gwater,Shade,ISOdry)
where:
TMO1= OR(AllDry=1,HotSpring=1)

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was <0.1 point around a mean score of 1.5 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, function scores ranged from 0 to 8.33. The overall low effectiveness of most Oregon wetlands for this function is implied by the strong down-skew of its median (= 0.89) and mean (= 1.54). The scores were correlated positively and significantly with those for Organic Export, Invertebrate Habitat, and Songbird-Mammal Habitat. They correlated negatively with those for Water Storage and the other 3 water quality functions.

Potential for Future Validation: Among a series of wetlands spanning the function scoring range and a range of wetland condition (integrity), water temperature could be measured continuously at wetland inlet and outlet, if any, using thermodata loggers (Dunham et al. 2005). Alternatively, when appropriate, ORWAP scores could be compared with results from more deterministic models such as Shade-o-Lator (Boyd & Kasper 2003).

VALUES MODEL

Structure: The site's thermoregulation function is considered more valuable if the wetland has longer duration outflow, is part of a watershed supporting anadromous fish (ESH) especially a priority watershed, if streams in the vicinity are highly dependent on cooling from groundwater, and if there are known violations of water temperature standards immediately upslope or downslope from the site.

Formula
AVERAGE(OutDur7,WQprobDisUp,WQprobDisDown,AnadHUC, AnadPrio,GWval)

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was ±0.9 around a mean score of 1.9 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, value scores covered the full range of 0 to 10 but were skewed low (median= 1.67, mean= 2.83).

CARBON SEQUESTRATION (CS)

Function Definition: The effectiveness of a wetland both for retaining incoming particulate and dissolved carbon, and through the photosynthetic process, converting carbon dioxide gas to organic matter (particulate or dissolved). And to then retain that organic matter on a net annual basis for long periods *while emitting little or no methane* (a potent "greenhouse gas"). Note that most published definitions of Carbon Sequestration do not include the important limitation on methane emission.

Scientific Support for This Function in Wetlands Generally: Although many wetlands support exceptionally high rates of primary productivity, many other factors determine whether a wetland is a net source or sink for carbon. Artificial disturbances or extreme events, such as increased frequency of drought or increased water levels (e.g., from global warming, tsunamis, artificial drainage), can quickly reverse gains in the amount of carbon sequestered in a wetland. Moreover, some of the most productive non-tidal wetlands also tend to be among the most significant emitters of methane, a potent greenhouse gas.

FUNCTION MODEL

Structure:

- If a site is tidal, the score is higher if salinity is high or (if salinity data are lacking) is located low in the estuary. Of equal importance is a high average score for all the following: regularly flooded by tide, natural outlet, varied microtoporgraphy, complex channel network, vegetated fringe is wide, and groundwater seeps are present.
- If a site is nontidal and always lacks surface water, then its score increases with two factors. One (CSQ1) is the average of several indicators of plant productivity: long growing season (no long-duration ice cover), dense ground cover, organic soils, the site is not a bog, and woody vegetation is relatively extensive and mature. The other (CSQ2) is the average of several disturbance factors, with the function's score decreasing with increased soil disturbance, artificial drainage or recent severe drought or flood, recent fire or removal of hay, and/or persistent grazing or mowing.
- If a site is nontidal and inundated at least seasonally, its score is the average of three groups which then is combined with a fourth (presumably more important) group. Of the three groups, two (CSQ1 and CSQ2) are the same as described above and the third (CSQ3) partly addresses the potential for less-extensive anaerobic conditions in the wetland, being the average of longer-duration outflow, presence of a natural outlet, little or no water confined to isolated pools during either wet or dry seasons, greater microtopographic variation, relatively wide vegetated area, and increased groundwater input. The average of these three groups is then combined with CSQ4, which has a higher score if most of the site is inudated only seasonally, water level fluctuations are moderate, depth is mostly shallow, gradient is flat, and/or soils are clay. All of this is discounted using a multiplier of 0.5 because limited evidence suggests nontidal wetlands may be much stronger emitters of methane than are tidal wetlands.

Formula:
IF((Tidal=1),(AVERAGE(Salin,EstuPos) + (CSQ3)) /2,
IF((AllDry=1),CSQ1,
ELSE (0.5*(CSQ4 + (AVERAGE (CSQ1,CSQ3)) /2))
where:

CSQ1=
AVERAGE(SoilTex,Bog,Freeze,WoodPct,Treeform,Gcover,SoilDisturb,Drier,Fire,HistDry,Deveg)
CSQ3 =AVERAGE(OutDur,Constric,ISOwet,ISOdry,Girreg,ThruFlow,VwidthRel,VwidthAbs,Groundw)
CSQ4 =AVERAGE(SeasWpct,PermWpct,Flucs,Depth,Gradient,Playa)

Potential for Future Validation: Among a series of wetlands spanning the function scoring range and a range of wetland condition (integrity), particulate and dissolved organic carbon would need to be measured regularly at wetland inlet and outlet, if any, along with measurements of changes in water volume. Equally important, emissions of methane and carbon dioxide would need to be measured regularly throughout the year and throughout the day/night cycle. Plant productivity rates (especially belowground), hydrology, and carbon accumulation in sediments or soils would require measurement as well. Results might be extrapolated to a broader range of conditions using existing site-scale models that require such detailed data (e.g., Frolking et al. 2002, St. Hilaire et al. 2008).

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was ±0.5 around a mean score of 2.1 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, scores ranged from .80 to 7.19 (median= 2.37, mean= 2.53). The scores correlated positively and significantly with those for Anadromous Fish Habitat, Pollinator Habitat, and Plant Diversity. They correlated negatively with Water Storage, Sediment Retention, and Amphibian-Turtle Habitat. They did not correlate significantly with scores for wetland Condition.

VALUES MODEL: No model is provided because this function's values are diffused throughout the planet.

ORGANIC MATTER EXPORT (OE)

Function Definition: The effectiveness of a wetland for producing and subsequently exporting organic matter, either particulate or dissolved.

Scientific Support for This Function in Wetlands Generally: Moderate-High. Wetlands which have outlets are potentially major exporters of organic matter to downstream waters. That is partly because many wetlands support exceptionally high rates of primary productivity. Numerous studies have shown that watersheds with a larger proportion of wetlands tend to export more dissolved and/or particulate carbon that is important to downstream food webs, compared with watersheds that have few wetlands. Value to food webs depends partly on the quality and timing of the exported carbon.

FUNCTION MODEL

Structure:

- If the site is tidal, the score is higher if outflow from the site occurs daily, the channel outlet is natural, the site is topographically flat, and two groups of indicators have high scores. One group is represented by the average of more-complex flow paths through vegetation, high interspersion of water and vegetation, high proportion of low marsh, minimal extent of isolated pools at low and high tide, and a relatively narrow vegetated area. The other group is the average of denser ground cover, lower salinity, and little or no microtopographic variation.
- For nontidal sites, this function scores "0" if the site has no outlet or if it never is inundated.
- For nontidal sites that are inundated permanently or seasonally, organic matter export is assumed greater as outflow duration increases, the outlet is natural (and thus presumably wider), site gradient is not flat, water is shallow, and the score of two indictor groups is high. One group (OMX3) reflects larger water level fluctuation, larger seasonal expansion of inundated areas, severe water level changes every few years, only limited confinement of water in onsite pools during wet and dry seasons, a narrow vegetated area, and larger

throughflow complexity. The other group (OMX4) reflects denser ground cover, no persistent grazing or mowing, extensive cover of nitrogen-fixing plants, no recent fire or soil disturbance or removal of vegetation, longer growing season, and not a bog or on non-hydric soil.

Formula:
=IF((Tidal =1),AVERAGE(OutDura,Constric,Gradient, OMX1, OMX2))
IF((NoOutlet=1), 0,
IF((AllDry=1), 0,
AVERAGE(OutDura,Constric, Gradient,Depth,OMX3,OMX4)
where:
OMX1=AVERAGE(ISOwet,ISOdry, LoMarsh, Interspers,ThruFlo,VwidthAbs,VwidthRel)
OMX2=AVERAGE(Gcover,Girreg,Salin)
OMX3=AVERAGE(Fluctu,SeasWpct,Interann,ISOwet,ISOdry,Interspers,Girreg,ThruFlo,VwidthAbs, VwidthRel)
OMX4=AVERAGE(Deveg,Gcover,Nfixer,FireHay,Vremove,SoilDisturb,Freeze,Bog,NonHydric)

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was ±1.3 around a mean score of 4.3 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, scores ranged from 0 to 8.60 (median= 5.81, mean= 4.72). The scores were correlated positively and significantly with those for Thermoregulation, Anadromous and Resident Fish Habitat, Songbird-Mammal Habitat, and Pollinator Habitat. They correlated negatively with Water Storage, Sediment Retention, Phosphorus Retention, Nitrate Removal, and wetland Sensitivity. They did not correlate significantly with scores for wetland Condition.

Potential for Future Validation: Among a series of wetlands spanning the function scoring range and a range of wetland condition (integrity), particulate and dissolved organic carbon would need to be measured regularly at wetland inlet and outlet, if any, along with measurements of changes in water volume and flow rate.

VALUES MODEL: No model is provided because this function's values are diffused throughout all receiving water bodies.

AQUATIC INVERTEBRATE HABITAT (INV)

Function Definition: The capacity to support an abundance and diversity of marine and freshwater invertebrate animals which spend all or part of their life cycle underwater or in moist soil. Includes dragonflies, midges, crabs, clams, snails, crayfish, water beetles, shrimp, aquatic worms, and others. See worksheet *WetInverts* in the *ORWAP_SuppInfo* file for list of freshwater aquatic invertebrates known or likely to occur in Oregon wetlands. The model described below will not predict habitat suitability accurately for every species.

Scientific Support for This Function in Wetlands Generally: High. All wetlands support invertebrates, and many wetlands support aquatic invertebrate species not typically found in streams, thus diversifying the local fauna. Densities of aquatic invertebrates can be exceptionally high in some wetlands, partly due to high primary productivity and partly because submerged vegetation provides additional structure (vertical habitat space).

FUNCTION MODEL

Structure:
- If the site is tidal, a higher score results from the site having proportionally more area as low marsh, pools that are isolated at low or high tide (but some channels as well), no exotic invertebrates, complex throughflow patterns, greater microtopographic variation, more extensive downed wood, greater cover of submerged aquatic vegetation (e.g., eelgrass), and little or no fish access.
- For nontidal sites that never contain surface water, the score is the average of three indicator groups. The first group (INV6) is the average of several indicators: greater microtopography, more vegetation height variation, more woody vegetation forms, more downed wood, more cover of nitrogen-fixing plants, denser ground cover, and little or no persistent grazing or mowing. The second group (INV7) reflects a larger proportion of the

contributing upland and surrounding buffer that is comprised of natural land cover. The third group (INV8) averages three stressors: potential for contaminants, potential for excessive sediment inputs, and soil disturbance.

- For nontidal sites that do contain surface water, the same three groups (INV6,7,8) are used again, and in addition four new groups which are considered favorable to aquatic invertebrates are included in the average:
  - INV2: intermediate extent of persistent surface water, presence of seeps or springs, moderate water level fluctuations, unaltered timing of water inputs, and occurrence of occasional drought or flood that maintains wetland productivity.
  - INV3: multiple depth classes, shallower water depths, large interspersion of vegetation and water, complex throughflow patterns, and numerous pools (but also some flowing water) during both wetter and drier times of the year.
  - INV5: wetland is a playa or alkaline lake, or is a wetland that lacks exotic invasive invertebrates and has less risk of those being introduced.

Formula:
IF((Tidal =1), (AVERAGE(LoMarsh,IsoWet,IsoDry,AqPest,ThruFlo,Girreg,WoodDown,ABpct,Access)),
IF((AllDry=1), INV1,
ELSE AVERAGE(INV2,INV3,INV4,INV5,INV6,INV7,INV8)
where:
INV1= AVERAGE(INV6,INV7,INV8)
INV2= AVERAGE(PermWpct,SeasPct, GroundW,Fluctu,AltTime, Interann))
INV3= AVERAGE(DepthEven,Depth,Interspers,ThruFlo,IsoWet,IsoDry)
INV5= AVERAGE(Playa,AqPest,Exoticmivs,Access)
INV6= AVERAGE(Girreg,VegGaps,TreeVar,WoodDown,Nfixers,Gcover,Deveg, Abpct,EmPct)
INV7= AVERAGE(NatVegPctCU,CUBuffPctNat)
INV8= AVERAGE(NutrIn,SedIn,SoilDisturb)

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was ±0.5 around a mean score of 4.3 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, scores ranged from 1.39 to 7.79, and had a mild low-end skew (median= 5.21, mean= 5.06). The scores were correlated positively and significantly with those for Thermoregulation and habitat for Amphibians, Waterbird Feeding, Waterbird Nesting, Songbirds & Mammals Habitat, and Pollinators. They also correlated significantly with scores for wetland Condition. They correlated negatively with Phosphorus Retention and Anadromous Fish Habitat.

Potential for Future Validation: Among a series of wetlands spanning the function scoring range and a range of wetland condition (integrity), the aquatic invertebrate richness, density, and (ideally) productivity would need to be measured regularly throughout the year. An EPA-funded effort with some of those components is currently underway in the Willamette Valley.

VALUES MODEL

Structure: This function is presumably valued to a greater degree if the site (1) contains an especially rare aquatic invertebrate, or (2) scored high as habitat for fish, amphibians, or birds, (3) is not dependent on artificial features to sustain it as a wetland or if it is, it's in the drier part of the state.

Formula: MAX(rare8,AVERAGE(pcp8,sustain8),
MAX(AnadFish,ResFish,Amphib,WbirdF,WbirdNest,SongbMam))

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was ±0.6 around a mean score of 7.6 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, value scores for this function ranged from 1.75 to 10, and had a strong high-end skew (median= 7.00, mean= 7.14).

FISH HABITAT - ANADROMOUS (FA)

Function Definition: The capacity to support an abundance of native anadromous fish (chiefly salmonids) for functions other than spawning. See worksheet *WetVerts* in the *ORWAP_SuppInfo* file for list of the species. The model described below will not predict habitat suitability accurately for every species, nor is it intended to assess the ability to restore fish access to a currently inaccessible wetland.

Scientific Support for This Function in Wetlands Generally: Moderate-high, depending mainly on accessibility of a wetland to anadromous fish. Many accessible wetlands provide rich feeding opportunities, shelter from predators, and thermal refuge (especially if groundwater is a significant water source).

FUNCTION MODEL

Structure:
A score of "0" is assigned if the site never contains surface water, or anadromous fish do not occur in the watershed, or cannot access any part of the site, or the site is an alkaline playa, salt flat, or hot spring.

- If the site is tidal, the score increases primarily in response to increased fish access to the wetland (FHA5) as determined by greater extent of low marsh, fewer pools isolated during high tide, greater channel network complexity, higher interspersion of water and vegetation at mid-tide, and greater water depth. The score increases equally in response to FHA4, which reflects a higher average of two groups:
  (1) the average of: increasing amounts of partly-submerged woody debris, greater extent of aquatic bed plant cover (mainly eelgrass), more extensive undercut banks, and connectivity with nontidal wetlands; and
  (2) the extent of natural land cover (especially that devoid of impervious surfaces) in the contributing upland (especially the part closest to the site).
- If the site is not tidal but surface water is sometimes present, the score increases in response to FHA5, which is the percent of the site that fish can access (FHA5) as described above, as well as actual or potential lack of non-native fish, and the average of two indicator groups: (1) increasing shade or higher likelihood of groundwater input (FHA6), and (2) FHA2 which itself is the average of four indicator groups: (a) extent of seasonal expansion of inundated areas and duration of outlet flow, (b) high interspersion or complex water flow paths, undercut banks, (c) greater extent of natural land cover (especially that devoid of impervious surfaces) in the contributing upland (especially the part closest to the site), and (d) no water quality violations immediately upstream or downstream of the site, and low risk of excessive sediment inputs and contaminants.

Formula:
IF((FHA1=TRUE),0,
IF((Tidal=1), AVERAGE(FHA5,FHA4)
ELSE AVERAGE [FHA5 + MAX(NNfish,PestFish) + AVERAGE(FHA6, FHA2)] / 3
where:

FHA1= OR((AfishShed=0), (AfishAccess=0), (AllDry=1),(Playa=1),(Hotspring=1))
FHA2= AVERAGE4: MAX(SeasWpct,OutDura), AVERAGE(WoodAbove,Undercut,NoScum), AVERAGE(NatVegCUpct,BuffCUnatPct,BuffLU), AVERAGE(NutrIn,SedIn,WQupDis,WQdownDis)
FHA4= [AVERAGE(WoodAbove,ABpct,Undercut,NtidalProx,FHA3) + AVERAGE(NatVegCUpct,BuffCUnatPct,BuffLU)] /2
FHA5= AVERAGE(LowMarsh,ISOwet,ThruFlo,Interspers,Depth)
FHA6= MAX(GroundW,Shade)

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was <0.1 point around a mean score of 0 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, scores ranged from 0 to 7.34 with a very strong skew towards the lower end of the scale (median= 0, mean= 1.07). The scores were correlated positively and significantly with those for Resident Fish Habitat, Carbon Sequestration, Organic Export, and Waterbird Feeding Habitat. They correlated negatively with Water Storage, Sediment Retention, Phosphorus Retention,and Invertebrate Habitat. They did not correlate significantly with scores for wetland Condition.

Potential for Future Validation: Among a series of wetlands spanning the function scoring range and a range of wetland condition (integrity), the number of anadromous fish and their duration of use would need to be measured regularly throughout the times when usually expected to be present, and weight gain during the period of wetland habitation should be measured (for techniques see Johnson et al. 2007, Lestelle et al. 1996, Scheuerell et al. 2006).

VALUES MODEL

Structure: This function is presumably valued to a greater degree if the site (1) is in a priority watershed for anadromous fish, or (2) scored high as habitat for feeding waterbirds.

Formula: MAX(priority watershed, feeding waterbird score)

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was ±0.5 around a mean score of 4.1 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, value scores for this function ranged from 0 to 10 (median= 5.17, mean= 6.01).

FISH HABITAT - NON-ANADROMOUS (FR)

Function Definition: The capacity to support an abundance and diversity of *native* non-anadromous fish (both resident and visiting species). See worksheet *WetVerts* in the *ORWAP_SuppInfo* file for list of the species. The model described below will not predict habitat suitability accurately for every species, nor is it intended to assess the ability to restore fish access to a currently inaccessible wetland.

Scientific Support for This Function in Wetlands Generally: High. Many accessible wetlands provide rich feeding opportunities, shelter from predators, and thermal refuge (especially if groundwater is a significant water source). Even isolated (inaccessible) wetlands are important to some fish species, such as Oregon chub.

FUNCTION MODEL

Structure:
- A score of "0" is assigned if the site is an alkaline playa, or if it lacks an outlet and surface water does not persist year-round.
- If the site is tidal, the score increases in response to increases in two groups of factors. One group (FHR2) reflects increased fish access with greater extent of low marsh, fewer pools isolated at high and low tide, persistent tidal connection, natural exit channel, higher interspersion of vegetation and water at mid-tide, and large complexity of water flow paths. The other group (FHR3) increases with increasing extent of undercut banks, more abovewater wood, extensive aquatic bed plant cover (e.g., eelgrass), greater depth at high tide, and connectivity with an adjoining nontidal wetland.
- If the site is not tidal but surface water is present at least seasonally, the score increases equally in response to the actual or potential presence of non-native fish, and the average of three indicator groups: (1) access as defined by FHR2 and described above, (2) the average of increasing extent of undercut banks, more abovewater wood, extensive aquatic bed plant cover, no long-duration ice cover, and/or site is a fringe wetland; and (3) normal seasonal timing of inundation, greater water depth, more even distribution of depth classes, and greater extent of natural land cover in the contributing upland.

Function Model Formula:
IF((FHR1=TRUE),0
IF((Tidal=1), AVERAGE(FHR2,FHR3)
ELSE: [MAX(PestFish,NNfish) + (AVERAGE(FHR2,FHR4,FHR5)] /2
where:
FHR1=OR [((Playa=1), (AND((NoOutlet=1), (NoPermW=1)]
FHR2=AVERAGE(AccessFR,LowMarsh,ISOwet,ISOdry,OutDura,Constric,Interspers,ThruFlo)
FHR3=AVERAGE(Undercut,WoodAbove,ABpct,Depth)

FHR4=AVERAGE(Undercut,WoodAbove,ABpct,Fringe,Freeze)
FHR5=AVERAGE(SeasTiming,Depth,DepthEven,NatVegCUpct)

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was ±0.8 around a mean score of 2.1 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, scores ranged from 0 to 7.96 with a strong low-end skew (median= 2.91, mean= 2.99). The scores were correlated positively and significantly with those for Anadromous Fish Habitat, Organic Export, and habitat for Amphibians, Waterbird Nesting, and Pollinators. They correlated negatively with Water Storage, Phosphorus Retention, and wetland Sensitivity. They did not correlate significantly with scores for wetland Condition.

Potential for Future Validation: Among a series of wetlands spanning the function scoring range and a range of wetland condition (integrity), the number of native non-anadromous fish and their onsite productivity and diversity would need to be measured regularly. For visiting species, the duration of use and weight gain throughout the times when usually expected to be present should be determined.

VALUES MODEL

Structure: This function is presumably valued to a greater degree if the site (1) is known to support a rare non-anadromous fish, (2) scored high as habitat for feeding waterbirds and/or recreational fishing is known to occur.

Formula: MAX [raresp, (AVERAGE(feeding waterbird score, fishing)]

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was <0.1 point around a mean score of 5.9 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, scores ranged from 1.47 to 10 (median= 6.67, mean= 6.07).

AMPHIBIAN AND REPTILE HABITAT (AM)

Function Definition: The capacity of a wetland to support an abundance and diversity of native amphibians and native wetland-dependent reptiles. See worksheet *WetVerts* in the *ORWAP_SuppInfo* file for list of the species.. The model described below will not predict habitat suitability accurately for **every** species.

Scientific Support for This Function in Wetlands Generally: High. Many frog and turtle species in Oregon occur almost exclusively in wetlands. Densities of amphibians can be exceptionally high in some wetlands, partly due to high productivity of algae and invertebrates, and partly because submerged vegetation provides shelter and sites for egg-laying.

FUNCTION MODEL

Structure:

- A score of “0” is assigned if the site is tidal or is an alkaline or saline playa (AMT7).
- If the site never has surface water, its score is increased in response to the average of 5 indicator groups:
  AMT1 which is the average of greater microtopography, more woody vegetation forms, more height variation in vegetation, more downed wood, more ground cover, more extensive area of gentle shore slopes, more upland inclusions, and lack of persistent grazing or mowing; and
  AMT2 which means the site is situated in a landscape with a large proportional coverage of natural vegetation, including some nearby and of large patch size; and
  AMT3 which means the site is situated in a landscape with a large proportional coverage of ponds and wetlands, including some large ones located nearby; and/or its HUC6 watershed has a relatively high concentration or diversity of wetlands
  AMT4 which means the site is situated in a landscape with a large proportional coverage of forest cover, including some large tracts located nearby; and

AMT6 which is the average of two groups, one being the combination of greater distance to busy roads and the wetland not being surrounded completely by roads. The other is infrequent visitation by humans, lack of contaminants immediately upstream or downstream, and minimal soil disturbance.

- For sites that do have surface water at least ephemerally, the score increases in response to the same indicator groups, and also the 2 groups:
  AMT8 which is the maximum of less access by fish, apparent absence of bullfrogs and nonnative fish, and lower risk of nonnative fish being introduced; and
  AMT5 which is the average of three groups: (a) the average of high interspersion of vegetation and water, extensive isolation of surface water in pools, moderately extensive areas of persistent water, and large cover of submerged aquatic vegetation, and (b) more abovewater wood, islands (for basking sites), more extensive undercut banks, and flatter gradient), and (c) minimal water level fluctuations and high likelihood of significant groundwater sources being present.

Function Model Formula:
IF((AMT7=TRUE), 0,
IF((AllDry=1), (AVERAGE(AMT1, AMT2,AMT3,AMT4,AMT6)),
ELSE: ((AVERAGE(AMT2,3,4) + AMT8 + (AVERAGE(AMT1,AMT5,AMT6)) / 3)
where:

AMT1=AVERAGE(Girreg,TreeVar,VegGap,WoodDown,Gcover,ShoreSlope,Inclus,Deveg)
AMT2=AVERAGE(NatVegPct,NatVegSize,NatVegProx,BuffLU)
AMT3=AVERAGE(PondPctScape,PondProx,HUCbest)
AMT4=AVERAGE(ForestPctScape,ForestSize,ForestProx)
AMT5=(AVERAGE ((AVERAGE(ISOwet,ISOdry,Interspers,PermWpct,SeasWpct,SeasTime,ABpct)), (AVERAGE(WoodAbove,Islands,Undercut,Gradient)), (AVERAGE(GroundW,Fluctu))
AMT6= AVERAGE(RoadCirc,RoadDist) + AVERAGE(Core1,Core2,WQupDis, Toxic, SoilDisturb) /2
AMT7= OR((Tidal=1), (Playa=1))
AMT8= MAX(Access, Nnativ,PestFish)

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was ±0.7 around a mean score of 3.6 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, scores ranged from 0 to 8.53 (median= 4.30, mean= 4.23). T he scores were correlated positively and significantly with those for habitat of Invertebrates, Resident Fish, Waterbird Feeding, Waterbird Nesting, Songbirds-Mammals, and Pollinators. They correlated negatively with Phosphorus Retention and Nitrate Removal. They did not correlate significantly with scores for wetland Condition.

Potential for Future Validation: Among a series of wetlands spanning the function scoring range and a range of wetland condition (integrity), amphibian and reptile species richness, density, and (ideally) productivity and survival would need to be measured during multiple years and seasons by comprehensively surveying (as applicable) the eggs, tadpoles, and adults.

VALUES MODEL

Structure: This function is presumably valued to a greater degree if the site (1) is known to support a rare amphibian or reptile species, or (2) has a high score for the average of vegetation patch form uniqueness, dry region, and wetland independence from artifical water sources and structures.

Formula: MAX [Rare,AVERAGE(UniqPatch,Precip,Sustain)]

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was <0.1 point around a mean score of 5.1 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, scores ranged from 1.33 to 10 (median= 6.67, mean= 6.51).

WATERBIRD HABITAT - FEEDING (WBF)

Function Definition: The capacity to support an abundance and diversity of feeding waterbirds, primarily outside of the usual nesting season. See worksheet *WetVerts* in the *ORWAP_SuppInfo* file for list of the species. The model described below will not predict habitat suitability accurately for every species in this group.

Scientific Support for This Function in Wetlands Generally: High. Dozens of waterbird species occur almost exclusively in wetlands during migration and winter. Densities can be exceptionally high in some wetlands, partly due to high productivity of vegetation and invertebrates, and partly wetland vegetation provides shelter in close proximity to preferred foods.

FUNCTION MODEL

Structure:

- A score of "0" is assigned if the site has a gradient (inlet to outlet) of more than 10%.
- If the site is tidal, the score increases in response to the average of three indicator groups: (1) the average of increasing extent of low marsh, greater complexity of water flow paths, greater isolation of surface water in pools at high tide, greater interspersion of vegetation and water, and greater connectivity with nearby nontidal wetlands, (2) greater proportion of surrounding upland that is openland and ponds, closer proximity to the nearest pond or patch of openland, and proximity to a large nontidal body of water (WBF3), and (3) greater diversity of vegetation heights, greater accessibility to fish, presence of favored waterfowl food plants, greater percent of open water containing submerged aquatic vegetation, and larger extent of mudflats.
- If the site is nontidal and is never inundated, the score reflects only the surrounding landscape conditions, increasing with increasing wetland size and the proportion and proximity of openland, ponds, and nontidal wetlands (WBF3 and WBF6).
- For all other wetlands, the score is the average of five indicator groups:
  WBF2: flatter wetland gradient, larger complexity of throughflow patterns, greater interspersion of vegetation and water, more isolation of surface water in pools during the wet season, and history of a nearly complete water level drawdown in the past few years; and
  WBF3: the average of greater proportion of surrounding upland that is openland and ponds, closer proximity to the nearest pond or patch of openland, and proximity to a large nontidal body of water ; and
  WBF4: the average of large proportional area that is seasonally inundated only, less that is permanently inundated, and extensive mudflat or other shorebird habitat; and
  WBF7: the average of more extensive cover of aquatic bed vegetation, emergent vegetation, mudflats, more persistent water, presence of favored waterfowl food plants, limited haying or occasional fire, and/or the site is a playa; and
  WBF8: the average of greater relative isolation from frequent visitors, no contaminants reported in nearby areas upstream or downstream of the wetland, less ice cover, intermediate water depths, equal distribution of depth categories, and greater accessibility to fish.

Formula:
IF((TooSteep=1),0,
IF((Tidal =1), AVERAGE((AVERAGE(LowMarsh, ISOwet,Interspers,ThruFlo,NtidalJux)),WBF3,
(AVERAGE(HtDiv,FishAcc,DuckFood,ABpct,Mudflat))),
IF((AllDry=1), (WBF3 + WBF6)/2,
ELSE AVERAGE(WBF2,WBF3,WBF4,WBF7,WBF8))))
where:

WBF2=AVERAGE(Gradient,Interspers,ThruFlo,ISOwet,HistDry)
WBF3=AVERAGE(PondPctScape,PondProx,BigPondProx,TidalProx)
WBF4= AVERAGE(SeasWpct, PermWpct, Mudflat)
WBF6= AVERAGE(Size,HUCdiv,OpenPctScape,OpenScapeProx)
WBF7=AVERAGE(HtDiv,DuckFood, FireHay,ABpct,Mudflat,EmPct, Playa,PermPctAll)
WBF8=AVERAGE(Core1,Core2,WQupDis,WQdownDis,Freeze,Depth,DepthEven,FishAcc)

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was ±0.5 around a mean score of 4.1 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, scores ranged from 0 to 8.69 (median= 4.72, mean= 4.79). The scores were correlated positively and significantly with those for Water Storage, Sediment Retention, Phosphorus Retention, and habitat for Waterbird Nesting, Invertebrates, Amphibians, Anadromous Fish, and Songbirds-Mammals. They correlated negatively only with Nitrate Removal. They did not correlate significantly with scores for wetland Condition.

Potential for Future Validation: Among a series of wetlands spanning the function scoring range and a range of wetland condition (integrity), feeding waterbird species richness and density would need to be determined monthly and more often during migration (see USEPA 2001 for methods). Ideally, daily duration of use and seasonal weight gain should be measured.

VALUES MODEL

Structure: This function is presumably valued to a greater degree if the site (1) is known to support a rare waterbird species outside of the nesting season, or (2) has been officially designated as an Important Bird Area (IBA), or is in western Oregon and is independent of artifical water sources and structures, or is in drier parts of eastern Oregon.

Formula: MAX(Rare,IBA,AVERAGE(Precip,Sustain))

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was <0.1 around a mean score of 5.0 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, scores ranged from 1.33 to 10 (median= 5.33, mean= 6.02). The scores were correlated positively and significantly with those of several other values: xx, xx.

WATERBIRD HABITAT - BREEDING (WBN)

Function Definition: The capacity to support an abundance and diversity of nesting waterbirds. See worksheet *WetVerts* in the *ORWAP_SuppInfo* file for list of the species. The model described below will not predict habitat suitability accurately for every species in this group.

Scientific Support for This Function in Wetlands Generally: High. Dozens of waterbird species nest almost exclusively in wetlands. Breeding densities can be exceptionally high in some wetlands, partly due to high productivity of vegetation and invertebrates, and partly because wetland vegetation provides nest sites in close proximity to preferred foods.

FUNCTION MODEL

Structure:

- If the wetland is tidal, a score of "0" is assigned (Oregon tidal wetlands do not generally provide nesting habitat for waterbirds)
- A score of 0 is also assigned if the site has a gradient (inlet to outlet) of more than 10%, or if it never contains surface water, or if it is has less than 0.25 acre of surface water and is not a fringe wetland or near a much larger water body.
- For all other wetlands, the average of seven indicator groups together generates higher scores for this function:
    - increasing percent-cover of herbaceous vegetation,
    - increasing extent of persistent water,
    - the average of: lacustrine location, high diversity or proportional extent of wetlands in watershed
    - WBN6: the average of higher interspersion of vegetation and water, presence of islands suitable for nesting, greater complexity of internal channels, larger proportion of surface water in isolated pools, and water level drawdown having occurred in last few years,

- WBN4: the average of: large wetland size, close proximity to another wetland or a large lake, and great number and proportional extent of wetlands within 2 miles,
- WBN7: the average of: optimal depths, greater equality of proportions of depth categories, minimal water level fluctuation during critical periods, and low gradient
- the average of two groups:
  - WBN5: the average of: infrequent visitation by people and pets, no known contaminants in upstream or downstream areas nearby, distant from busy roads, no recent fire or removal of hay
  - WBN8: the average of greater height diversity within the dominant vegetation layer, greater wetland width (if a fringe wetland), more snags, and presence of food plants favored by waterfowl.

Formula:
=IF((Tidal =1),0,
IF((WBN1=TRUE),0,
ELSE (EmPct + PermWpct + AVERAGE(HUCdiv,Lacust) +WBN6 + WBN4 + WBN7+ (AVERAGE(WBN5, WBN8)) /7))
where:

WBN1 =OR((Steep=1),WBN2)
WBN2 =AND((MinSize=0),(LakeNear=0),(Lacust=0))
WBN3=AVERAGE(NatVegTractSize, BuffLUtype, BuffNatPct, Deveg)
WBN4 =AVERAGE(PondScapePct, PondProx,LakeProx, Size)
WBN5=AVERAGE(Core1,Core2,WQupDis,WQdownDis,RdDis,FireHay)
WBN6=AVERAGE(Interspers,Islands,ThruFlo,ISOdry,HistDry)
WBN7=AVERAGE(Depth,DepthEven,Fluctu, Gradient)
WBN8=AVERAGE(HtDiv,VwidthAbs,Snags,DuckFood)

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was <0.1 point around a mean score of 1.1 on a scale of 0-10 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, scores ranged from 0 to only 8.25 with a very strong skew towards the lower end of the scale (median= 0, mean= 2.45). The scores were correlated positively and significantly with those for Sediment Retention and habitat for Waterbird Feeding, Invertebrates, Amphibians, Resident Fish, and Songbirds-Mammals. They did not correlate negatively with any function or with wetland Condition.

Potential for Future Validation: Among a series of wetlands spanning the function scoring range and a range of wetland condition (integrity), nesting waterbird species richness and density would need to be determined during the usual breeding period -- approximately April through July (see USEPA 2001 for methods). Ideally, nest success and juvenile survival rates should be measured.

VALUES MODEL

Structure:
This function is presumably valued to a greater degree if the site (1) is known to support nesting by a rare waterbird species, or (2) has been officially designated as an Important Bird Area (IBA), or is in western Oregon and is independent of artifical water sources and structures, or is in drier parts of eastern Oregon.

Formula: MAX(Rare,IBA,AVERAGE(Precip,Sustain))

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was <0.1 point around a mean score of 4.1 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, scores ranged from 1.00 to 10 (median= 4.00, mean= 4.72).

SONGBIRD, RAPTOR, AND MAMMAL HABITAT (SBM)

Function Definition: The capacity to support an abundance and diversity of songbirds, raptors, and mammals, especially species that are most dependent on wetlands or water. See worksheet *WetVerts* in the *ORWAP_SuppInfo* file for list of the species. The model described below will not predict habitat suitability accurately for every species in this group.

Scientific Support for This Function in Wetlands Generally: High. Dozens of songbirds, raptors, and mammals depend almost exclusively in wetlands. Densities can be exceptionally high in some wetlands, partly due to high productivity of vegetation and invertebrates, and partly because wetland vegetation provides nest sites in close proximity to preferred foods.

FUNCTION MODEL

Structure:

- A score of "0" is assigned if the site is entirely a low tidal marsh or nearly all of it remains inundated year-round
- If the site is tidal and is not entirely low marsh, it scores higher if it has more high marsh, downed wood, diverse vegetation heights, adjoins uplands that have extensive natural vegetation, and/or is contiguous to a nontidal wetland.
- For all other wetlands, the score increases as the average of five indicator groups increases:
  SBM1: the average of denser ground cover, greater microtopography, more convoluted upland edge, more upland inclusions, greater diversity of vegetation heights within the dominant layer, near potential nesting structures, near cliffs or steep banks or signs of beaver use; and
  SBM2: average of:greater proportional extent of surrounding land cover that is natural, closer proximity to natural land cover, connectivity to a large patch of natural land cover; and
  SBM3: average of:greater proportional extent of surrounding land cover that is forest or shrubland, closer proximity to the woody vegetation, greater connectivity to a large forested patch, more extensive woody cover within the site or along its edge, minimal fragmentation of woody cover within the site, greater variety of tree size classes, more downed wood, and/or more partly-submerged wood; and
  SM4= average of: greater proportional extent of surrounding land cover that is wetland, and/or closer proximity to other wetlands; and
  SM5= average of: little or no persistent grazing or mowing, infrequent visitation by people and pets, not completely surrounded by roads, not near busy roads.

Formula:
=IF((LowMarshAll=1),0,
IF((Tidal=1),AVERAGE(LowMarshPct,WoodDown,VegGap,CUbuffNatPct,NtidalJux),
IF((PermWaterAll=1),0,
ELSE: AVERAGE(SM1,SM2,SM3,SM4,SM5)
where:

SM1=AVERAGE(VegGap,Gcover,Cliffs,Struc,Girreg,UpEdge,Inclus)
SM2=AVERAGE(NatVegPctScape,NatVegSize,NatVegProx,ScapeLU, CUbuffNatPct)) + ()) /2
SM3=AVERAGE(ForestPctScape,ForestSize,ForestProx) + (AVERAGE(WoodyPct,WoodyEdge, TreeTypes,WoodDown,WoodAbove) /2
SM4= AVERAGE(PondPctScape,PondProx
SM5=AVERAGE(Deveg,Corea,Coreb,DisRd,RdBox)

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was ±0.4 around a mean score of 2.9 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, scores ranged from 0 to 9.5 (median= 4.54, mean= 4.45). The scores were correlated positively and significantly with those for Thermoregulation, Organic Export, Plant Diversity, and habitat for Invertebrates, Amphibians, Waterbird Nesting, Waterbird Feeding, Pollinators, and wetland Condition. They correlated negatively with Sediment Retention and Phosphorus Retention.

Potential for Future Validation: Among a series of wetlands spanning the function scoring range and a range of wetland condition (integrity), species richness and density of songbirds, raptors, and mammals would need to be determined monthly and more often during migration or seasonal movements (see USEPA 2001 for methods). Ideally, daily duration of use and seasonal weight gain of key species should be measured.

VALUES MODEL

Structure: This function is presumably valued to a greater degree if the site (1) is known to support a rare songbird, raptor, or mammal species, or (2) has been officially designated as an Important Bird Area (IBA), or is in western Oregon and is independent of artifical water sources and structures, or is in drier parts of eastern Oregon.

Formula: MAX(Rare,IBA,AVERAGE(Precip,Sustain))

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was <0.1point around a mean score of 7.3 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, scores ranged from 1.84 to 10 (median= 7.00, mean= 7.23).

POLLINATOR HABITAT (POL)

Function Definition: The capacity to support pollinating insects, such as bees, wasps, butterflies, moths, flies, and beetles.

Scientific Support for This Function in Wetlands Generally: High. Many wetlands may be especially important to pollinators because, in contrast with surrounding uplands, they host different plant species which may flower at different times over a prolonged season due to greater water availability in wetlands.

FUNCTION MODEL

Structure: Regardless of the wetland type, the relative level of function is estimated as the average of three groups: (1) the average of: percent of surrounding area comprised of native vegetation, proximity to closest patch of native vegetation, and size of that patch; (2) the average of: percent cover of native (vs. non-native) herbaceous plants and especially non-graminoids, percent cover of native (vs. non-native) woody plants, extent of downed wood, extent of snags and large-diameter trees, and presence of regionally uncommon herbaceous plants; and (3) the average of: percent of wetland not submerged by persistent water, infrequent fires and vegetation removal, vegetation height diversity, intermediate ground cover, large extent of microtopographic variation, presence of nearby rocky areas, and minimal soil disturbance.

Formula:
= [AVERAGE(natveg,natvprox,natvacres) +
AVERAGE(gramin,herbsens,herbrare,woodynn,woodydbh,downwood) +
AVERAGE(lomarsh,persist,firehay,htunif,gcover,girreg,cliff,soildisturb)] /3

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was ±0.5 around a mean score of 3.7 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, scores ranged from 2.18 to 9.02 (median= 5.65, mean= 5.59). The scores were correlated positively and significantly with those for Carbon Sequestration, Organic Export, Thermoregulation and habitat for Invertebrates, Resident Fish, Amphibians, Songbirds & Mammals, as well as Plant Diversity and wetland Condition. They correlated negatively with Water Storage, Sediment Retention, and Phosphorus Retention and Anadromous Fish Habitat.

Potential for Future Validation: Among a series of wetlands spanning the function scoring range and a range of wetland condition (integrity), the frequency with which flowers of dominant wetland plants are visited by various pollinating species should be monitored throughout the periods when each species is flowering.

VALUES MODEL

Structure: This function is presumably valued to a greater degree if the site is near extensive cropland (represented by the average of 3 indicators) or has a high score for the average of wetland cover uniqueness (e.g., the site is the largest patch of unaltered herbaceous, shrub, or forested land within 0.5 mile), presence of rare wetland plants, presence of rare wetland plant community.

Formula:
=MAX [(AVERAGE(crops0,agland0,aglandprox)),(AVERAGE(wetuniq,rareherb)]

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was ±0.9 around a mean score of 3.2 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, value scores for this function ranged from 0 to 8.06 (median= 3.33, mean= 3.20).

NATIVE PLANT HABITAT

Function Definition: The capacity to support an abundance and diversity of songbird, raptor, and mammal species and functional groups, especially those that are most dependent on wetlands or water. See worksheet *P_WetIndic* in the *ORWAP_SuppInfo* file for list of the species.

Scientific Support for This Function in Wetlands Generally: High. Many plant species grow only in wetlands, and thus diversify the local flora, with consequent benefits to food webs and energy flow.

FUNCTION MODEL

Structure: This function increases in response to the average of three indicator groups:
PLD1: average of: greater cover of native plants in the aquatic bed, emergent, and/or woody layers, and greater representation of uncommon plant species in whichever of those layers are present; and
PLD2: average of: greater microtopographic variation, greater vegetation height diversity, major recent drawdown or flood, no recent and intense fire or removal of hay or timber, clay or organic soils; and
PLD3: average of: less cover of invasive plants along the wetland-upland edge, greater distance from roads and boat docks, less frequent visitation by people and pets, little or no persistent grazing or mowing, greater proportion of the surrounding land cover is natural.

The model structure implies that PLD1 is being assigned twice the weight of either PLD2 or PLD3. In tidal wetlands, additional indicators contribute to a higher score. These are greater proportional extent of high marsh, greater connectivity with a nontidal wetland, and greater diversity of vegetation heights. In tidal wetlands each of these is weighted equally with PLD3 which contains several variables that together represent potential for invasion by nonnative plants.

Function Model Formula:
IF((Tidal=1),[PLD1+(AVERAGE(LowMarsh,TNonTconn, HtDiv,PLD3)] /2,
ELSE: [PLD1+(AVERAGE(PLD2,PLD3)] /2
where:

PLD1=(RareType + AVERAGE(SAV1,SAV2,herb1,herb2,wood1,wood2))/2
PLD2=AVERAGE(SoilTex,interann,girreg,FireHay,HtDiv,PondScape,PondProx)
PLD3= AVERAGE(core1,core2,weedsource,Boat,deveg, NormalTiming,NoSedLoading, NoSoilDisturb, NoNutrients,(AVERAGE(NatVegCA,BuffLU)),DistRd)

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was ±0.6 around a mean score of 4.6 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, scores ranged from 1.63 to 9.10 with a slight low-end skew (median= 4.81, mean= 4.93). The scores were correlated positively and significantly with those for Phosphorus Retention, Carbon Sequestration, and habitat for Invertebrates, Amphibians, Songbirds & Mammals, Pollinators, and with wetland Condition. They did not have a significant negative correlation with the scores of any function.

Potential for Future Validation: Among a series of wetlands spanning the function scoring range and a range of wetland condition (integrity), all plant species would be surveyed and percent-cover determined at their appropriate flowering times during the growing season. Standardized protocols are well-established, e.g., xx, and data management software are available at no cost ("VEMA": Marshall & Mueller 2007).

VALUES MODEL

Structure: This function is presumably valued to a greater degree if (1) the site or nearby areas are known to support an especially rare plant species, or (2) contains the largest patch of herbaceous or woody vegetation in the immediate area, or scored high as habitat for Pollinators, Feeding Waterbirds, or Songbirds, and/or (3) is in western Oregon and is independent of artifical water sources and structures, or is in drier parts of eastern Oregon.

Formula:
=MAX[(Rare,(AVERAGE(UniqPatch,ScorePOLf,ScoreWBFf,ScoreSBMf)),AVERAGE(Precip,Sustain)]

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was <0.1 point around a mean score of 7.3 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, value scores ranged from 0.67 to 10 (median= 7.00, mean= 7.32).

WETLAND SENSITIVITY

Definition: the lack of intrinsic resistance and resilience of the wetland to human and natural stressors (Niemi et al. 1990)

Structure:
If the wetland is a bog or fen, or lacks an outlet (even a temporary one), it is automatically assigned the highest sensitivity score.
In all other cases, a larger score depends on the average of four indictor groups:
SENS2 is the average of: shorter outflow duration, artificial (presumably constricted) outlet, small ratio of contributing area to wetland area, higher potential for sediment delivery to the wetland (based on upland slope and soil type), large organic component, less extensive persistent water, sparser ground cover, greater fragmentation of forest canopy, and greater proportion of surface water within wetlands occurring in isolated pools; and
SENS3 is the average of greater cover of native plants in the aquatic bed, emergent, and/or woody layers, and greater representation of uncommon plant species in whichever of those layers are present; and
SENS4 is the average of several indicators representing smaller proportional extent and proximity to surrounding natural land cover, ponds, and wetlands (i.e., less potential for buffering of pollutant runoff before it reaches the site); and
SENS5 is the average of: shallower depth, narrower vegetated area, smaller size, greater likelihood of long-duration ice cover (correlated with shorter growing season), and less annual precipitation.

Formula:
=IF(SENS1=TRUE,1,
ELSE (AVERAGE(SENS2, SENS3, SENS4, SENS5))
where:

SENS1=(OR(NoOut=1,Bog=1)
SENS2=AVERAGE(OutDura,CUratio,ShedPosErodib,Constric, SoilTex, Gcover,SeasW,IsoDry)
SENS3=AVERAGE(ShrubSens1,EmSens1,SAVsens1,WoodySens2,EmSens2,SAVsens2)

SENS4=AVERAGE(NatVegPctScape,NatVegProx,NatVegSize,NatVegCUpct,CUbuffPctNat,CUbuffPctNat, BuffSlope,PondScape,PondProx,LakeProx)
SENS5=AVERAGE(Depth,VwidthRel,VwidthAbs,Size,Freeze,Pcp)

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was ±0.5 around a mean score of 5.1 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, scores ranged from 1.83 to 8.75 (median= 4.63, mean= 4.72). The scores were correlated positively and significantly with those for Plant Diversity and for the habitat of Invertebrates, Songbirds-Mammals, and Pollinators.

WETLAND ECOLOGICAL CONDITION

Definition: The integrity or health of the wetland as defined primarily by its vegetation composition (because that is the only meaningful indicator that can be estimated rapidly). More broadly, the structure, composition, and functions of a wetland as compared to reference wetlands of the same type, operating within the bounds of natural or historic disturbance regimes. However, in the case of ORWAP, the model outputs were not scaled to reference wetlands.

Structure: Sites that are scored as being in the best ecological condition (i.e., have the highest integrity) are those that contain or are near areas that contain many rare plant and animal species (RareAll indicator), that have not historically been partially filled or fragmented by roads, dikes, etc. or expanded artificially (i.e., HydroConn indicator). Of equal weight is the average of indicators that describe larger proportional cover (within their layer) of species that are native and/or uncommon, increased coverage of the water surface with algae and duckweed, and presence of invasive invertebrates, non-native fish, bullfrogs, and/or nutria. If the wetland is in a landscape that historically was prairie, desert, or otherwise was not dominated by forest, then invasion of the wetland by woody plants is also used as an indicator of degradation.

Formula:
= AVERAGE(HydroConn, RareAll,NoWoody, AVERAGE(ShrubSens1,EmSens1,SAVsens1,WoodySens2,EmSens2,SAVsens2,NoScum,NoExotics))

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was ±0.5 around a mean score of 5.1 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, scores ranged from 2.62 to 8.75 (median= 5.70, mean= 5.64). Wetland Sensitivity was greater (correlated positively and significantly) in wetlands that were estimated to be more effective for Sediment Retention and Nitrate Removal functions, and less effective for Organic Export and Resident Fish Habitat.

WETLAND STRESS (RISK)

Definition: The degree to which the wetland is or has recently been altered by, or exposed to risk from, human and natural factors

Structure: Sites that are scored as potentially having the most stress to their ecological communities and geomorphic condition are those that (1) scored high for **any one** of the following types of potential ongoing or recent stress: wetter water regime, drier water regime, altered timing of water inputs or outputs, soil or sediment disturbance, vegetation-altering activities, and loading from sediment, nutrients, organics, or salts, **and** of equal weight, (2) have extensive cover of invasive weeds along their upland edge, are near busy roads, are surrounded by roads on all sides, are visited frequently, are more likely to be exposed to erosive waves and boat wakes, are near boating areas, have large proportional cover of impervious surfaces and other non-natural cover in their surrounding area or contributing area, and/or have known water quality exceedences immediately upstream or downstream. The presence of individual stressing activities (e.g., mining, subdivisions) is not included in the calculation of the stressor score -- only the estimates of their potential or actual effects are.

Formula:
= ((MAX(Wetter,Drier,Inflow,AltTiming,Toxic,SedLoad,SoilDisturb,VegClear)) + (AVERAGE(Waves,BoatVector,WeedSource,AVERAGE(Core1,Core2),DistRd,RdBox,NatVegCA, BuffDisturbTyp, WQupProb)))/2

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was 0.3 around a mean score of 7.4 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, scores ranged from 0.16 to 7.70 (median= 3.60, mean= 3.63).

PUBLIC USE & RECOGNITION

Definition: The potential and actual capacity of a wetland to sustain low-intensity human uses such as hiking, nature photography, education, and research.

Structure: Wetlands considered to currently or potentially be more valuable for public use are assumed to be those designated officially as wetland priority areas, are in public ownership, have less restrictive access policies and a greater degree of visibility from roads, are physically accessible to a wider range of users, have more prior investment of funds for conservation or enhancement, and/or some history of scientific monitoring or use for compensatory mitigation.

Formula:
MAX(SPA,COA,(AVERAGE(Visibility,Ownership,PubAccess,RecreaPoten,SciUse,ConsInvest,MitigaSite)))

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was ±0.7 around a mean score of 3.4 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, scores ranged from 0 to 10 (median= 4.17, mean= 5.24).

PROVISIONING SERVICES

Definition: The passive and sustainable providing of tangible natural items of potential commercial value.

Values Model: Wetlands considered more valuable are those in which humans harvest these natural products sustainably and with minimal impact. They include hay, timber, other wild plants, fish, and wildlife. The more categories that are harvested, the higher the score for Provisioning Services.

Repeatability Analysis: For the 6 wetlands where repeatability was tested, the average repeatability among independent users was <0.1 point around a mean score of 0.3 over a potential score range of 0-10.

Sensitivity Analysis: Among 221 wetlands from across Oregon, scores ranged from 0 to 4, with a strong down-skew (median= 0, mean= 0.8).

Appendix C: Map Layers and Data in the ORWAP Section of the Wetlands Explorer

Wetlands. This coverage is a compilation of polygon data from numerous sources, and represents the most comprehensive dataset available for the location, type, and extent of the state's wetlands. It uses as a base all available digital data from the National Wetlands Inventory (U.S. Fish and Wildlife Service), to which has been added draft NWI mapping (ORNHIC and The Wetlands Conservancy), Local Wetlands Inventories (approved by DSL), wetlands along state highways (Oregon Department of Transportation), Wetland Reserve Program sites (NRCS), wetland mitigation banks (DSL), and mapping of individual sites by a variety of federal, state, academic, and nonprofit sources. The NWI worksheet in the *ORWAP SuppInfo* file accompanying this manual reports the percent of each Oregon watershed that does not yet have NWI maps in digital format. Despite the contributions from many sources, huge numbers of jurisdictional wetlands are not shown in this coverage. As noted on the Web site, the wetland maps shown there must not be used to represent jurisdictional wetlands or jurisdictional wetland boundaries.

Hydric Soils. This coverage is a compilation of polygon data from numerous sources, and represents the most comprehensive dataset available for the location, composition, and extent of the state's hydric soils. It uses as a base all available digital data from the SUURGO layer (NRCS; "hydric" and "partially hydric" soils, the latter with a variable percentage of hydric inclusions), to which has been added Soil Resource Inventory data (USDA Forest Service; "somewhat poorly drained" to "poorly drained" soils), Unique Habitat data (USDA Forest Service; e.g., "wet meadow"), and soil survey mapping by Weyerhaeuser Company ("imperfectly drained" to "poorly drained"). Note that soils have not been identified and mapped on much of the federally-owned land in Oregon, and soil surveys are periodically updated.

100-year Floodplain. Obtained from FEMA, this is their Q3 "Regulatory Floodway" layer that shows the area that will be inundated by a flood event having a 1 percent chance of being equaled or exceeded in any given year. Such floodplains have been mapped mainly near developed areas. In areas that have experienced extensive development only recently, the boundary may be wider than shown unless new regulating dams or detention basins have been simultaneously installed. The Q3 Flood Data are derived from the Flood Insurance Rate Maps (FIRMS) published by the Federal Emergency Management Agency (FEMA). The file is georeferenced to earth"s surface using geographic projection and decimal degree coordinate system. The specifications for the horizontal control of Q3 Flood Data files are consistent with those required for mapping at a scale of 1:24000.

Wetland Priority Areas. This coverage identifies areas with concentrations of important wetland habitats and opportunities for wetland enhancement and restoration. It was created by overlaying the ODFW's "Conservation Opportunity Areas" (COA) map, the wetlands layer described above, and NRCS hydric soils mapping, and then retaining areas of overlap. COA's are primarily areas notable for their rare habitat types or wildlife species, and were defined systematically by a public process as part of Oregon's *Comprehensive Wildlife Conservation Strategy* (ODFW 2006). The full COA layer can be viewed at: http://nrimp.dfw.state.or.us/coaexplorer/viewer.htm . In the Willamette Valley, the map is based on The Nature Conservancy's (TNC) Willamette Synthesis project, with subsequent adjustments and additions made by ORNHIC and The Wetlands Conservancy (TWC). The Willamette Synthesis represents a two-year effort that integrates (1) TNC's portfolio sites identified by ecoregional planning, (2) ODFW's COAs, (3) NRCS hydric soils mapping, (4) FEMA floodplain mapping, (5) Army Corps of Engineers historical floodway maps, and a number of other sources detailed in http://oregonstate.edu/ornhic/transfer/wv_synthesis_draft_methods.zip . To improve the focus on wetlands, ORNHIC and TWC then removed the larger upland portions (e.g., oak savanna and woodland, upland prairie) from the Synthesis map, and included additional wetland information based on conservation data, restoration opportunities, and cluster analysis of USFWS NWI mapping. As a matter of policy, it should not be assumed that DSL is necessarily in agreement with the "Priority Area" designation of all wetlands labeled as such.

Essential Salmonid Habitat. Essential salmonid habitat is defined as the habitat necessary to prevent the depletion of native salmon species (chum, sockeye, Chinook and coho salmon, and steelhead and cutthroat trout) during their life history stages of spawning and rearing. The designation applies only to those species that have been listed as "Sensitive, Threatened or Endangered" by a state or federal authority. The Department of State Lands, in consultation with the Oregon Department of Fish and Wildlife (ODFW), designates essential salmonid habitat areas based on field surveys and/or the professional judgment of ODFW´s district biologists, and is the source of this coverage. Designations are periodically reviewed and updated. Stream reaches used only by non-native salmonids, or used only as passageways, are not included. For more information, see http://www.oregon.gov/DSL/PERMITS/counties_ess.shtml

Springs. This coverage was created by The Nature Conservancy using springs information obtained from Pacific Northwest Hydrography Framework (www.hydro.reo.gov) and from the Geographic Names Information System (GNIS). Thus, it shows mainly the points that are named "springs" on topographic maps. Many such areas would qualify as slope wetlands in the HGM classification because subsurface flow is a major water source. Many more wetlands are groundwater-dependent but their springs have not been mapped. See TNC's report, *Groundwater and Biodiversity* (Brown et al. 2007).

Watersheds. This shows the boundaries of HUC4, HUC5, and HUC6 watersheds as obtained from the State of Oregon's GEO Web site. Those had been delineated manually by the source agency. Some imprecision is apparent (e.g., where boundaries intersect streams, which they should not) and is probably the result of using too-coarse topographic information when the delineations were originally done. The boundaries may be refined as more detailed topographic data (e.g., LiDAR) become available for parts of Oregon. For metadata, see: www.oregon.gov/DAS/EISPD/GEO/alphalist.shtml .

In addition to information contained in the above map layers, the ORWAP support tool reports several other types of information near the right margin of the Web page:

HUC6. This is the name and code number of the HUC6 watershed in which the entered point is located, based on the Watersheds layer described above.

Presettlement Vegetation Class. The reported class, if any, is from a layer developed by ORNHIC (John Christy), mainly from interpretations of General Land Office (GLO) surveyor notes made at quarter-section intervals during the mid-1800's. The spatial resolution is consequently very coarse.

Rare Wetland Type Within 1 mile. This information is from ORNHIC's database, and includes wetland types considered to be Special Areas of Concern (SAC's) by DSL and other agencies. Four SAC's have been excluded from this Web tool because more accurate information can be obtained by direct field inspection while using ORWAP. They are: Intertidal Salt and Brackish Marsh, Intertidal Mudflat, and Subtidal Salt and Brackish Aquatic Bed. In addition, the following names were changed to maintain consistency with ORWAP and the terminology used for these types by the National Vegetation Classification.

- Dune Wetland → Interdunal Wetland
- Intertidal Brackish and Freshwater Shrub Swamp and Forested Wetland→ Wooded Tidal Wetland
- Intertidal Freshwater Marsh → Tidal Freshwater Wetland
- Serpentine Riparian, Spring, Seep, and Fen → Ultramafic Soil Wetland
- Westside Valley Wet Prairie → Wet Prairie

Special Protected Area. These include BLM Areas of Critical Environmental Concern (ACEC) or Outstanding Natural Area (ONA), federal Research Natural Areas (RNA) or Special Interest Areas (SIA), or Natural Heritage Conservation Areas (NHCA), Land Trust and Nature Conservancy Preserves, and other lands protected specifically for their high ecological significance.

Rare Species Scores. The scores are computed using information from ORNHIC's database. See section 2.2.8 for explanation.

Element of Occurrence Records (number of). This is tallied using information from ORNHIC's database. See section 2.2.8 for explanation.

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APPENDIX E

B2H SPECIAL STATUS SPECIES LIST

B2H SPECIAL STATUS SPECIES LIST

FEDERAL AND STATE LISTED WILDLIFE SPECIES; AS WELL AS MIS AND BLM / FOREST SERVICE SENSITIVE SPECIES

Species	USFWS[1/]	BLM Boise District[2/]	BLM Oregon District[2/]	BLM RANK[3/]	USFS R6[4/]	ODFW[5/]	Potential Habitat within Route	State (along route)
MAMMALS								
Gray Wolf (*Canis lupus*)	E (outside the NRM DPS)	FRFO	VALE	Idaho: Type 1	UMA; WAW	LE	Y	Oregon
Canada Lynx (*Lynx canadensis*)	T	FRFO;	VALE; PRIN	Idaho: Type 1	UMA; WAW		N	Oregon
Northern Idaho Ground Squirrel (*Spermophilus brunneus brunneus*)	T	FRFO		Idaho: Type 1			N	Idaho
Southern Idaho Ground Squirrel (*Spermophilus brunneus endemicus*)	C	FRFO		Idaho: Type 1			N	Idaho
Washington ground squirrel (*Spermophilus washingtoni*)	C		VALE; PRIN			LE	Y	Oregon
Pygmy Rabbit *(Brachylagus idahoensis)*		FRFO	VALE; PRIN	Idaho: Type 2 Oregon: Sensitive		SV	Y	Idaho and Oregon
White-tailed Jack Rabbit (*Lepus townsendii*)						SV	Y	Oregon
Wolverine (*Gulo gulo*)	C	FRFO (North American sub-species)	PRIN	Idaho: Type 3 Oregon: Sensitive (California Subs.)	UMA; WAW (MIS) (California subsp)	LT	Y	Oregon
Fisher (*Martes pennanti*)		FRFO	PRIN	Idaho: Type 3 Oregon: Sensitive	WAW	SC	Y	Oregon
American Marten (*Martes martes*)					UMA (MIS); WAW (MIS)	SV	Y	Oregon
Kit Fox *(Vulpes velox)*			VALE	Idaho: Type 4 Oregon: Sensitive			N	Oregon
Rocky Mountain Elk (*Cervus canadensis*)					WAW (MIS)		Y	Oregon
Fringed Myotis (*Myotis thysanodes*)		FRFO	VALE; PRIN	Idaho: Type 3 Oregon: Sensitive		SV	Y	Idaho and Oregon
Spotted Bat *(Euderma aculatum)*		FRFO	VALE; PRIN	Idaho: Type 3 Oregon: Sensitive		SV	Y	Idaho and Oregon
Townsend's Big-eared Bat (Corynorhinus townsendii)		FRFO	VALE; PRIN	Idaho: Type 3 Oregon: Sensitive	UMA	SC	Y	Oregon
Pallid Bat (*Antrozous pallidus*)			PRIN	Oregon: Sensitive		SV	Y	Idaho and Oregon
AVIAN								
Bald Eagle *(Haliaeetus leucocephalus)*	Delisted 8/8/2007	FRFO	VALE; PRIN	Idaho: Type 1 Oregon: Sensitive	UMA; WAW (MIS)	LT	Y	Idaho and Oregon
Yellow-billed Cuckoo *(Coccyzus americanus)*	C	FRFO	VALE; PRIN	Idaho: Type 3 Oregon: Sensitive		SC	N	Idaho and Oregon
Flammulated Owl (*Otus flammeoulus*)		FRFO		Idaho: Type 3		SV	Y	Oregon
Great Gray Owl (*Strix nebulosa*)						SV	Y	Oregon
Burrowing Owl (*Athene cunicularia*)				Idaho: Type 5		SV	Y	Idaho and Oregon
Greater Sage-grouse *(Centrocercus urophasianus)*	C	FRFO	VALE; PRIN	Idaho: Type 2 Oregon: Sensitive	WAW	SV	Y	Idaho and Oregon
Columbian Sharp-tailed Grouse *(Tympanuchus phasianellus columbianus)*		FRFO	VALE	Idaho: Type 3 (no subsp.) Oregon: Sensitive	WAW	SC	Y	Oregon
Mountain Quail *(Oreotyx pictus)*		FRFO		Idaho: Type 3		SV	Y	Idaho and Oregon

Species	USFWS[1/]	BLM Boise District[2/]	BLM Oregon District[2/]	BLM RANK[3/]	USFS R6[4/]	ODFW[5/]	Potential Habitat within Route	State (along route)
Peregrine Falcon *(Falco peregrinus anatum)*		FRFO	VALE; PRIN	Idaho: Type 3 Oregon: Sensitive	UMA; WAW (MIS)	SV	Y	Idaho and Oregon
Prairie Falcon *(Falco mexicanus)*		FRFO					Y	Idaho and Oregon
Northern Goshawk *(Accipiter gentilis)*		FRFO			WAW (MIS)	SV	Y	Oregon
Ferruginous Hawk *(Buteo regalis)*		FRFO		Idaho: Type 3		SC	Y	Idaho and Oregon
Swainson's hawk (*Buteo swainsoni*)				Idaho: Type 5		SV	Y	Idaho and Oregon
Common nighthawk (*Chordeiles minor*)						SC	Y	Idaho and Oregon
Three-toed Woodpecker (*Picoides tridactylus*)					UMA; WAW (MIS)	SV	Y	Oregon
Lewis' Woodpecker *(Melanerpes lewis)*		FRFO	VALE; PRIN	Idaho: Type 3 Oregon: Sensitive	UMA (MIS); WAW (MIS)	SC	Y	Oregon
White-headed Woodpecker (*Picoides albolarvatus*)		FRFO	VALE; PRIN	Idaho: Type 4 Oregon: Sensitive	UMA (MIS); WAW (MIS)	SC	Y	Oregon
Williamson's Sapsucker (*Sphyrapicus throideus*)		FRFO			UMA (MIS); WAW (MIS)		Y	Oregon
Pileated Woodpecker (*Dryocopus pileatus*)					UMA (MIS); WAW (MIS)	SV	Y	Oregon
Yellow-bellied Sapsucker (*Sphyrapicus varius*)					UMA (MIS); WAW (MIS)		Y	Oregon
Black-backed Woodpecker (*Picoides arcticus*)					UMA (MIS); WAW (MIS)	SV	Y	Oregon
Hairy Woodpecker (*Picoides villosus*)					UMA (MIS); WAW (MIS)		Y	Oregon
Northern Flicker (*Colaptes auratus*)					UMA (MIS); WAW (MIS)		Y	Idaho and Oregon
Downy Woodpecker (*Picoides pubescens*)					UMA (MIS); WAW (MIS)		Y	Oregon
Mountain Chickadee (*Poecile gambeli*)					UMA (MIS); WAW (MIS)		Y	Oregon
Black-capped Chickadee (*Poecile atricapilla*)					UMA (MIS); WAW (MIS)		Y	Oregon
White-breasted Nuthatch (*Sitta carolinensis*)					UMA (MIS); WAW (MIS)	SV	Y	Oregon
Red-breasted Nuthatch (*Sitta canadensis*)					UMA (MIS); WAW (MIS)		Y	Oregon
Pygmy Nuthatch (*Sitta pygmaea*)				Idaho: Type 5	UMA (MIS); WAW (MIS)		Y	Oregon
White-headed woodpecker *(Picoides albolarvatus)*					UMA (MIS)		Y	Idaho and Oregon
American White Pelican (*Pelecanus erythrorhynchos*)		FRFO	VALE; PRIN	Idaho: Type 2 Oregon: Sensitive		SV	N	Idaho and Oregon
Trumpeter Swan (*Cygnus buccinator*)			VALE; PRIN	Idaho: Type 3 Oregon: Sensitive			N	Idaho and Oregon
Horned Grebe (*Podiceps auritus*)			VALE	Oregon: Sensitive			N	Idaho and Oregon
Calliope Hummingbird (*Stellula calliope*)		FRFO					Y	Idaho and Oregon
Willow Flycatcher *(Empidonax traillii)*		FRFO				SV	Y	Idaho and Oregon
Hammond's Flycatcher *(Empidonax hammondii)*		FRFO					Y	Idaho and Oregon
Olive-sided Flycatcher (*Contopus borealis*)		FRFO				SV	Y	Idaho and Oregon

Species	USFWS[1/]	BLM Boise District[2/]	BLM Oregon District[2/]	BLM RANK[3/]	USFS R6[4/]	ODFW[5/]	Potential Habitat within Route	State (along route)
Black Swift (*Cypseloides niger*)			PRIN	Idaho: Type 4 Oregon: Sensitive			N	Oregon
Loggerhead Shrike *(Lanius ludovicianus)*		FRFO				SV	**Y (Incidental with WAGS)**	Idaho and Oregon
Sage Sparrow *(Amphispiza belli)*		FRFO				SC	**Y (Incidental with WAGS)**	Idaho and Oregon
Black-throated Sparrow *(Amphispiza bilineata)*		FRFO				SP	Y	Idaho and Oregon
Grasshopper Sparrow (*Ammodramus savannarum*)			VALE; PRIN	Idaho: Type 5 Oregon: Sensitive		SV/SP	Y	Idaho and Oregon
Yellow Breasted Chat (*Icteria virens*)						SC	N	Idaho and Oregon
Bobolink (*Dolichonyx oryzivorus*)			VALE; PRIN	Oregon: Sensitive		SV	N	Oregon
Tricolored blackbird (*Agelaius tricolor*)			PRIN	Oregon: Sensitive		SP	Y	Oregon
Western Bluebird (*Sialia Mexicana*)						SV	Y	Idaho and Oregon
Sage Thrasher (*Oreoscoptes montanus*)							Y	Idaho and Oregon
Franklin's Gull (*Larus pipixcan*)			VALE	Oregon: Sensitive		SV	N	Idaho and Oregon
Upland Sandpiper (*Bartramia longicaula*)		FRFO	PRIN	Idaho: Type 4 Oregon: Sensitive	UMA; WAW	SC	Y	Idaho and Oregon
Northern Waterthrush *(Parkesia noveboracensis)*				Oregon: Sensitive			Y	Idaho and Oregon
Brewer's Sparrow *(Spizella breweri)*		FRFO		Idaho: Type 3			Y	Idaho and Oregon
Golden Eagle *(Aquila chrysaetos)*	SOC						Y	Idaho and Oregon
Long-billed Curlew (*Numenius americanus*)				Idaho: Type 5		SV	Y	Idaho and Oregon
Bufflehead (*Bucephala albeola*)			PRIN	Oregon: Sensitive	WAW		N	Idaho and Oregon
REPTILES AND AMPHIBIANS								
Columbia Spotted Frog *(Rana luteiventris)*	C		VALE; PRIN	Idaho: Type 1 Oregon: Sensitive	UMA; WAW	SC	Y	Idaho and Oregon
Oregon Spotted Frog (*Rana pretiosa*)			PRIN	Oregon: Sensitive		SC	N	Oregon
Northern Leopard Frog *(Rana pipiens)*		FRFO	VALE	Idaho: Type 2 Oregon: Sensitive	UMA	SC	Y	Idaho and Oregon
Western Toad *(Bufo boreas)* – Northern Rocky Mountain Population		FRFO				SV	Y	Idaho and Oregon
Woodhouse Toad *(Bufo woodhousii)*		FRFO	VALE	Idaho: Type 3 Oregon: Sensitive		SP	Y	Idaho and Oregon
Inland Tailed Frog (*Ascaphus montanus*)			VALE	Oregon: Sensitive	UMA; WAW	SV	Y	Oregon
Mojave Black-collared Lizard *(Crotaphytus bicinctores)*		FRFO					N	Idaho and Oregon
Longnose Snake *(Rhinocheilus lecontei)*		FRFO		Idaho: Type 3			Y	Idaho and Oregon
Western Ground Snake *(Sonora semiannulata)*		FRFO		Idaho: Type 3			Y	Idaho and Oregon
Common Garter Snake *(Thamnophis sirtalis)*		FRFO					Y	Idaho and Oregon
Sagebrush Lizard (*Sceloporus graciosus*)						SV	**Y (Incidental with WAGS)**	Oregon
Painted Turtle (*Chrtsemys picta*)			VALE	Oregon: Sensitive	UMA	SC	N	Oregon
FISH								
Bull Trout (*Salvelinus confluentus*)	T	FRFO	VALE; PRIN	Idaho: Type 1	UMA; WAW	SC	Y	Oregon
Inland Redband Trout (*Oncorhynchus mykiss gibbsi)*		FRFO	VALE; PRIN		UMA; WAW	SV	Y	Oregon
Oregon Great Basin Redband Trout (*Oncorhynchus myskiss*)						SV	Y	Oregon
Middle Columbia River Steelhead (*Oncorhynchus mykiss* ssp.)	T		PRIN; CEN		UMA; WAW	SV	N (downstream influence)	Oregon
Snake River Basin steelhead (*Oncorhynchus mykiss* ssp.)	T				UMA; WAW	SV	Y	Oregon

Species	USFWS[1/]	BLM Boise District[2/]	BLM Oregon District[2/]	BLM RANK[3/]	USFS R6[4/]	ODFW[5/]	Potential Habitat within Route	State (along route)
Snake River Chinook (Spring/Summer/Fall Runs) (*Oncorhynchus tshwatscha* ssp.)	T		VALE; PRIN	Idaho: Type 1 Oregon: Sensitive	UMA; WAW	LT	Y	Oregon
Snake River Sockeye Salmon	E		VALE	Idaho: Type 1	WAW		Y	Oregon
Coho Salmon – (*Oncorhynchus kisutch*) Lower Columbia River DPS- No Designated Critical Habitat	T		PRIN			SV	Y	Oregon
Westslope Cutthroat Trout (*Oncorhynchus mykiss* ssp.)			PRIN	Idaho: Type 2 Oregon: Sensitive	UMA; WAW	SC	Y	Oregon
White Sturgeon (*Acipenser transmontanus*)		FRFO		Idaho: Type 2			Y	Idaho and Oregon
Malheur Mottled Sculpin (*Cottus bendirei*)							N	Oregon
Margined Sculpin (*Cottus marginatus*)							N	Oregon
Pacific Lamprey (*Lampetra tridentata*)				Idaho: Type 2 Oregon: Sensitive		SV	Y	Oregon
INVERTEBRATES								
Meadow Fritillary (*Boloria Bellona)*			VALE; PRIN	Oregon: Sensitive	WAW		Y	Idaho and Oregon
Silver-bordered Fritillary (*Boloria selene)*			VALE; PRIN	Oregon: Sensitive	WAW		Y	Idaho and Oregon
Fir pinwheel (*Radiodiscus albietum)*					WAW		Y	Idaho and Oregon
Bliss Rapids Snail (*Taylorconcha serpenticola*)	T	FRFO		Idaho: Type 1			N	Idaho and Oregon Border

1/ Federally Listed Species: E = Endangered; T = Threatened; C = Candidate; XN = Experimental Non-essential Population; CH = Critical Habitat.
2/ BLM Sensitive Species: FRFO = Four Rivers Field Office; PRIN = Prineville District; VALE = Vale District
3/ BLM Rank: Type 1: Threatened, endangered, proposed and candidate: species listed by the FWS or NMFS as threatened or endangered, or proposed or candidates for listing under the Endangered Species Act of 1973.
Type 2: Rangewide/Globally imperiled: species that are experiencing significant 4 declines throughout their range with a high likelihood of being listed in the foreseeable future due to their rarity and/or significant endangerment factors.
This includes species ranked by the NatureServe heritage program network with a Global rank of G1–G3 or T1–T3 or recent data indicate that the species is at significant rangewide risk and this is not currently reflected by heritage program global ranks.
Type 3: Regional/ State imperiled: species that are experiencing significant declines in population or habitat and are in danger of regional or local extinctions in Idaho in the foreseeable future if factors contributing to their decline continues. This
includes Idaho BLM sensitive species that (a) are not in Type 2, (b) have an S1 or S2 State rank (exception being a peripheral or disjunct species), or (c) score high (18 or greater) using the Criteria for Evaluating Animals for Sensitive Species Status or (d) other regional/national status evaluations (e.g., Partners in Flight scores) indicate significant declines.
Type 4: Peripheral: species that are generally rare in Idaho with the majority of their breeding range largely outside the state (Idaho Conservation Data Center 1994). This includes sensitive species that have an S1 or S2 state ranking, but are peripheral species to Idaho.
Type 5: Watch list: these species are not considered BLM sensitive species and associated sensitive species policy guidance does not apply. Watch list species include species that may be added to the sensitive species list depending on new information concerning threats, species' biology or statewide trends. The Watch List include species with insufficient data on population or habitat trends or the threats are poorly understood. However, there are indications that these species may warrant special status species designation and appropriate inventory or research efforts should be a management priority.
Oregon: "Sensitive" refers to naturally-reproducing fish and wildlife species, subspecies, or populations which are facing one or more threats to their populations and/or habitats. Implementation of appropriate conservation measures to address the threats may prevent them from declining to the point of qualifying for threatened or endangered status.
4/ Region 6 Forest Sensitive Species: WAW = Willowa-Whitman National Forest; UMA = Umatilla National Forest;MIS = Management Indicator Species
5/ Oregon Department of Fish and Wildlife: LE = Listed Endangered; LT = Listed Threatened; SC = Critical Sensitive Species; SV = Vulnerable Sensitive Species; SP = Peripheral Species

FEDERAL AND STATE LISTED PLANTS; AS WELL AS BLM / FOREST SERVICE SENSITIVE SPECIES

Species	USFWS[1/]	BLM Boise District[2/]	BLM Oregon District[2/]	BLM RANK[3]	USFS R6[4/]	ODA[5/]	Potential Habitat within Route	Potential Field Survey Requirement	State (along route)
Vascular Plants									
FEDERALLY LISTED SPECIES									
Howell's spectacular thelypody (*Thelypodium howellii* ssp. *spectabilis*)	T		VALE (Baker)			SE	Y	Y	Oregon
Slickspot Peppergrass (*Lepidium papilliferum*)	T	FRFO,OFO		Idaho: Type 1			Y	Y	Idaho
STATE LISTED SPECIES **BLM / FS FOREST SERVICE SENSITIVE**									
Biennial stanleya (*Stanleya confertiflora*)		FRFO, OFO	VALE	Idaho: Type 2 Oregon: Sensitive			Y	Y	Oregon / Idaho
Bigelow's four-o'clock (*Mirabilis laevis* var. *retrorsa*)							Y	U	Oregon
Calcareous buckwheat (*Eriogonum ochrocephalum* var. *calcareum*)		FRFO		Idaho: Type 3			U	U	Idaho
Cronquist's stickseed (*Hackelia cronquistii*)		FRFO	VALE (Baker, Malheur)	Oregon: Sensitive		ST	Y	Y	Oregon
Cusick's false yarrow (*Cheanactis cusickii)*		OFO		Idaho: Type 2			Y	Y	Idaho
Cusick's lupine (*Lupinus lepidus* var. *cusickii*)			VALE	Oregon: Sensitive		SE	Y	Y	Oregon
Desert pincushion (*Chaenactis stevioides*)		FRFO, OFO		Idaho: Type 4			Y	Y	Idaho
Dimersia (*Dimeresia howellii)*		FRFO, OFO		Idaho: Type 3			Y	U	Idaho
Douglas' clover (*Trifolium douglasii*)		FRFO	VALE	Oregon: Sensitive			U	U	Oregon / Idaho
Greeley's wavewing (*Cymopteris acaulis* var. *greeleyorum*)		OFO	VALE	Idaho: Type 3 Oregon: Sensitive			Y	Y	Idaho
Janish's penstemon *(Penstemon janishiae)*		OFO		Idaho: Type 3			Y	Y	Idaho
Laurence's milk-vetch (*Astragalus collinus* var. *laurentii*)			VALE	Oregon: Sensitive		ST	Y	Y	Oregon
Least snapdragon *(Sairocarpus kingii)*		OFO					Y	Y	Idaho
Malheur cryptantha *(Cryptantha propria)*		FRFO, OFO					Y	Y	Oregon / Idaho
Malheur yellow phacelia (*Phacelia lutea* var. *calva)*		FRFO, OFO		Idaho: Type 3			Y	U	Idaho
Many-flowered phlox (*Phlox multiflora*)			VALE	Oregon: Sensitive			U	U	Oregon
Mingan's moonwort (*Botrychium minganense*)			PRIN; VALE	Idaho: Type 4 Oregon: Sensitive			U	Y	Oregon / Idaho
Mountain moonwort (*Botrychium montanum*)			PRIN; VALE	Oregon: Sensitive			U	Y	Oregon / Idaho
Mulford's milkvetch (*Astragalus mulfordiae*)		FRFO, OFO	VALE	Idaho: Type 2 Oregon: Sensitive		SE	Y	Y	Oregon / Idaho
Oregon semaphore grass *(Pleuropogon oregonus*)			VALE	Oregon: Sensitive		ST	Y	Y	Oregon

Species	USFWS[1/]	BLM Boise District[2/]	BLM Oregon District[2/]	BLM RANK[3]	USFS R6[4/]	ODA[5/]	Potential Habitat within Route	Potential Field Survey Requirement	State (along route)
Owyhee Clover (*Trifolium owyheense*)		OFO	VALE	Idaho: Type 2 Oregon: Sensitive			Y	Y	Oregon / Idaho
Packard's Mentzelia (*Mentzelia packardiae*)			VALE	Oregon: Sensitive		ST	Y	Y	Oregon
Packard's Wormwood (*Artemisia packardiae*)			VALE				U	U	Oregon / Idaho
Red-fruited lomatium (*Lomatium erythrocarpum*)			VALE	Oregon: Sensitive		SE	Y	Y	Oregon
Retrorse sedge (*Carex retrorsa*)			VALE (Baker)	Oregon: Sensitive			U	U	Oregon
Salt heliotrope (*Heliotropium curassavicum*)		FRFO, OFO	VALE	Oregon: Sensitive		SE	Y	U	Idaho
Simpson's hedgehog cactus (*Pediocactus simpsonii)*		FRFO, OFO		Idaho: Type 4			Y	U	Idaho
Smooth Mentzelia (*Mentzelia mollis*)		OFO	VALE	Idaho: Type 2 Oregon: Sensitive		SE	Y	Y	Oregon / Idaho
Snake River Goldenweed (*Pyrrocoma radiata*)		FRFO	VALE	Idaho: Type 3 Oregon: Sensitive		SE	Y	Y	Oregon / Idaho
Sterile Milk-vetch (*Astragalus cusickii* var. *sterilis)*			VALE	Idaho: Type 3 Oregon: Sensitive		ST	Y	Y	Oregon
Stiff milkvetch (*Astragalus conjunctus*)		OFO		Idaho: Type 5			Y	Y	Idaho
White-margined waxplant *(Glyptopleura marginata*)		OFO		Idaho: Type 4			Y	Y	Idaho

1/ Federally Listed Species: E = Endangered; T = Threatened; C = Candidate; NRM DPS = Northern Rocky Mountain Distinct Population Segment; CH = Critical Habitat.
2/ BLM Sensitive Species: Idaho Boise District - FRFO = Four Rivers Field Office, OFO = Owyhee Field Office; Oregon - PRIN = Prineville District, VALE = Vale District
3/ Idaho: Type 1: Threatened, Endangered, Proposed, and Candidate species. These species are listed by the U. S. Fish and Wildlife Service (USFWS) as Threatened or Endangered, or they are Proposed or Candidates for listing under the Endangered Species Act.
Type 2: Rangewide/Globally Imperiled Species - High Endangerment. These are species that have a high likelihood of being listed in the forseeable future due to their global rarity and significant endangerment factors. Species ranked by the network of Conservation Data Centers and Natural Heritage Programs with Global Ranks of G1-G3 or T1-T3 with a threat priority of 1-9 using the USFWS Listing Priority Criteria.
Type 3: Rangewide/Globally Imperiled Species - Moderate Endangerment. These are species that are globally rare with moderate endangerment factors. Their global rarity and inherent risks associated with rarity make them imperiled species. Idaho BLM sensitive species that are ranked by the network of Conservation Data Centers and Natural Heritage Programs with Global Ranks of G1-G3 or T1-T3 with (a) a threat priority of 10-12 using the USFWS Listing Priority Criteria or (b) an Idaho Native Plant Society ranking of Priority 1-2 or Sensitive--i.e., Sensitive with the majority of the population on BLM-administered lands.
Type 4: Species of Concern. These are species that are generally rare in Idaho with small populations or localized distribution and currently have low threat levels. However, due to the small populations and habitat area, certain future land uses in close proximity could significantly jeopardize these species. This includes sensitive species that are not Type 3.
Type 5: Watch List. Watch list species are not considered BLM sensitive species, and associated sensitive species policy guidance does not apply. Watch list species include species that may be added to the sensitive species list depending on new information concerning threats and species biology or statewide trends. This includes (a) Idaho Native Plant Society Monitor and Review species and (b) Idaho Native Plant Society Sensitive species (Types 2, 3, or 4) that are only suspected to occur in a BLM resource area.
Oregon: "Sensitive" refers to naturally-reproducing fish and wildlife species, subspecies, or populations which are facing one or more threats to their populations and/or habitats. Implementation of appropriate conservation measures to address the threats may prevent them from declining to the point of qualifying for threatened or endangered status.
4/ Region 6 Forest Sensitive Species: WAW = Willowa-Whitman National Forest; UMA = Umatilla National Forest;MIS = Management Indicator Species
5/ Oregon Department Agriculture: LE = Listed Endangered; LT = Listed Threatened; SC = Critical Sensitive Species; SV = Vulnerable Sensitive Species; SP = Peripheral Species
U – Species on agency lists required for surveys, but presence of suitable habitat along survey area corridor is unlikely

APPENDIX F

PRELIMINARY HABITAT CATEGORIZATION BASED ON ODFW HABITAT CATEGORIES

Habitat maps with associated ODFW categories will be prepared for ODFW. The habitat maps will be presented in a map book that contains 11 x 17 inch maps, at a scale of 1:24,000, for Idaho Power Company's (IPC's) proposed route and route alternatives. These will be accompanied by a summary table showing the acres of each habitat type, ODFW habitat category, and rational for assigning the ODFW habitat category. The habitat maps will be refined and finalized based on feedback from ODFW. Any potential changes to the proposed route will be addressed using survey results from Phase 2 and Phase 3 of the Work Plan.

The Oregon Department of Fish and Wildlife (ODFW) has developed a Fish and Wildlife Habitat Mitigation Policy (OAR 635-415-000), that provides a framework for assigning one of six category types to habitats based on the relative importance of these habitats to fish and wildlife species. Additionally, the policy establishes consistent goals and standards to mitigate the impacts of a project on fish and wildlife habitats. Although mitigation will certainly be a part of the project's final application for certification (due to the potential impacts related to this type of project), mitigation measures or a mitigation outline are beyond the scope of this document, and will instead, need to be determined and developed in a separate document once impacts are assessed. However, the final step of the habitat mapping process will be to categorize survey areas within the framework of the ODFW habitat mitigation categories. All existing wildlife spatial data will be overlaid to aid in the determination of habitat categories. Examples of wildlife spatial data will include, but are not limited, to:

- raptor nest locations,
- streams containing special status fish,
- greater sage-grouse leks,
- sage-grouse core area habitat ranks,
- Washington ground squirrel habitat,
- designated big game winter range, and
- known extent of special status species habitats.

The categories that will be assigned to the habitat types present within the project area shall be consistent with the requirements found in OAR 635-415-000 and will include Categories 1 through 6, which are defined below.

Habitat Category 1: irreplaceable, essential habitat for a fish or wildlife species, population, or a unique assemblage of species and is limited on either a physiographic province or site-specific basis, depending on the individual species, population or unique assemblage.

(a) The mitigation goal for Category 1 habitat is no loss of either habitat quantity or quality.

(b) The Department shall act to protect Category 1 habitats described in this subsection by recommending or requiring:

  (A) Avoidance of impacts through alternatives to the proposed development action; or

(B) No authorization of the proposed development action if impacts cannot be avoided.

Habitat Category 2: essential habitat for a fish or wildlife species, population, or unique assemblage of species and is limited either on a physiographic province or site-specific basis depending on the individual species, population or unique assemblage.

(a) The mitigation goal if impacts are unavoidable is no net loss of either habitat quantity or quality and to provide a net benefit of habitat quantity or quality.

(b) The Department shall act to achieve the mitigation goal for Category 2 habitat by recommending or requiring:

(A) Avoidance of impacts through alternatives to the proposed development action; or

(B) Mitigation of impacts, if unavoidable, through reliable in-kind, in-proximity habitat mitigation to achieve no net loss of either pre-development habitat quantity or quality. In addition, a net benefit of habitat quantity or quality must be provided. Progress towards achieving the mitigation goals and standards shall be reported on a schedule agreed to in the mitigation plan performance measures. The fish and wildlife mitigation measures shall be implemented and completed either prior to or concurrent with the development action.

(c) If neither 635-415-0025(2)(b)(A) or (B) can be achieved, the Department shall recommend against or shall not authorize the proposed development action.

Habitat Category 3: essential habitat for fish and wildlife, or important habitat for fish and wildlife that is limited either on a physiographic province or site-specific basis, depending on the individual species or population.

(a) The mitigation goal is no net loss of either habitat quantity or quality.

(b) The Department shall act to achieve the mitigation goal for Category 3 habitat by recommending or requiring:

(A) Avoidance of impacts through alternatives to the proposed development action; or

(B) Mitigation of impacts, if unavoidable, through reliable in-kind, in-proximity habitat mitigation to achieve no net loss in either pre-development habitat quantity or quality. Progress towards achieving the mitigation goals and standards shall be reported on a schedule agreed to in the mitigation plan performance measures. The fish and wildlife mitigation measures shall be implemented and completed either prior to or concurrent with the development action.

(c) If neither 635-415-0025(3)(b)(A) or (B) can be achieved, the Department shall recommend against or shall not authorize the proposed development action.

Habitat Category 4: important habitat for fish and wildlife species.

(a) The mitigation goal is no net loss in either existing habitat quantity or quality.

(b) The Department shall act to achieve the mitigation goal for Category 4 habitat by recommending or requiring:

(A) Avoidance of impacts through alternatives to the proposed development action; or

(B) Mitigation of impacts, if unavoidable, through reliable in-kind or out-of-kind, in-proximity or off-proximity habitat mitigation to achieve no net loss in either pre-development habitat quantity or quality. Progress towards achieving the mitigation goals and standards shall be reported on a schedule agreed to in the mitigation plan performance measures. The fish and wildlife mitigation measures shall be implemented and completed either prior to or concurrent with the development action.

(c) If neither 635-415-0025(4)(b)(A) or (B) can be achieved, the Department shall recommend against or shall not authorize the proposed development action.

Habitat Category 5: is habitat for fish and wildlife having high potential to become either essential or important habitat.

(a) The mitigation goal, if impacts are unavoidable, is to provide a net benefit in habitat quantity or quality.

(b) The Department shall act to achieve the mitigation goal for Category 5 habitat by recommending or requiring:

(A) Avoidance of impacts through alternatives to the proposed development action; or

(B) Mitigation of impacts, if unavoidable, through actions that contribute to essential or important habitat.

(c) If neither 635-415-0025(5)(b)(A) or (B) can be achieved, the Department shall recommend against or shall not authorize the proposed development action.

Habitat Category 6: Habitat that has low potential to become essential or important habitat for fish and wildlife.

(a) The mitigation goal is to minimize impacts.

(b) The Department shall act to achieve the mitigation goal for Category 6 habitat by recommending or requiring actions that minimize direct habitat loss and avoid impacts to off-site habitat.

Category types 1 through 6 will be assigned to the various habitat types based on the decision tree presented Figure 1.

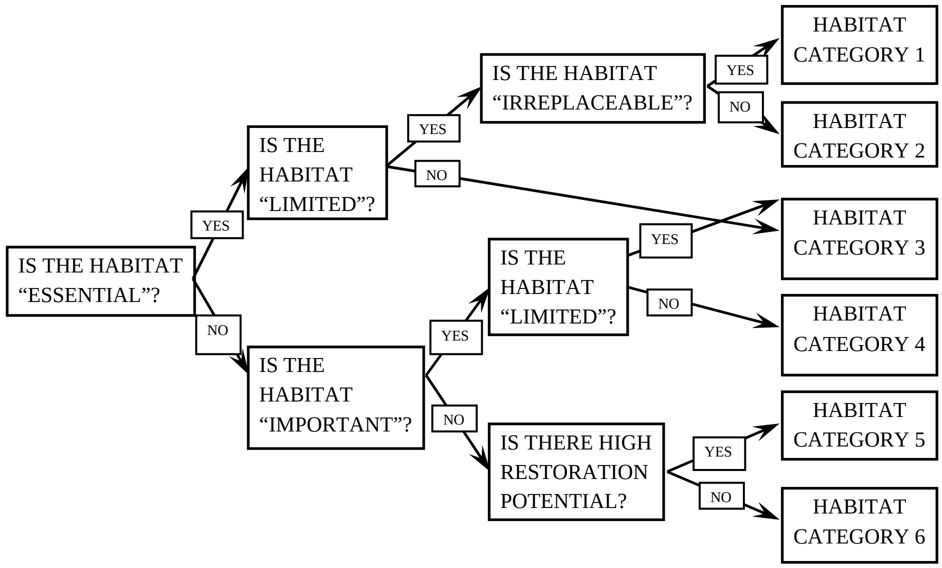

Figure 1. ODFW Habitat Classification System

Table 1 lists the habitat types that are crossed by the project as well as the habitat categories that could be assigned to these habitat types. The habitat categorization types presented in Table 1 are based on a coordination meeting held between IPC and the ODFW on September 30, 2008. (ODFW staff attending the 2008 meeting included Colleen Fagen, James Cadwell, Nick Myatt, and Scott Torland.) The habitat categorization is preliminary at this time, but serves to inform the agencies of the current status of IPC's commitment to address this important aspect of the overall project.

Table 1. Preliminary List of EFSC Habitat Types Crossed by the Project and the Applicable ODFW Habitat Categories.

EFSC Habitat Type	EFSC Habitat Sub-type	ReGAP Ecological System[1]	Habitat Category
Ponds/Lakes, Streams and Rivers	**Ponds/Lakes** Open water areas, including natural lakes, stock ponds, beaver ponds	Open Water	1 – Threatened or Endangered species present; or spotted frog present 2 – Ponds/lakes that do not contain sensitive species 4 – Stock ponds
	Long-term / Perennial Streams and Rivers Drainages mapped by USGS having permanent (year-round) flow		1 – Threatened or Endangered fish present 2 – Streams that do not contain sensitive species
	Intermittent Streams and Rivers Drainages mapped by USGS as intermittent		2 – Streams that do not contain sensitive species.
Wetland	**Emergent** Herbaceous vegetation dominated by cattails, bulrushes, reed canarygrass, and other emergent plants	Inter-Mountain Basins Alkaline Closed Depression	1 – Wetlands containing Threatened or Endangered species; or raptor nests 2 – Wetlands that do not contain Threatened or Endangered species; or raptor nests
		North American Arid West Emergent Marsh	
		Rocky Mountain Alpine-Montane Wet Meadow	
	Forested Upland streamside forests (defined as areas with a minimum of 40% canopy closure > 20 feet tall), dominated by trembling aspen, cottonwood and willows wild plum, hawthorn	Columbia Basin Foothill Riparian Woodland and Shrubland	1 – Wetlands containing Threatened or Endangered species; or raptor nests 2 – Wetlands that do not contain Threatened or Endangered species; or raptor nests
		Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland	
		Northern Rocky Mountain Conifer Swamp	
		Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland	
		Rocky Mountain Lower Montane Riparian Woodland and Shrubland	
		Rocky Mountain Subalpine-Montane Riparian	

EFSC Habitat Type	EFSC Habitat Sub-type	ReGAP Ecological System[1]	Habitat Category
		Woodland	
	Scrub-shrub Woody vegetation less than 20 feet tall with willows, dogwood and other woody wetland species	Columbia Plateau Silver Sagebrush Seasonally Flooded Shrub-Steppe	1 – Wetlands containing Threatened or Endangered species; or raptor nests 2 – Wetlands that do not contain Threatened or Endangered species; or raptor nests
		North Pacific Shrub Swamp	
		Rocky Mountain Subalpine-Montane Riparian Shrubland	
	Other	Ruderal Wetland	2 – Wetlands that do not contain Threatened or Endangered species; or raptor nests 5 – Low-quality habitat
		Unconsolidated Shore	
Grassland, shrub-steppe and shrubland	**Desert Shrub** Communities on saline soils with shadscale, salt sage, or saltbush-greasewood mixture	Inter-Mountain Basins Greasewood Flat	1 – Washington ground squirrel colonies present 2 – Sensitive species present; or suitable Washington ground squirrel habitat adjacent to documented colonies 3 – Dominated by native species (greater than 75% ground cover is native) 4 – Mix of natives and non-natives, low quality understory (greater than 25% ground cover is native) 5 – Low-quality (weed-infested and/or highly disturbed) habitat. Less than 25% ground cover is native)
		Inter-Mountain Basins Mixed Salt Desert Scrub	
		Inter-Mountain Basins Playa	
	Native Grasslands Grassland areas with few shrubs (not irrigated or cultivated/planted)	Inter-Mountain Basins Semi-Desert Shrub-Steppe	1 – Washington ground squirrel colonies present 2 – Sensitive species present; or suitable Washington ground squirrel habitat adjacent to documented colonies 3 – Dominated by native species (greater than 75% ground cover is native) 4 – Mix of natives and non-natives, low quality understory (greater than 25% ground
		Columbia Basin Foothill and Canyon Dry Grassland	
		Columbia Basin Palouse Prairie	
		Columbia Plateau Steppe and Grassland	
		Northern Rocky Mountain Subalpine-Upper Montane Grassland	

EFSC Habitat Type	EFSC Habitat Sub-type	ReGAP Ecological System[1]	Habitat Category
		Rocky Mountain Subalpine-Montane Mesic Meadow	cover is native) 5 – Low-quality (weed-infested and/or highly disturbed) habitat. Less than 25% ground cover is native)
	Shrub-steppe with Big Sage Dominated by big sagebrush shrubs, with a variety of other species such as western wheatgrass, Idaho fescue, bitterbrush, basin wild rye.	Inter-Mountain Basins Semi-Desert Grassland Northern Rocky Mountain Lower Montane, Foothill, and Valley Grassland Inter-Mountain Basins Big Sagebrush Shrubland Inter-Mountain Basins Big Sagebrush Steppe Inter-Mountain Basins Montane Sagebrush Steppe	1 – Threatened or Endangered species present (this applies to all habitat types); raptor nests present; Washington ground squirrel colonies present; or greater sage-grouse lek locations present. 2 – Sensitive species present; suitable Washington ground squirrel habitat adjacent to documented colonies; high quality sage-grouse nesting and late brood-rearing habitat present; or big game winter range present 3 – Dominated by native species (greater than 75% ground cover is native) 4 – Mix of natives and non-natives, low quality understory (greater than 25% ground cover is native); or juniper encroachment into shrublands 5 – Low-quality (weed-infested and/or highly disturbed) habitat. Less than 25% ground cover is native)
	Shrub-steppe without Big Sage Shrub areas lacking big sagebrush but supporting other shrubs such as rigid sagebrush, bitterbrush, and rabbitbrush	Columbia Plateau Ash and Tuff Badland Columbia Plateau Low Sagebrush Steppe Columbia Plateau Scabland Shrubland Great Basin Xeric Mixed Sagebrush Shrubland Inter-Mountain Basins Active and Stabilized Dune Northern Rocky Mountain Montane-Foothill	1 – Washington ground squirrel colonies present 2 – Sensitive species present; suitable Washington ground squirrel habitat adjacent to documented colonies; or big game winter range present 3 – Dominated by native species (greater than 75% ground cover is native) 4 – Mix of natives and non-natives, low

EFSC Habitat Type	EFSC Habitat Sub-type	ReGAP Ecological System[1]	Habitat Category
		Deciduous Shrubland	quality understory (greater than 25% ground cover is native) 5 – Low-quality (weed-infested and/or highly disturbed) habitat. Less than 25% ground cover is native)
		Northern Rocky Mountain Subalpine Deciduous Shrubland	
		Recently burned grassland	
		Rocky Mountain Lower Montane Foothill Shrubland	
	Other	Introduced Upland Vegetation – Annual and Biennial Forbland	5 – Low-quality habitat
		Introduced Upland Vegetation – Annual Grassland	
		Introduced Upland Vegetation – Shrub	
Forest	**Mixed Grand fir/Douglas fir** Forests dominated by Douglas-fir and/or grand fir	Middle Rocky Mountain Montane Douglas-fir Forest and Woodland	1 – Raptor nests present; or old growth stands defined as "overmature" stands (37 or more trees 21+ in dbh/ha, 2 or more snags over 21 in dbh/ha, 2 canopy layers, overstory canopy closure of 10-40%, shrub-sapling layer cover over 40%, understory + overstory combined >70% cover, logs obvious on ground): Definition from Umatilla National Forest Plan, is essential and limited. 3 – Mature stands defined as mature stands (9-20.9 in dbh) (habitat important but not limited, has high restoration potential within lifetime of project) 5 – Grass-forb, Shrub seedling, Pole-sapling defined as Grass-forb, shrubseedling, pole-sapling (1-4.9 in dbh), young (5-8.9 in dbh) (not important, but with restoration potential present but lower than that of mature stands within the life of the project)
		Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest	
		Northern Rocky Mountain Mesic Montane Mixed Conifer Forest	
		Northern Rocky Mountain Western Larch Savanna	
		Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	
		Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	

EFSC Habitat Type	EFSC Habitat Sub-type	ReGAP Ecological System[1]	Habitat Category
	Monotypic Lodgepole Pine Forests dominated by lodgepole pine	Rocky Mountain Lodgepole Pine Forest Rocky Mountain Poor Site Lodgepole Pine Forest	1 – Raptor nests present; or old growth stands defined as "overmature" stands (37 or more trees 21+ in dbh/ha, 2 or more snags over 21 in dbh/ha, 2 canopy layers, overstory canopy closure of 10-40%, shrub-sapling layer cover over 40%, understory + overstory combined >70% cover, logs obvious on ground): Definition from Umatilla National Forest Plan, is essential and limited 3 – Mature stands (9-?? in dbh) (habitat important but not limited, has high restoration potential within lifetime of project) 5 – Grass-forb, shrub seedling, pole-sapling (1-4.9 in dbh), young (5-8.9 in dbh) (not important, but with restoration potential present but lower than that of mature stands within the life of the project)
	Mountain Mahogany Areas dominated by mountain mahogany	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland and Shrubland	3 – Dominated by mountain mahogany and often transitional between ponderosa pine and shrub-steppe communities
	Ponderosa Pine Woodlands and forests dominated by ponderosa pine	Northern Rocky Mountain Foothill Conifer Wooded Steppe Northern Rocky Mountain Ponderosa Pine Woodland and Savanna	1 – Raptor nests present; or old growth stands defined as "overmature" stands (37 or more trees 21+ in dbh/ha, 2 or more snags over 21 in dbh/ha, 2 canopy layers, overstory canopy closure of 10-40%, shrub-sapling layer cover over 40%, understory + overstory combined >70% cover, logs obvious on ground): Definition from Umatilla National Forest Plan, is essential and limited. 3 – Mature stands defined as mature stands (9-20.9 in dbh) (habitat important but not limited, has high restoration potential within

EFSC Habitat Type	EFSC Habitat Sub-type	ReGAP Ecological System[1]	Habitat Category
			lifetime of project) 5 – Grass-forb, Shrub seedling, Pole-sapling defined as Grass-forb, shrubseedling, pole-sapling (1-4.9 in dbh), young (5-8.9 in dbh) (not important, but with restoration potential present but lower than that of mature stands within the life of the project)
	Rocky Mt. Aspen Forests dominated by trembling aspen	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland Rocky Mountain Aspen Forest and Woodland	1 – Raptor nests present; or moist areas dominated by trembling aspen, essential and limited.
	Western Juniper Woodland Open woodlands dominated by western juniper	Columbia Plateau Western Juniper Woodland and Savanna	1 – Raptor nests present; or old-growth stands (defined as containing at least 6 junipers at least 18 inches dbh per acre) 4 – Juniper stands along rocky breaks and ridges 5 – Young juniper stands along rocky breaks and ridges with non-native understory
	Mixed Tamarack Mixed forest with dominant tamarack component	No Corresponding ReGAP classification within project area	1 – Raptor nests present; or old growth stands defined as "overmature" stands (37 or more trees 21+ in dbh/ha, 2 or more snags over 21 in dbh/ha, 2 canopy layers, overstory canopy closure of 10-40%, shrub-sapling layer cover over 40%, understory + overstory combined >70% cover, logs obvious on ground): Definition from Umatilla National Forest Plan, is essential and limited. 3 – Mature stands defined as mature stands (9-20.9 in dbh) (habitat important but not limited, has high restoration potential within lifetime of project) 5 – Grass-forb, Shrub seedling, Pole-sapling defined as Grass-forb, shrubseedling, pole-

EFSC Habitat Type	EFSC Habitat Sub-type	ReGAP Ecological System[1]	Habitat Category
			sapling (1-4.9 in dbh), young (5-8.9 in dbh) (not important, but with restoration potential present but lower than that of mature stands within the life of the project)
	Other	Harvested Forest – Tree Regeneration	5 – Low-quality habitat
		Introduced Upland Vegetation - Treed	
Agriculture	**CRP Lands** Planted to Grassland-steppe	CRP Lands	2 – Sensitive species present; or irrigated pastures and hay meadows within big game winter range 3 – CRP, planted to grassland-shrub steppe that provide important wildlife habitat 4 – CRP, planted to grassland-shrub steppe that lack later seral stage vegetation or are less important due to land management and topographic locale 5 – Orchards, Vineyards, Wheat Fields, Irrigated poplar plantations; or irrigated, grazed pasture and hay meadows. 6 – Agricultural lands with low potential to become productive wildlife habitat.
	Orchards **Vineyards** **Wheat Fields** **Irrigated Poplar Plantations**	Cultivated Cropland	
	Irrigated Pastures and Hay **Meadows**	Pasture/Hay	
		Ruderal Upland - Old Field	
Bare ground, cliffs, talus		Barren Land (Rock/Sand/Clay)	1 – Critical bat habitat 2 – Sensitive species present or cliffs with potential raptor nests 3 – Cliffs and talus slopes and rock outcrops of significant size 6 – Bare ground
		Inter-Mountain Basins Cliff and Canyon	
		Quarries Strip Mines and Gravel Pits	
		Rocky Mountain Cliff, Canyon and Massive Bedrock	
Developed		Developed, High Intensity	2 – Non-jurisdictional wetlands; ditches

EFSC Habitat Type	**EFSC Habitat Sub-type**	**ReGAP Ecological System**[1]	**Habitat Category**
		Developed, Low Intensity Developed, Medium Intensity Developed, Open Space (Parks, Golf Courses, Open Space)	containing sensitive species; or fish bearing ditches 5 – Roads to be decommissioned; or ditches with dirt or gravel channel 6 – Long-term roads; industrial areas; residential areas; or ditches with concrete channel

[1] Ecological Systems classification from ReGAP land cover data (2008) and NatureServe community descriptions (http://www.natureserve.org/explorer/servlet/NatureServe?init=Ecol).

APPENDIX G

AGENCY COMMENTS AND RESPONSES

Agency Comments on the February 2009 Draft B2H Biological Survey Work Plan (Plan)

Comment ID	Page #	Section #	Agency/ Commenter	Comment	Page Number or Section Number where Comment is Addressed
1	ES-4	Exec Sum	BLM, G. Wigglesworth	"Please define or include the reference in which the BLM "intuitive controlled" survey method is derived from."	Section 3.2.5
2	ES-4	Exec Sum	BLM, G. Wigglesworth	"Please address attributes of botanical surveys that will be collected by the contractor for each land owner whether it be federal, state, or private. Negative survey data will also need to be listed as collected information via GPS."	Appendix A
3			BLM, G. Wigglesworth	"Please refer to Brent Grasty's input regards use of data collection standards for GeoBOB."	Appendix A
4	App D	Appendix	BLM, G. Wigglesworth	"As addressed in the Level 1 meeting February 17th in La Grande, OR previously submitted species known to occur on the preferred site are not within the Draft Biological Survey Work Plan and thus need to be added."	Entire document
5	App D	Appendix	BLM, G. Wigglesworth	"Within the Appendix D chart it is unclear whose land the surveys for Federal and State Listed Plants will occur on. An additional Land Ownership column would be helpful to clarify this point."	Sections 2.2 and 3.2
6	ES-2	Exec Sum	ODFW, C. Fagan	"The Department is concerned with the term "incidental observation species" and "incidental wildlife". These species are Oregon state sensitive species and have been identified by the Department as requiring field surveys. Some of these species can be surveyed for concurrently with other species. Recording incidental observations, however, will not be sufficient."	Term changed to Terrestrial Visual Encounter Surveys; Section 3.1.9
7	ES-2	Exec Sum	ODFW, C. Fagan	"URS erroneously refers to the survey width of raptor nest locations as 0.5 miles on both sides of the B2H centerline. This should be modified to 1.0 miles on both sides of the centerline (2 mile total width)."	Section 3.1.3
8		Exec Sum	ODFW, C. Fagan	"Pygmy rabbit, long-billed curlew, flammulated owl, sharp-tailed grouse, peregrine falcon, three-toed woodpecker, northern waterthrush, and Columbia spotted frog should be added to the executive summary table outlining wildlife surveys."	Executive summary; and Sections 3.1.2, 3.1.6, 3.1.7, 3.1.8, and 3.1.9
9		Exec Sum	ODFW, C. Fagan	"Significant differences exist between this executive summary table and the similar table (3-1) on page 16. These differences need to be remedied."	Executive Summary Table, and Table 1
10	2	1.2	ODFW, C. Fagan	"The survey work plan indicates that approximately 400 miles of access roads will be surveyed in addition to the preferred route. According to the survey plan, access road surveys will only occur with the 14 to 16-foot surface disturbance width. The Department does not believe a survey of surface disturbance width is sufficient to assess potential effects from road construction and maintenance. Therefore, the Department recommends that surveys along access roads and other project features be conducted similar to surveys for the preferred transmission line route."	Section 1.2
11	2	1.2	ODFW, C. Fagan	"This section should be modified to include that surveys will be conducted along alternative routes when identified or adopted. The Department expects the same survey effort to occur along preferred and alternative routes to ensure sufficient information is collected to adequately assess each route and determine a preferred route."	Section 1.2 (BLM required surveys will be conducted for each alternative route and project features. EFSC required surveys will be conducted on all ownership types in Oregon for routes and project features that will be submitted in the application for site certificate)
12	6	2.0	ODFW, C. Fagan	"The Department supports the approach being taken for vegetation and habitat mapping and believes that this approach **should,** not would as indicated in the work plan, meet the precision level needed for compliance with our Fish and Wildlife Habitat Mitigation Policy (OAR 635-415). There may be some level of uncertainty and potential for modifications and changes as surveys proceed."	Entire document
13	8	2.2.1	ODFW, C. Fagan	"Vegetation and habitat mapping will also need to occur along access roads and around other proposed project features such as staging and fly yards."	Section 2.2
14	14-15	3.1	ODFW, C. Fagan	"The Department would like this section of the survey report expanded to better explain what will occur prior to line construction if private land access is not granted to conduct surveys, per discussions at our February 17, 2009 meeting."	Section 1.4

Comment ID	Page #	Section #	Agency/ Commenter	Comment	Page Number or Section Number where Comment is Addressed
15	15-16	3.2	ODFW, C. Fagan	"A comprehensive reconnaissance survey will need to occur in all areas potentially affected by construction of the transmission line, including access roads, staging areas, and fly yards and along alternative routes."	Section 1.2
16	16	3.2	ODFW, C. Fagan	"Table 3.1 (B2H Schedule for Completing Biological Field Surveys 2009) is incomplete. A large number of species identified by the Department as requiring field surveys are not included and, as pointed out earlier, this table is significantly different from the table presented in the Executive Summary. Species missing from Table 3-1 are burrowing owl, grasshopper sparrow, loggerhead shrike, long-billed curlew, sage sparrow, sagebrush lizard, white tailed jackrabbit, pygmy rabbit, flammulated owl, sharp-tailed grouse, peregrine falcon, three-toed woodpecker, northern waterthrush, and Columbia spotted frog. Also missing are sensitive species habitats as requested in our meeting January 16, 2009. These include rock outcroppings, talus slopes, cliffs, caves, riparian zones, mature timber stands and permanent and seasonal ponds, lakes, wetlands, and springs."	Executive Summary Table, and Table 1
17	17	4.0	ODFW, C. Fagan	"In previous meetings and correspondence, the Department identified additional species requiring field surveys. Some of these species can be surveyed for concurrently with other species, not incidentally to other species. These species are identified in the previous paragraph. For those species that will be surveyed for concurrently with other species, survey protocols need to be included or additional information added to survey protocols already included in the work plan. For example, the Department has indicated that surveys for sage sparrows, grasshopper sparrows, and burrowing owls can occur concurrently with, or be incorporated into, surveys for Washington ground squirrels. However, a survey protocol is needed to document how surveys for Washington ground squirrels will be used to survey for and document these additional species. Again, the Department does not support the term "incidental species". These species are to be surveyed for concurrently not incidentally to other species. A more suitable title would be concurrent species surveys."	Section 3.1.9
18	17	4.0	ODFW, C. Fagan	"At prior meetings, URS indicated that presence of some species will be inferred based on habitat type mapping. These species need to be identified in the survey work plan."	Sections 2.1.1.1, 2.1.3, 3.3.3, and 3.4.1
19	18	4.1	ODFW, C. Fagan	"Table 4-1 is incomplete and needs to be modified to include species and segments to be surveyed identified in this and previous correspondence from the Department. Differences between this table and previous tables in the work plan need to be reconciled."	Executive Summary Table, and Table 1
20	18-21	4.1.1	ODFW, C. Fagan	"The Department supports the proposed Washington ground squirrel survey protocol. It is consistent with other projects and is used by the Department for determining presence. However, species that will be surveyed for concurrently need to be identified and survey methodology provided within this or a separate protocol. Any additional habitat to survey should also be identified."	Section 3.1.9, Appendix B-9, and Appendix E
21	29-30	4.1.5	ODFW, C. Fagan	Sage-grouse-" ODFW believes the survey methodology proposed is good, but requires a few minor modifications. The protocol should expand on what will occur when a bird or birds are located or flushed, such as ground visits to document the lek."	Section 3.1.2, and Appendix B-2
22	29-30	4.1.5	ODFW, C. Fagan	Sage-grouse - "The survey area also needs to be expanded to include suitable habitat from Craig Mountain to the Baker County line, and contiguous blocks of sage brush."	Sage-grouse survey polygons were provided by ODFW staff for input on survey locations. Additional areas were added (i.e. north of the Baker/Union county line to Craig Mtn). Final survey locations will be confirmed with ODFW prior to the initiation of surveys. In addition, ongoing coordination will occur with the agencies to ensure that survey protocols and areas are appropriate. Section 3.1.2, Appendix B-2, and Section 3 Map Set found in Volume II of the BSWP.
23	30	4.2	ODFW, C. Fagan	"The Department identified sensitive habits that should be avoided as part of the project area and, if unavoidable, should be surveyed during the appropriate time of year and day to identify presence or absence of associated sensitive species. These habitats are not expected to occupy a large area of the proposed project. These sensitive habitats need to be better defined in the work plan and include habitats from the Departments additional survey information provided to URS on January 16, 2009."	Sections 2.2, and Section 3.4.1
24	34-45	5.0	ODFW, C. Fagan	"Surveys in Oregon for state listed plant species should occur where habitat is deemed suitable, not based on known occurrences present within the county."	Section 3.2

Comment ID	Page #	Section #	Agency/ Commenter	Comment	Page Number or Section Number where Comment is Addressed
25	48	6.3	ODFW, C. Fagan	"Wetlands will need to be delineated along access roads, other project features, and along alternative routes in addition to the preferred transmission line route."	Sections 3.3, and 4.3
26	48	6.3	ODFW, C. Fagan	"If impacts are expected to wetland habitats, regardless of jurisdiction, additional species surveys may be required, particularly for amphibian species."	Sections 3.3, 3.4.1, and 4.3
27	App D	Appendices	ODFW, C. Fagan	"Appendix D should be updated based on information contained in this letter and from previous discussions occurring between URS and the Department."	Appendix E (was originally Appendix D in older versions of the document)
28	General	General	ODFW, C. Fagan	"The survey work plans needs to describe in detail what types of surveys and information will be collected and reported for alternative routes. At the February 17, 2009 meeting, URS indicated that the applicant was required to treat alternative routes the same as the proposed routes in the EFSC process. However, URS also indicated that only available information would be used for evaluating alternative routes in the draft EIS. The Department is concerned that the difference in information provided for the preferred route and alternatives in the draft EIS will not allow an adequate assessment and comparison of the alternatives, preventing the Department from making a recommendation on a preferred route and potentially delaying project permitting. According to the Council on Environmental Quality's "A Citizen's Guide to the NEPA, Having Your Voice Heard" the identification and evaluation of alternative ways of meeting the purpose and need of the proposed action is the heart of the NEPA analysis. Agencies are obligated to evaluate all reasonable alternatives or a range of reasonable alternatives in enough detail so that a reader can compare and contrast the environmental effects of the various alternatives. Without survey information from alternative routes, the draft EIS may not allow sufficient comparison of various alternatives."	Entire document
29	NA	4.0	BLM, J. Holderman	"I told Jarod and Aaron that one of the proposed alternative routes would pass through potential habitat for the Southern Idaho ground Squirrel (*Spermophilus brunneus endemicus,* SIDGS) a candidate species for listing. Though the majority of the proposed route in Idaho does not fall on BLM lands they should attempt to gain access to conduct surveys if this is a viable alternative. I did mention to him that the majority of private land has not have been surveyed along this proposed route so if no SIDGS locations show along this route it does not mean they don't occur there. Transmissions lines that provide raptor perches could impact SIDGS populations due to increased predation."	Sections 1.4 and 2.2
30	NA	NA	BLM, J. Holderman	"At this time until I know which alternative routes they are considering carrying forward for analysis its difficult to know if they need to consider additional wildlife surveys."	Comment noted
31	NA	4.0	BLM, M. Yzquerdo	"There were a few corrections on Idaho Power (IP) proposed biological survey work plan. The following species will need surveying within the BLM lands: **SPECIES NEEDED TO BE ADDED** • Pygmy rabbit (Farewell Bend through Ladd Canyon) within the right-of-way. • White-tailed jack rabbit (around Farewell Bend through Pleasant Valley) within the right-of way • All bat species • Columbia spotted frog (in all wetland areas)"	Sections 2.1.3, 3.1.8, and 3.1.9; Appendix B-8, B-9, and B-11
32	NA	4.0	BLM, M. Yzquerdo	"**AREA(S) THAT NEED TO BE ADDED** • Northern goshawk (if the line will extend to Lookout Mountain or Pedro Mountain areas 2mi buffer from line) • Information on proposed alternative routes"	Section 3.14
33	NA	NA	BLM, M. Yzquerdo	"I looked at the proposed alternative routes and all alternative routes were not mapped to potential species to survey. If this is the case, I would need to see the entire routes that are being considered because different wildlife species may exists within the alternative routes. Hopefully, IP can provide that information."	Comment noted. The location of the Proposed Route and route alternatives are provided in the latest version of the Work Plan.

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34	NA	4.1.5	BLM, M. Yzquerdo	"I also noticed that some areas cross over or within sage-grouse lek buffers (Virtue Flat, Magpie Peak) and that goes against State direction for sage-grouse guidelines (2mi buffer). Those areas will have to be re-evaluated."	Within Oregon, each area that intersects a sage-grouse lek 2-mile buffer will be evaluated on a case-by-case basis to explore visual obstructions between the lek and t-line, habitat quality within the buffer, current and historical use of the lek, and existing infrastructure near the proposed facility. These evaluations will be coordinated with the agencies.
35	NA	4.0	BLM, M. Caviness	"As we discussed, surveys for the following species need to be conducted on BLM lands: • Pygmy rabbit • Columbia spotted frog • peregrine falcon • all bat species (acoustic surveys for bats would be adequate)."	Sections 2.1.3, 3.1.3, 3.1.8, and 3.1.9
36	NA	4.0	BLM, M. Caviness	"The Malheur field office will be coordinating peregrine falcon surveys this spring in areas that have potential nesting habitat that also occur within the B2H project area. The data collected from this survey effort can be used for the B2H project, however, all proposed powerline sites may not be covered with our in-house surveys and additional surveys by the contractor will be needed. Prior to these surveys we can provide a habitat analysis report identifying potential nesting sites for peregrines with the understanding that this information is sensitive information that cannot be shared or appear in public documents."	Section 2.1
37	NA	7.0	BLM, M. Caviness	"In review of the Data Collection section of the survey report I noticed that the document does not identify the data elements to be recorded during species surveys. This needs to be clearly defined and agreed to by the agencies. There should be a coordinated meeting with all agencies to agree upon standards and criteria required for species survey data that best meet each agency's database requirements. We would like to receive BLM survey data in the format of GeoBob (Geographic Biota Observations). A data dictionary can be provided to the contractor complete with all data requirements. I would refer to Brent Grasty's comments on this section for more specific GPS standard requirements. We require both surveyed areas and located sites collected be delivered to the agency. This should include spatial data showing where target species surveys occurred but no species were found as well as those sites where the species were found to occur." Document does not identify the data elements to be recorded during species surveys. This needs to be clearly defined and agreed to by the agencies. Would like to receive BLM survey data in the format of GeoBOB.	Appendix A; Appendix B-1 through B-11
38	NA	General	BLM, M. Caviness	"Finally, it was unclear during our last meeting that one of the purposes of the meeting was to discuss using existing data in the draft EIS. Some of these areas have never been surveyed for target species so there is no existing information on species occurrence. Most of the data we have is from incidental observations and not formal surveys and therefore we could not conclude a species is not present just from a lack of existing data. In this case we would have to assume that the species is present if there is suitable or potential habitat. Because this topic wasn't fully addressed in our last meeting, I believe it is necessary to reconvene to discuss what information we should put into the draft EIS."	Section 2.1, and Sections 3.0 and 4.0
39	NA	7.0	BLM, B. Grasty	Numerous comments, please see document "B2H BLM Comments on URS BSWP February 2009 rev 2.24.09."	Comment noted
40	2	1.2	EFSC Biologist, Golder Associates	"The work plan describes project features that will be surveyed in addition to the 250-foot buffer on either side of the preferred route. It indicates that approximately 400 miles of access roads will be required for the project and will be surveyed for target species. No surveys are described for buffer areas on either side of the proposed access roads. Does a survey of the road centerline adequately depict the potential effects of the road on wildlife and vegetation resources?"	Section 1.2

Comment ID	Page #	Section #	Agency/ Commenter	Comment	Page Number or Section Number where Comment is Addressed
41	2	1.2	EFSC Biologist, Golder Associates	"The study area is defined for each species in relation to the centerline of the preferred route; however, it is unclear what studies will occur along proposed alternative routes. Based on comments from Stacey Duncan and Aaron English at the February 17th meeting, Idaho Power may rely on existing data to evaluate alternative routes or may implement studies described in this work plan. I recommend clarification of the intensity of studies that will occur along alternative routes."	Section 1.2 and Table 4
42	6	2.0	EFSC Biologist, Golder Associates	"Vegetation mapping will need to take place along access roads and staging/fly yards."	Section 2.2
43	6	2.0	EFSC Biologist, Golder Associates	"Will the corrections to the map based on ground truthing be applied only to polygons that have been field verified, or will the results of ground truthing be extrapolated? (i.e. if 20% of type A are visited and found to actually be type C on the ground, will all type A polygons be re-mapped as type C or only the 20% visited?)"	Section 2.2
44	15	3.2	EFSC Biologist, Golder Associates	"A reconnaissance field survey needs to include all affected areas (access roads, fly yards and staging areas) if it is intended to ground truth vegetation mapping and identify potential habitat for target species."	Section 2.2
45	17	4.1	EFSC Biologist, Golder Associates	"Does ODFW concur that the list of incidental species to be surveyed for is adequate? Other state sensitive species likely use affected areas."	Section 3.1.9 and Appendix E
46	25	4.1.4	EFSC Biologist, Golder Associates	"Based on comments from the February 17th meeting, is the habitat identified for great gray owl surveys sufficiently broad?"	Mark Penniger (with USFS) was contacted on 3/30/09 to clarify survey areas. He agreed that the proposed survey area was adequate for nesting owls.
47	29	4.1.5	EFSC Biologist, Golder Associates	"Based on comments from the February 17th meeting, sage-grouse lek surveys should take place north of the Baker/Union County line, between the preferred route and Craig Mountain."	Sage-grouse survey polygons were provided by ODFW staff for input on survey locations. Additional areas were added (i.e. north of the Baker/Union county line to Craig Mtn). Final survey locations will be confirmed with ODFW prior to the initiation of surveys. In addition, ongoing coordination will occur with the agencies to ensure that survey protocols and areas are appropriate. Section 3.1.2, Appendix B-2, and Section 3 Map Set found in Volume II of the BSWP.
48	29	4.1.5	EFSC Biologist, Golder Associates	"Based on comments from the February 17th meeting, the window for sage-grouse surveys should be flexible to account for seasonal conditions. Idaho Power surveyors should consult with local ODFW biologists on sage-grouse activity."	Section 3.1.2 and Appendix B-2.
49	29	4.1.5	EFSC Biologist, Golder Associates	"Based on comments from the February 17th meeting, aerial sightings of occasional birds should be followed-up with ground searches (or lek presence should be assumed)."	Survey methods for sage-grouse have been modified based on recommendations obtained from the BLM and ODFW.
50	30	4.2	EFSC Biologist, Golder Associates	"The definition of "suitable special status wildlife habitats" needs to be more clearly defined to explicitly include ODFW's requested habitats (i.e. talus, wetlands, mature stands)."	Section 2.2.3
51	30	4.2	EFSC Biologist, Golder Associates	"Route reconnaissance may take place at any time during the year, including times when sensitive species may be less active or dormant. Are incidental observations adequate to evaluate effects to sensitive species where targeted surveys are not used?"	Yes. We are only documenting presence/absence. The surveys under the Terrestrial Visual Encounter Surveys will document observations of species as well as habitat type and condition. This habitat-based approach will be of more use than species targeted surveys because a single season study could likely miss special status species occurrence. Section 3.1.9.
52	30	4.2	EFSC Biologist, Golder Associates	"How will access road alignments be surveyed for incidental species and their habitats? Wetland species in particular will likely face more significant impacts from roads than from towers."	Sections 3.1.9, 3.3, 4.0, and Appendix B-9
53	44	5.1.5	EFSC Biologist, Golder Associates	"Based on comments from the February 17th meeting, provisions for preventing the spread of noxious weeds should be included for all surveys (i.e. clean field gear/vehicles before traveling to a new site)."	The Plan of Development (POD) will include measures that Idaho Power and its contractors will implement to minimize the spread and establishment of noxious weeds. Survey crews will wash all vehicles (including ATVs) at a commercial facility prior to driving them off-road while conducting surveys. Additionally, crews will minimize driving through large infestations of noxious weeds to the extent possible.
54	48	6.2 and 6.3	EFSC Biologist, Golder Associates	"If wetland identification is limited to the reconnaissance crew staking the preferred alternative centerline, wetlands and streams that may be affected by access roads will be overlooked."	Sections 2.2, 3.3, and 4.3
55	48	6.2 and 6.3	EFSC Biologist, Golder Associates	"If disturbance is planned within 100-feet of a wetland, and delineation is initiated, I recommend a "basic amphibian inventory" at a minimum (Olson, Leonard and Bury 1997)."	Sections 2.1.2, 3.3, and 4.3

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56	48	6.2 and 6.3	EFSC Biologist, Golder Associates	"Surveys for amphibians are generally recommended in appropriate habitats within two-kilometers (1.2 miles) of a proposed disturbance, because nearby breeding sites are often part of the same population. Breeding activity may shift among sites over time, and the population's long-term viability may depend on a wetland that is not occupied during the year that surveys occur."	Sections 3.3, and 4.3
57	48	6.2 and 6.3	EFSC Biologist, Golder Associates	"Amphibian surveys should be considered in wetlands that are not jurisdictional under federal and state standards (i.e. isolated, artificial wetlands under 1 acre). These sites may provide breeding habitat for western toad. Toads have been known to breed in stock watering ponds."	Protocol level surveys will be conducted in wetlands for the spotted frog, which should be able to detect other amphibian species as well. Continued coordination with agencies regarding surveys will occur. Table 1, Section 3.1.8 and Appendix B-8.
58	ES-3	Exec Sum	USFWS, S. Anderson	"Top of page ES-3 states that greater sage-grouse helicopter lek surveys will be conducted between March 30 and April 17 at locations specified by ODFW specialists. This seems like a very narrow window and depending on the weather, these surveys could span March, April, and into May. We want to make sure that you do not miss peak counts, which could occur early or late, again depending on the weather."	Section 3.1.2, and Appendix B-2
59	NA	4.0	USFWS, S. Anderson	"As per our 12/15/2008 email providing information for recommended surveys for Oregon and Idaho species associated with the B2H Project: The Columbia spotted frog was not included in your draft."	Section 3.1.8 and Appendix B-8
60	NA	5.0	USFWS, S. Anderson	"Shining flat sedge (Cyperus bipartitus) in Idaho was missing from the plant list."	This species has not been included in the Work Plan as it is not considered an Idaho BLM/USFS sensitive species.
61	13	2.3.4	USFWS, S. Anderson	"Bottom of page 13, under "Final Habitat Maps", third bullet refers to greater sage-grouse leks. The Service strongly recommends that you also utilize ODFW's sage-grouse high and moderate habitat categories (August 2005 Greater Sage-Grouse Conservation Assessment and Strategy for Oregon). We recommend staying out of the high and medium viability habitats as these encompass vital rearing and wintering habitat."	Section 2.2.3
62	NA	4.0	USFWS, S. Anderson	"Bottom of page 13, under "Final Habitat Maps", third bullet refers to greater sage-grouse leks. The Service strongly recommends that you also utilize ODFW's sage-grouse high and moderate habitat categories (August 2005 Greater Sage-Grouse Conservation Assessment and Strategy for Oregon). We recommend staying out of the high and medium viability habitats as these encompass vital rearing and wintering habitat."	Section 2.2.3
63	NA	4.0	IDFG, R. Ward	From email R. Ward to J. Blades B2H Survey 3/6/2009: 1. In Owyhee county add Great Basin collared lizard, groundsnake, long-nosed snake, Columbia Plateau ground squirrel, and Merriam's shrew. 2. At major river crossings (Boise, Snake) add surveys for bald eagles and migratory shore birds, esp. shorebirds, cranes, and waterfowl.	All species will be recorded during concurrent species-specific protocol surveys or TVES (Table 1 and Section 3.19). In addition, ongoing coordination will occur with the agencies to ensure that survey protocols are appropriate.

BLM Comments on the May 2009 Draft B2H Biological Survey Work Plan (Plan)

Comment ID	Page #	Section #	Agency/ Commenter	Comment	Page Number or Section Number where Comment is Addressed
1	NA	NA	D. Mason	If there is a possibility that an alternative may go into Burns and Prineville Districts as well as Malheur NF and Umatilla, I suggest they get a copy of this document to review and participate in the Sept. meeting as well. After attending the public meeting in Baker this week and talking with IPC staff, it sounds as if this is a real possibility.	Page 1, second paragraph of Section 1.0
2	NA	NA	D. Mason	There is no data collection planned, mentioned or provided regarding fish. I realize the alternatives are still open, but there are details in the document for everything except fish. The final document should include what will be done for each phase for fish data analysis, inventory and impact assessment. Actual surveys may not be necessary, depending on where the route goes, but the plan must be in place. There are multiple listed species, regardless of route choices. Evaluation and consultation is required if the project is anywhere within a Category 1 watershed. Category 1 watersheds are those containing listed fish. We have lots.	Sections 2.1.2 and 3.3.3
3	NA	NA	D. Mason	Buffers of streamside vegetation and other management actions in Category 1 watersheds will need to meet PACFISH and INFISH and the Interagency Biological Opinions. This should be stated in the fish section yet to be written.	Section 2.1.2
4	1-10	1.1	D. Mason	Survey details seem to use a lot of aerial surveys (Sage-grouse, raptors). Details of how to conduct these were spelled out in ODFW comments provided in March 2009. Any of these aerial surveys will need to comply with ODFW and IDFG (if provided) standards and procedures.	Appendix B-2 and B-3
5	NA	NA	D. Mason	BLM cannot 'approve' this document until ESA consultation with NOAA and FWS is completed and concurrence is reached with ODFW and IDFG. Therefore, it is my recommendation that they be provided a copy of the document very soon to allow at least 2 -3 weeks review prior to a meeting.	Comment Noted. Staff from NOAA Fisheries and FWS, ODFW, and IDFG have received previous versions of this work plan and are part of the Biological Working Group.
6	3-10	Table 1	M. Caviness	I don't see any mention of using the GeoBob database to collect data or about using the existing data that already exists in GeoBob.	Appendix A
7	3-10	Table 1	M. Caviness	I also do not understand why the comment in phase III "Follow-up surveys of modifications to route access roads, or lay down area prior to constructions" is only listed for some species and not all. These surveys should be conducted for all species.	Section 4.0
8	3-10	Table 1	M. Caviness	Also, preconstruction aerial surveys to check for active nests should be done for goshawks. (Other species are covered, but goshawks were not).	Section 3.1.4
9	3-10	Table 1	M. Caviness	Surveys for Columbia spotted frogs should occur in the phase II data collection. This is a candidate species with FWS and our GeoBob database shows site occurrences in the general area of one of the proposed routes. Clearance surveys of potential habitat that occurs within tower footprints, access road footprints and other disturbance areas should be conducted before construction.	Section 3.1.8
10	3-10	Table 1	M. Caviness	There is a search protocol for pygmy rabbits and burrows that should be implemented during the phase II construction. The method of data collection listed is not clear and does not appear to follow the protocol for doing pygmy rabbit surveys. In addition, there should be follow-up surveys for pygmy rabbits during phase III if any modification to the route, access areas or lay down area changes. (This should be the same verbiage that exists for most species and that I recommend be there for every species as mentioned above).	Sections 3.1.9 and 4.0; Appendix B-10 and B-11
11	3-10	Table 1	M. Caviness	I don't see any mention of bats, mountain quail, bald eagles or some of the other species that we provided comment on and listed as needing to be considered. It is unclear whether or not these species were meant to be in the category "Terrestrial Visual Encounter Surveys" found on page 6. A list of those species we provided that need to be recorded should be listed in an appendix. These species are in the database that Brent Grasty has been working on and intends to provide to the contractor prior to surveys. The list of species and survey protocols should be included in this study plan.	Section 2.1.3 (Bats) Section 3.1.9 (quail) Section 3.1.3 (bald eagles) Appendix E (all species)

Comment ID	Page #	Section #	Agency/ Commenter	Comment	Page Number or Section Number where Comment is Addressed
12	NA	Appendix E	M. Caviness	Appendix E is not a complete list of BLM special status species and is lacking occurrence information for some species on the Vale district. Please refer to the special status species list the Vale district biologists provided. Among the species not addressed are mountain quail and bats.	Appendix E.
13		2.3, 3.1	M. Caviness	The species list under "Wildlife Field Surveys" for site specific surveys is not complete. We discussed which species should be surveyed. I am not sure why these species were selected and others were not. The list has some species of birds and reptiles, but not others. What criteria were used to select these species and deselect those that were previously discussed?	Coordination with the agencies was utilized to develop survey protocols and species lists. See Appendices B, C, and E.
14	NA	2.3	M. Caviness	Coordination with ODFW needs to occur prior to the planning of any aerial surveys. Surveying for raptors and grouse during these important reproductive periods can be very disrupting to the birds. ODFW has specific protocols for doing these types of surveys. These protocols are species specific on methods and timing. ODFW provided these protocols and requirements in their initial comments, but there seems to be some inconsistencies in the document. It is unclear as to why we are doing lek surveys for sage grouse. ODFW has lek attendance information and specific requirements for what is considered an occupied lek versus unoccupied leks. In addition, the BLM has policy that states how far power lines and associated facilities should be from leks. I am also unclear as to why there are two flights for lek surveys. I understand surveying the project area and survey corridor and looking for new leks, but I don't understand the wording on "active" leks, especially considering the direction given by ODFW on criteria for classifying a lek as "inactive" or unoccupied (ODFW wording). The last sentence under 2.3.2 "The objective of the greater sage-grouse surveys is to identify previously unknown active leks" is unclear. You are surveying to document any new leks. The word "active" is just an unneeded adjective.	Section 3.1.2 and Appendix B-2
15	NA	2.3.2	M. Caviness	Other habitat types that are used by sage grouse during different life cycle stages should also be considered when doing surveys. Impacts to brood-rearing and winter habitat should be considered in the EIS analysis. The buffer required around leks helps in protecting the nesting and brood-rearing habitat, however, occurrences of broods during the ground surveys should be documented and those important areas and habitats should be avoided, if possible, or mitigated.	Section 2.2.3 (i.e., sage-grouse habitat models (including brood-rearing and winter habitats) will be included in the habitat mapping process and ODFW habitat categorization process)
16	NA	NA	M. Caviness	I believe that the Burns field office should be involved in the review based on rumors and previously identified routes crossing into that district. The proposed route I saw goes through an area with a number of leks and other special status species occurrences.	Continued coordination will occur with affected agencies throughout the NEPA process.
17	1-10	1.1	M. Caviness	In Table 1 for pygmy rabbits under phase 2 there is a comment to "see below", but no information to follow up. Surveys for pygmy rabbits should follow the protocol developed by Ulmschneider, et al. Surveys for pygmy rabbits do not just include rabbit sightings. Burrows and droppings are considered as well. Any burrows found should be mapped and those areas avoided. This could occur in phase 3 if a proposed route is going near a burrow or other positive sighting. Please contact me if you need a copy of the survey protocol for pygmy rabbits.	Section 3.1.9 and Appendix B-11
18	NA	NA	M. Caviness	As stated above and at previous meetings, there are other species that should be included in the terrestrial encounter surveys. The list that the BLM, FS and ODFW provided include these as does the information that Brent Grasty is sharing with the database he created to capture field data in the format consistent with GeoBob.	Section 3.1.9; Appendix A, and Appendix E
19	1-10	1.1	M. Caviness	Under existing data in Table 1 please add the agencies (BLM, FS). We are providing some information of documented species sightings that should be incorporated in Phase 1.	Table 1
20	NA	NA	M. Caviness	The Forest Service should review this plan for those forest dwelling species that don't occur on BLM lands. In addition, the agencies should be consulted and agree on survey protocol for those species that overlap jurisdictions.	Comment noted. Forest Service has been included in the project's review. In addition, coordination with the Forest Service was utilized to develop the species lists. See Appendices B, C, and E.

Comment ID	Page #	Section #	Agency/ Commenter	Comment	Page Number or Section Number where Comment is Addressed
21	29	3.1.7	M. Caviness	Under 3.1.7 in regards to the burrowing owl, it seems that potential habitat for this species is already being identified for specific segments of the project using GAP. Isn't this premature since we don't have an established route yet? Not sure why this information is in the document for this species only. I recommend omitting it and replacing it with the general survey statement of protocol that you have for the other species based on specific habitat needs.	Section 3.1.9.
22	33-34	4.2	M. Caviness	Under Survey Methods for spotted frogs it is unclear what parts of the protocol you are going to use for survey efforts. You describe the different methods under the protocol, but you do not identify which survey method you are going to use. There should be some coordination with the Fish and Wildlife Service on these surveys as the Columbia Spotted frog is a candidate species. Identifying tadpoles and juvenile amphibians can be somewhat difficult and should be done with someone who is experienced with species identification.	The agencies have provided us with a spotted frog protocol (Appendix B-8). This protocol would be used during surveys.
23	NA	NA	J. Holderman	Candidate ground squirrel called the Southern Idaho Ground Squirrel (*Spermophilus brunneus endemicus).* If any of the transmission line (and it looks like it could from the map) occurs north of the Payette River the proposed route would fall within this species range. Surveys should be conducted for Southern's. If any of the route falls north of Council Idaho (I don't think it does, but they seem to keep changing the route so I'm not for sure) then surveys need to be conducted for Northern Idaho Ground squirrel (*Spermophilus brunneus*) a listed species.	Surveys would be conducted if the Project crosses this species range. Otherwise, any individuals occurring outside of their known range would be identified during TVES.
24	21-22	2.4	G. Wigglesworth	*'Surveys in Oregon and Idaho will be conducted for listed and candidate species **where both** suitable habitat is found within the survey area and known locations occur within the county or watershed.'* This statement implies that the coupling of habitat and known occurrences render a survey, not each individually. Can this be stated to read '*Surveys in Oregon and Idaho will be conducted for listed and candidate species where suitable habitat is found within the survey area and where known locations occur within the county or watershed.'*	The coupling of habitat and known occurrence within a county or watershed will be used to identify survey areas. Performing surveys throughout a county or watershed outside of potential habitat may not be efficient. Performing surveys in potential habitat outside of the known range of the species may not be efficient.
25	NA	2.4.2	G. Wigglesworth	Add geographic known and suspected occurrence areas.	Comment noted.
26	NA	2.4.3	G. Wigglesworth	Add geographic known and suspected occurrence areas. The following reference may be helpful: Colket, B. 2008. Slickspot Peppergrass (*Lepidium papilliferum*) Field Survey and Predictive Distribution Modeling. Idaho Natural Heritage Program. How will *Spiranthes diluvialis* be addressed? USFWS considers all of Idaho to be potential habitat for this species even though there are no documented occurrences in Owyhee County.	Reference provided will be reviewed for inclusion in the survey plan. See response to comment 20 regarding geographic distribution. *Spiranthes diluvialis* is not listed by the USFWS for Owyhee County in Idaho or for the State of Oregon. BLM IM ID-2003-057 does not list this species for the Lower Snake River District. Therefore, it was not included in this plan.
27	22	2.4.4	G. Wigglesworth	USDA/USDI 1998 not listed in references.	Page 45 of Section 5
28	31	3.2.2	G. Wigglesworth	USDA/USDI 1998 not listed in references.	Page 45 of Section 5
29	NA	APPENDIX C-2	G. Wigglesworth	Known geographic range for each species should be listed. Currently only a few species have this information.	Comment noted. Information on known and potential occurrences from previous versions of the survey plan was erroneously included in this version. Statement was removed.

Agency Comments on the October 2010 Draft B2H Biological Survey Work Plan (Plan)

Comment ID	Page #	Section #	Agency/ Commenter	Comment	Page Number or Section Number where Comment is Addressed
1	NA	Data Collection	BLM	BLM will provide updated GeoBob data because new burrowing owl data has been collected since the data layers were provided. BLM will provide an updated version because the state office has been putting data in all summer. The State Office is putting the bat grid data in, but it is uncertain whether they have completed that task or not. BLM will arrange for the information to be provided.	Page 18 of Section 2.1.1
2	NA		BLM	In our previous review BLM indicated that CSF surveys should be moved to phase 2 of the survey process as it was listed as a phase 3 survey. The response was that it was moved to Phase 2, however, after reviewing their newly edited biological survey work plan CSF surveys are still listed in Phase 3 in the phased study plan table. Please adjust the study plan to reflect the change to phase 2. Also, as previously mentioned, Tetra Tech should contact USGS to inquire about CSF surveys that they have been conducting for the (at least) past two years to determine if there might be some overlap. BLM will provide the contact information at USGS.	Page 31 of Section 3.1.8
3	NA		BLM	BLM has indicated in previous comments that there is a specific protocol for pygmy rabbit surveys. This is well known to all who do pygmy rabbit surveys. There is no description in the plan text to explain how pygmy rabbit surveys will be conducted. The plan says that Tetra Tech will use a specific habitat model to identify habitat. This is of concern to BLM because we have found pygmy rabbits in areas on Malheur Resource Area where we would not have expected them, therefore we have a new search image that differs from other parts of Oregon where surveys have been conducted. The phased study plan table indicates that pygmy rabbit surveys will be part of the terrestrial visual encounter surveys. This process will not work for pygmy rabbits. BLM will provide the survey protocol and the surveyor requirements that we (BLM east side biologists) agreed to for requirements for our statewide pygmy rabbit contract. The person conducting the survey needs to know specifically what they are looking for as surveys for pygmy rabbits require being more targeted than cursory. BLM will also provide information on our new search image in perhaps the form of an addendum to the survey protocol. BLM has a contractor conducting pygmy rabbit surveys in the general area of the newly proposed route. There may be overlap with this survey and the proposed route but this will be determined when we receive the report. We do have a written report that coordinates for part of the survey, but work is ongoing to get the digital files of her survey lines and point locations of identified sites. She will be doing more surveys in 2011 in the same general area. BLM will provide those data as well when it is available. Her new search image applies to this general area as this is the only place in MRA, so far, that pygmy rabbits have been identified. Because of it's close proximity, it is possible that the pygmy rabbits may be found within the boundaries of the new proposed route. If there is a burrow system located within the route we would need to mitigate any pole or road placement.	Appendix B-10; and Page 33 of Section 3.1.9.

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4	NA		BLM	BLM has requested bat surveys at every meeting and comment opportunity. The work plan indicates that Tetra Tech would do the terrestrial visual encounter surveys. This will not work for obvious reasons. We have several special status bat species that must be considered during the planning process. BLM is working with colleagues trying to collect literature on impacts from powerlines to bats, but there is literature out there on the impacts from development in general and of course there would be impacts to habitat fragmentation from removal of vegetation to create roads or other infrastructure. BLM has direction from the WO in regards to white nose syndrome (WNS) to identify and consider any potential roosting, hibernacula or maternity sites in the form of caves or mines. This came out in an Instruction Memo along with the protocol for entry into these special habitats and for use in the handling of bats. BLM will provide Tetra Tech with the WNS protocol because they have caves listed under the "crucial habitat" survey section. The surveyors MUST follow the decontamination protocol if they enter the caves. Tetra Tech should identify these habitats early on and notify the district before doing surveys in the caves so that qualified BLM staff could accompany them. For example, there are certain times we would not want them to enter the caves such as during hibernation and if they were to find a maternity colony they need to leave immediately. There are a lot of BLM Instruction memos that outline safety issues as well. They apply to BLM employees and therefore should apply to the contractors. BLM is working on rounding all that information up and will send it to Tetra Tech as soon as it is available. With regard to foraging BLM suggests that we should assume the special status species are present, but the surveys for the crucial habitats will provide information on potential roosting habitat. If there are a number of cliffs, talus slopes or caves then we should consider doing at least acoustical surveys. It all depends on where these sites might be in relation to the line footprint. At the meeting BLM said that they would either provide the mine location GIS layer we have or overlay that layer and relay whether or not we have underground structures within the project area. BLM needs to ask whether or not we are allowed to share that database. We have recently received a database of cave locations for the district as well. We do not have the coordinates, but will be working on getting that information from the state office. That information we will not be able to share with anyone. It is treated the same as archeological sites. Cave locations are covered by the Cave Protection Act and are exempt from FOIA. If there are mine sites within the project area then BLM recommends doing acoustical surveys and depending on the location, for safety reasons, we may need to mitigate or at least fence the site and clearly mark it. If a mine is encountered the location needs to be documented and the district needs to be contacted. Underground workings should not be entered by surveyors.	Page 19 of Section 2.1.3; and Section 3.4.1 (multiple pages).
5	NA		BLM	BLM wants to be clear that we are to receive our data in the GeoBob format and that if any paper forms are used in the field that they are entered into the system so that we receive only electronic data. This may already be taken care of, but it was unclear in the draft plan. Also, when this was brought up at the October 26 meeting it was suggested that this would be discussed at a later time thus insinuating that there might be some issues.	Appendix A
6	NA		BLM	Long-billed curlew surveys should be conducted. They can be expected in Idaho and near Boardman.	Section 3.1.9
7	NA		BLM	Add surveys for northern water thrush, and burrowing owls. BLM has a survey protocol and will provide it.	Section 3.1.9; and Appendix B-10
8	NA		BLM	You will need to also survey and document bald eagle use areas, nests and roosting areas. There is a nest to the southwest of Huntington that was documented by IPC during relicensing. See (IPC) Toni Holthuiheizen's data from Hells Canyon relicensing studies. There may be others along the proposed routes.	Section 3.1.3; Appendix B-3; and Table 4

Comment ID	Page #	Section #	Agency/ Commenter	Comment	Page Number or Section Number where Comment is Addressed
9	NA		BLM	The protocol we should use for the Depot and for the Baker County project is attached (and a MS Word version attached to this email). For the Baker County project, we should develop survey points that completely cover all potential habitat, so we can do a 'wall-to-wall' survey effort within the designated project area. Also attached is the .pdf of the main article by Conway and Simon 2003 (the protocol is in Appendix A). Also attaching another paper by Conway (2008) that deals more specifically with detecting Burrowing Owl nests.	Section 3.1.9; and Appendix B-10
10	NA		Idaho BLM	Idaho BLM is in concurrence with Oregon relative to survey needs and protocol.	Comment noted
11	NA		Idaho BLM	Species we are most concerned with for surveys are: long-billed curlew, western burrowing owl, Mojave black-collard lizard, western ground snake, golden eagle, California bighorn sheep, and sagebrush obligate birds, specifically; greater sage-grouse, loggerhead shrike, sage sparrow, Brewer's sparrow, sage thrasher, and black-throated sparrow.	Section 2.1.1; Section 3.1.2; Section 3.1.3; Section 3.1.9; and Section 4.2
12	NA		Idaho BLM	Idaho does have a specific long-billed curlew survey protocol that may differ from Oregon's. The protocol can be provided by November 23.	Section 3.1.9; and Section 4.2
13	NA	Global	ODOE	ODOE would like further clarity on an amendment process for the work plan, the sharing of field data and analysis between agencies and contractors, the review process and the timing of information availability. ODOE proposes that IPC, BLM and ODOE establish protocols and processes for these issues early in this review process, perhaps through a Memorandum of Understanding or Programmatic Agreement. We will hopefully be able to clarify this process in the next few months as we begin discussions on the contents of the application and what the minimum requirements will be to enable the Department to deem the application complete and move forward through the siting process.	Comment noted. Continued coordination has occurred with the agencies.
14	NA	Global	ODOE	In general, methods for the species survey protocol are included in the appendices. However, within the text, please identify the specific protocol that will be followed, its reference, and reasoning for selection of that protocol. Thus, tell the reader the reference used (name, date), refer to the appendix if applicable, and explain why the specific protocol was selected. For most species, this can be done in a 1-2 sentences. For some species, reasons for not using a different but popular protocol method may be needed. Please do not refer to "later discussions with agencies" for the methods that will be applied. This is important since this project has been ongoing for several years, review staff has changed, and agreements made between some previous reviewing staff for methods may not be known by the current reviewing staff.	Section 3.1; 3.2; and Appendixes B-3 through B-11
15	NA	Global	ODOE	This document floats between metric and English units. Please use English units.	Entire Document
16	NA	Global	ODOE	Please confirm that all planned wildlife surveys as described in the work plan for uncommon species will be recorded using GPS with behavior notes recording breeding, roosting, or other information that may indicate species use of the habitat.	Appendix A
17	NA	Global	ODOE	B2H Habitat Mitigation Plan. If referred to in the work plan, this mitigation plan, or at least the overall approach to the mitigation plan in light of the phased survey approach, will need to be provided. Otherwise, it is not possible to understand how the work plan will be consistent with the mitigation plan.	Appendix F
18	NA	Global	ODOE	The ODFW Habitat Mitigation Policy is for both fish and wildlife. However, fish and their associated habitat are excluded from field surveys. How can ODFW habitat categories be developed for threatened and endangered fish and their critical habitat if no surveys are conducted? Although the transmission line will not affect fish, impacts will occur from road crossings, culverts, and access road sedimentation. How can mitigation be developed for fish if no surveys are conducted to determine habitat quality for fish (including areas where restoration may be an opportunity for mitigation)?	Section 2.1.2
19	NA	Global	ODOE	Additionally, note that limiting field surveys to only two species indirectly implies that the only areas that would be identified as Category 1 (avoid) would be locations where either of the two species occur. This is not likely.	Section 3.1; Section 3.2; Appendixes B-3 through B-11; and Appendix F
20	NA	Global	ODOE	Habitat Mitigation. How will field surveys, in general, be used to identify mitigation opportunities as will be needed under ODFW's Habitat Mitigation Policy?	Appendix F

Comment ID	Page #	Section #	Agency/ Commenter	Comment	Page Number or Section Number where Comment is Addressed
21	NA	Global	ODOE	State and Federally Listed Species. How will listed state and federal species be recorded that do not have associated field surveys, such as the gray wolf and Canada lynx? Recording (including GPS) of all listed species and/or markings of their presence should occur during all surveys, if encountered.	Appendix A; and Page 4 of Section 1.1 (second to last sentence in the second to last paragraph)
22	NA	Global	ODOE	Survey Locations. There is no discussion in the work plan on special habitats already identified in Oregon and how field surveys would mesh with these habitats. These areas would include USFWS/NMFS critical habitat, Oregon State Lands essential habitat, Oregon Goal 5 resources, proposed and existing BLM areas of Critical Environmental Concern (ACEC), areas with habitat conservation plans, and/or other federal, state, and local areas that have been mapped and identified as supporting important wildlife resources. Helpful would be the mapping of these areas in the work plan, the sensitive wildlife and plant resources that occur in these areas, and how field surveys will ensure that these areas are surveyed etc. The work plans should have a section on these sensitive habitats and confirmation that the appropriate data bases were checked etc.	Section 2.2.2.2
23		3.1.8	ODOE	TVES surveys should include recording all species observed during the survey. Uncommon and sensitive species, as well as threatened and endangered species should be recorded with GPS where possible.	Section 3.1.9; Appendix A; and Page 4 of Section 1.1 (second to last sentence in the second to last paragraph)
24		3.4.2 and Global	ODOE	References to ODFW's Habitat Mitigation Policy tend to focus on vegetation rather than the policy purpose, which is to identify habitats of value for wildlife and fish. The work plan will need to tie the vegetation classifications with wildlife and fish presence. What is the plan to accomplish this effort?	Appendix F
25		3.4.1	ODOE	Please confirm that all crucial habitats will be recorded using GPS.	Section 3.4.1; and Appendix A
26		4.0	ODOE	The preconstruction surveys should not be limited to an unidentified list of wildlife species. At a minimum, it should be assumed that construction or operation that may impact a state or federally listed species or species of concern would be surveyed for following the appropriate federal or state protocols.	Section 4.0
27		4.1	ODOE	What methods will be employed for the preconstruction raptor surveys?	Section 4.1
28		4.2.1	ODOE	Where will spotted frogs be surveyed?	Section 3.1.8; and Appendix B-8
29		4.3	ODOE	Please provide a list of the wetland classifications that the project intends to move forward with for EFSC and NEPA documentation.	See Section 2.4 in Appendix D-3. We anticipate the following classifications associated with this project (Depressional, Riverine flow-through, Riverine impounding, Slope/flats)
30		4.3.1	ODOE	State the methodology that will be followed for the wetland functional classification with reference.	ORWAP will be used. Below is the reference and is Appendix D-3 of the Work Plan. (Adamus, P., J. Morlan, and K. Verble. 2010. Manual for the Oregon Rapid Wetland Assessment Protocol (ORWAP). Version 2.0.2. Oregon Dept. of State Lands, Salem, OR.).
31		Executive Summary	BLM Wigglesworth	**Sensitive Plant Species and Noxious Weed Surveys** States there are *up to **30 plants** identified as T or E by the state of Oregon, Sensitive or Strategic by the Oregon BLM…* Section 3.2 states *'There are **27 species** in these categories…'.*	Page ES-4; Section 3.2; and Appendixes C-1 and C-2.
32		ES-1	BLM Wigglesworth	Corrections on spelling: Mulford's milkvetch - Astragalus mulfordiae Snake River goldenweed - Pyrrocoma radiate	Table ES-1
33		2.4.3	BLM Wigglesworth	See the following reference for areas of potential habitat in Oregon: Colket, Beth. 2008. Slickspot Peppergrass (*Lepidium papilliferum*) Field Survey and Predictive Distribution Modeling. Idaho Natural Heritage Program.	Current available literature states that this species is not found outside of ID. Colket 2008 has been reviewed and volcanic ash layer modeled in Oregon will be overlaid onto plant field maps crossed by the Proposed Route and route alternatives.
34		Appendix A	BLM Wigglesworth	…Standardized data sheets will be used for all biological surveys, all data will be double-checked during entry, and any issues resolved with the persons who gathered the data… *Is there a current example of this data sheet? It would be good to verify that core attributes are being captured and the standardized data sheet.*	See Appendixes A and C-5.

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35		Appendix A	BLM Wigglesworth	**Rare Plant Site Documentation** All target plant species will be surveyed using resource-grade GPS equipment with sub-meter positional accuracy. Individual points will be taken for lone plants or sparse populations. Polygons will be surveyed around large populations. *How is a large population defined, by area or number of plants or both?*	Appendix A footnote.
36		Appendix C-2	BLM Wigglesworth	Due to changes in the proposed route and the addition of the proposed dogleg and the modified dogleg the following changes should be made to the Survey Work Plan: ***ADD*** Artemisia packardiae – occurs approximately 0.4 miles outside of the proposed route near the Owyhee below the dam. Potential habitat also occurs within the Owyhee River Below the Dam Alternative. Mirabilis laevis var. retorsa – Bigelow's four-o'clock – Located adjacent to Proposed Dogleg and Modified Dogleg. NOT in GeoBOB! ***DROP*** No longer located within or in close proximity to the corridors of the proposed route, the proposed dogleg, or the modified dogleg: *Lepidium davisii* (Davis' peppergrass) *Eriogonum chrysops* (Golden Buckwheat) *Ivesia rhypara var. rhypara* (Grimy ivesia) *Amsinckia carinata* (Malheur Valley fiddleneck) Oregon BLM species that have been dropped from the Bureau Strategic list and, thus, no longer carry a special status in Oregon: *Penstemon perpulcher* (Beautiful penstemon) *Langloisia setosissima ssp. Punctata* (Punctate langloisia)	Table ES-1; Appendix C-2
37		Appendix E	BLM Wigglesworth	Why does the list of plants not include 'B2H Special Status and Sensitive species' only 'Federal and State Listed Plants'?	Appendix C-2

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<tr><th>Comment ID</th><th>Page #</th><th>Section #</th><th>Agency/ Commenter</th><th>Comment</th><th>Page Number or Section Number where Comment is Addressed</th></tr>
<tr><td>38</td><td></td><td>General</td><td>USFS / PDHall</td><td>
<table>
<tr><th>Species</th><th>Common name</th><th>Elevation range</th><th>Habitat</th><th>Habitat abundance</th><th>Population abundance & Distribution</th></tr>
<tr><td>Botrychium minganense</td><td>Mingan's moonwort</td><td>Moderate - high</td><td>Moist meadows in Coniferous forest</td><td>Mod. Not many acres of potential micro-habitat compared to amount of coniferous forest; widely scattered.</td><td>High. Most abundant of the rare Botrychiums (on the W-W). Pops are scattered throughout most of the (BMF) plan area.</td></tr>
<tr><td>Botrychium montanum</td><td>Mountain moonwort</td><td>1000-2000 m</td><td>'Coniferous forest'; adj. to streams and swamps</td><td>Mod. Usually restricted to wetter sites than others B. species.</td><td>Mod. Well distributed within moderate elevation areas of moist forested habitat.</td></tr>
<tr><td>Phacelia minutissima</td><td>Least phacelia</td><td>Moderate</td><td>Moist meadow, seep edges, barren slopes</td><td>Mod. Few appropriate openings in general forest; vernally wet areas and seeps limited over larger plan area.</td><td>Low. Populations are clustered in two widely separated areas.</td></tr>
<tr><td>Phlox multiflora</td><td>Many flowered phlox</td><td>Moderate</td><td>Rock outcrop, coniferous forest.</td><td>Mod. Habitat is restricted to small outcrops and rocky areas within a 10x10 mile geographic area.</td><td>Moderate. Six clusters, all on LGRD.</td></tr>
<tr><td>Trifolium douglasii</td><td>Douglas' clover</td><td>Low - Moderate</td><td>Moist or mesic meadows, prairie remnants, riparian areas, vernally wet areas.</td><td>Moderate. Habitat is both riparian and forest edge; can tolerate drier sites than strictly riparian.</td><td>High. Mostly within a 15 x 15 mile area on boundary of LGRD and NFJD RD (Umatilla NF).</td></tr>
</table>
</td><td>Appendix E</td></tr>
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<tr><th>Comment ID</th><th>Page #</th><th>Section #</th><th>Agency/ Commenter</th><th>Comment</th><th>Page Number or Section Number where Comment is Addressed</th></tr>
<tr><td>39</td><td></td><td>General</td><td>FS / Jamie Ratliff</td><td>Sensitive species are those recognized by the Region 6 Regional Forester as needing special management to meet NFMA obligations. The latest list of Proposed, Endangered, and Threatened species (PETS) occurring on the forest was received from the FWS on January 31, 2008. The Regional Forester's Sensitive species list for Region 6 (FSM 2670.43) and La Grande Ranger District information regarding the B2H project area were reviewed to determine possible species occurrence. Only those PETS known or suspected to occur in or immediately adjacent to the B2H transmission line corridor are listed (Table 1). Many of the PETS species are already included in the preconstruction data collection protocol proposed by Idaho Power. However, surveys for the white-headed woodpecker and Lewis' woodpecker should be included, as well as habitat surveys for the meadow and silver-bordered fritillary (Table 1). In addition to surveying for raptor nests, all raptor nest sites should be protected by avoiding construction in these areas or by timing activity within these areas to minimize disturbance to nesting raptors.
Table 1. Proposed, Endangered, and Threatened Species that may occur within the proposed B2H transmission line corridor.
<table>
<tr><th>Status[1]</th><th>Scientific name</th><th>Common name</th><th>Occurrence on the Forest[2]</th></tr>
<tr><td colspan="4">Mammals</td></tr>
<tr><td>S</td><td>Canis lupis</td><td>Gray wolf</td><td>D</td></tr>
<tr><td colspan="4">Gray wolves are habitat generalists inhabiting a variety of plant communities, typically containing a mix of forested and open areas with a variety of topographic features.</td></tr>
<tr><td colspan="4">Birds</td></tr>
<tr><td>S</td><td>Flaco peregrinus anatum</td><td>American peregrine falcon</td><td>D</td></tr>
<tr><td colspan="4">Tall cliff faces or other rock features for nesting.</td></tr>
<tr><td>S</td><td>Haliaeetus leucocephalus</td><td>Bald eagle</td><td>D</td></tr>
<tr><td colspan="4">Nesting habitat consists of large conifers within 1 km of water containing adequate supply of medium to large fish.</td></tr>
<tr><td>S</td><td>Melanerpes lewis</td><td>Lewis' woodpecker</td><td>D</td></tr>
<tr><td colspan="4">This woodpecker is associated with open woodland habitat, often at lower elevations, near water. In Oregon, it breeds primarily in white oak, ponderosa pine, and riparian cottonwood communities of the river valleys of eastern Oregon, and winters in oak savannah.</td></tr>
<tr><td>S</td><td>Picoides albolarvatus</td><td>White-headed woodpecker</td><td>D</td></tr>
<tr><td colspan="4">Nesting habitat consists of open-canopy stands with mature and overmature ponderosa pine.</td></tr>
<tr><td colspan="4">Amphibians and Reptiles</td></tr>
<tr><td>C,S</td><td>Rana luteiventris</td><td>Columbia spotted frog</td><td>D</td></tr>
<tr><td colspan="4">This species is found at aquatic sites in a variety of vegetation types, from grasslands to forests.</td></tr>
<tr><td colspan="4">Invertebrates</td></tr>
<tr><td>S</td><td>Boloria bellona</td><td>Meadow Fritillary</td><td>S</td></tr>
<tr><td colspan="4">In the west they occur in meadows and openings in aspen or pine forests. The only known site in Oregon is located in Umatilla County.</td></tr>
<tr><td>S</td><td>Boloria selene</td><td>Silver-bordered Fritillary</td><td>S</td></tr>
<tr><td colspan="4">Suitable habitat consists of bogs and marshes, often willowy sites, sometimes tall, wet grass.</td></tr>
<tr><td>S</td><td>Radiodiscus albietum</td><td>Fir pinwheel</td><td>S</td></tr>
<tr><td colspan="4">Most often found in moist and rocky Douglas-fir forest at mid-elevations in valleys and ravines. Known distribution in Oregon is limited to extreme NE (above Weston, Umatilla Co.). In Idaho this species has been found between 1500-5500 ft in elevation.</td></tr>
</table>
[1] E = Endangered, T = Threatened, C = Candidate, S = Sensitive.
[2] D = Documented occurrence, S = Suspected occurrence (FS Pacific Northwest Region 6 Regional Forester's Sensitive Animal List July 2004).</td><td>Appendix E</td></tr>
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<tr><td>40</td><td></td><td>General</td><td>FS / Jamie Ratliff</td><td>The LRMP identifies five wildlife species, or groups of species, as MIS (Table 2) (U.S. Forest Service 1990). The habitat requirements of MIS are presumed to represent those of a larger suite of species using the same type of habitat. Three MIS species depend on old growth or mature forest. Preconstruction Crucial Habitat Surveys should include surveys for old-growth and mature forest, specifically for trees ≥ 21” DBH. Surveys should also include snags and logs, which provide habitat for primary cavity excavators and many other species.

Table 2. MIS and their primary habitats.
<table>
<tr><th>Species</th><th>Habitat</th></tr>
<tr><td>American ma□ten</td><td>□Old-growth and mature forest</td></tr>
<tr><td>Northern goshawk</td><td>Old-growth and mature forest</td></tr>
<tr><td>Pileated woodpecker</td><td>Old-growth and mature forest</td></tr>
<tr><td>Primary cavity excavators[1]</td><td>Snags and logs</td></tr>
<tr><td>Rocky mountain elk</td><td>Cover and forage</td></tr>
</table>
[1] Northern flicker; black-backed, downy, hairy, Lewis’, three-toed, and white-headed woodpeckers; red-naped and Williamson’s sapsuckers; black-capped, chestnut-backed, and mountain chickadees; and pygmy, red-breasted, and white-breasted nuthatches.</td><td>Appendix E</td></tr>
<tr><td>41</td><td></td><td>General</td><td>FWS / Gary S. Miller</td><td>The Service offered to provide you with golden eagle GIS data. However, in reviewing this data, along with all the caveats and disclaimers associated with the data, we have determined that this information is not precise enough to meet your needs. We ask that you continue to rely on the golden eagle information provided by Oregon Department of Fish and Wildlife and in the Service’s initial NOI comments, dated September 27, 2010.</td><td>Section 2.1. Comment noted, IPC will work with the data they have.</td></tr>
</table>

Agency Comments on the February 15, 2011, B2H Biological Survey Work Plan Kick-off Meeting

Comment ID	Page #	Section #	Agency/ Commenter	Comment	Page Number or Section Number where Comment is Addressed
1			USFWS	1) Although bull trout critical habitat will not be surveyed, it needs to be addressed in the Plan. For example, you could add bull trout critical habitat in the second paragraph under 2.1.2 Fish, "In addition, streams containing special status fish (and their critical habitat) will be mapped for the purpose of data collection in Phase 2. Bull trout critical habitat information can be obtained at http://www.fws.gov/pacific/bulltrout/CH2010_Maps.cfm#CHMaps.	Designated critical habitat will be included in habitat mapping. In addition, occurrences of designated critical habitat have influenced the Project's sighting process and will influence the classification of ODFW habitat mitigation categories (discussed in Appendix F; i.e., these habitats would be Category 1).
2			USFWS	2) Under Survey Methods on page 27, you state that the survey area for most raptor nests is 0.5 miles from the corridor… The correct survey area for raptors should be 1.0 miles. Also, in this section you go on to say surveys will be conducted from the centerline, versus corridor as stated above. Please clarify if all surveys will start from the centerline or from the outer edge of the corridor. The Service recommends the later.	The surveys would be conducted from the either side of the 500-foot corridor (as outlined in Appendix B-3). Survey distances have been extended for certain raptor species (i.e., ferruginous hawk surveys out to 1 mile and golden eagle surveys out to 2 miles).
3			USFWS	3) Under 3.3.3 Sensitive Fish Habitat, you state that stream data will be collected at all locations where the project has the potential to adversely impact fish habitat. During what Phase of the Plan will these activities occur.	As discussed in Section 3.3.3, this data would be collected during habitat surveys that would be conducted during Phase 2.
4			NOAA	1. The Survey Work Plan states "Special status and listed fish (Appendix E) will be assumed present in streams that have been documented to contain these species. Fisheries surveys will not be conducted; however, stream data (i.e., stream morphology, riparian vegetation characteristics, and substrate characteristics) will be collected at all locations where the project has the potential to adversely impact fish habitats (see Sections 2.1.2 and 3.3.3)." However, I do not see any where in the Phased Biological Survey Approach when this data will be collected??	As discussed in Section 3.3.3, this data would be collected during habitat surveys that would be conducted during Phase 2.
5			NOAA	2. The Purpose of the Work Plan states that "......This plan contains a list of the specific species that will be surveyed for the timing of the surveys, and detailed protocols for the surveys for each species." Snake River Basin steelhead and Mid-Columbia River steelhead are not identified in the list.	This is because these species will not be surveyed for (i.e., fish presence will be assumed). In addition, both the Snake River Basin steelhead and Mid-Columbia River steelhead are included in Appendix E (i.e., the list of sensitive species that could occur within the Project area); and steelhead in general are discussed in the body of the document (see page 18).
6			NOAA	3. Designated critical habitat also needs to be addressed. For example, Snake River Chinook designated critical habitat is everywhere they were historically regardless of fish presence. Document only speaks to fish presence.	As designated critical habitat has been designated and has a corresponding spatial polygon, these areas do not need to be surveyed for in order to delineate their extent (i.e., their extent is known and available in GIS data format). Know occurrences of unique habitats (e.g., rock outcroppings, talus slopes, cliffs, caves, riparian zones, mature, timber stands, permanent and seasonal ponds, lakes, and wetlands), as well as mapping of known locations of sensitive areas such as ESA designated critical habitat will occur during Phase 1 (as part of the habitat mapping effort). Occurrences of designated critical habitat have influenced the Project's sighting process, will influence the classification of ODFW habitat mitigation categories (discussed in Appendix F; i.e., would be Category 1), and will certainly play a substantial role in the effects analysis; however, they do not play a significant role in the survey process as these areas are of critical importance regardless of survey results (i.e., they are important as fish habitats even if surveys were conducted and did not find any fish present).
7			NOAA	4. There is no mention of the Magnuson-Stevens Act designated Essential Fish Habitat (EFH). Federal regulations at 50 CFR 600 et seq. for EFH consultation will need to be applied.	See response to the previous comment. EFH has been addressed in the Project's sighting studies, and will be addressed in any impact analysis.
8			LSD	1. Has it been established that surveys for Forest Service Sensitive species (e.g., northern goshawk) need to be conducted outside of National Forest lands? Will impacts to Forest Service Sensitive species be analyzed by jurisdiction (i.e., only on National Forest lands) in the EIS?	Impacts will be discussed in the EIS and the ODOE Exhibits. Impacts will not be addressed in this work plan, as the scope of this document is to define the survey methodologies. The scope of the EIS will be determined by the BLM and its third party contractor.
9			LSD	2. It would be helpful to see the modeled habitat that has been identified for each species (to see why surveys included some areas but not others).	Maps of the modeled habitat are presented in the work plan.

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10			LSD	3. Surveys for special status plant and wildlife species will be conducted concurrently" - Special status plant surveys need to be conducted independently from special status wildlife surveys, and need to be conducted during the appropriate periods - one pass through the project area (i.e., the TVE survey) would not seem to suffice based on the appropriate timing required to locate each of the target wildlife species.	This text indicates that they would be done at the same time; not that they would be done by the same surveyors or during the same survey.
11			LSD	4. Table 1 and Table ES1 are difficult to understand the timelines. ES1 has all phases occurring between the months Jan-September; Table 1 states phase 1 will last 12 months, phase 2 will last 12 months, and phase 3 will last 4-6 months.	Comment noted.
12			LSD	5. On page 41: "surveys would be performed within 10 days of clearing." Table ES 1 suggests Phase 3 will occur between March and Sept--does this suggest that clearing could occur before the EIS is even drafted? Phasing and timing is very difficult to figure out (as pointed out in previous comment).	As required by federal law, clearing could not occur before the NEPA process concludes. Dates are preliminary estimates based on current conditions.
13			LSD	6. Washington Ground Squirrel - The survey methods narrative states that surveys will be conducted "within 250 feet either side of the proposed centerlines (500 feet total) and 1,000 feet on either side of the corridor boundaries", while Table 4 on the previous page states that ground squirrel surveys will be conducted only within the 500 foot corridor. Need to clarify where WAGS surveys will occur. Not sure why there is an unsurveyed area between Map Tiles 1 and 22 (on the WAGS survey maps).	Appendix B-2 states that surveys will cover all land within the preferred route corridor and within 1,000 feet of the outer boundaries of the corridor in native grassland, shrub-steppe and where native species were planted in CRP habitats and those CRP habitats are adjacent to native habitats. Table 4 has been changed to reflect that all suitable habitat within the corridor (500 feet total) plus 1,000 feet either side will be surveyed. The unsurveyed areas shown on the map set indicates cultivated wheat fields or pivot fields.
14			LSD	7. The Plan states that ALL raptors will be surveyed. Why then are burrowing owls excluded?	Burrowing owls will be surveyed for and are included in the plan under TVES. The separate discussions are because the protocols are different.
15			LSD	8. Raptor survey methods - Golden eagle surveys need to conform to the current USFWS guidance (February 2010). "At least two" surveys need to occur "at least 30 days apart" and "the first inventory and monitoring surveys should be conducted during courtship when the adults are mobile and conspicuous." Golden eagle surveys need to be conducted by qualified observers, as defined in the Interim Golden Eagle Technical Guidance (USFWS 2010).	That is correct. All staff are qualified to conduct these surveys defined in the guidance report mentioned.
16			LSD	9. Northern goshawk survey methods - A map of the modeled primary habitat would be helpful in discerning why call points are placed where they are - the coverage shown on the call point maps does not appear to be adequate, particularly in many densely-wooded areas. The proposed survey methods should state what the maximum distance between call points will be in suitable habitat areas. By conducting surveys along existing roads, this methodology has an inherent bias, and this bias may impact detectability. If the purpose of this survey is to "identify all northern goshawk nests" in the survey area (as stated in the survey work plan), it is unlikely that this survey method will accomplish the desired result (based on the apparent 250 meter or greater distance between call points). It should be determined whether the Forest Service will accept the results of this non-protocol survey method.	These methods reflect interagency coordination and reflect all suitable habitat based on photo interpretation and extend outside of USFS lands where habitat exists. Acoustical Broadcast Surveys are the best method to cover large areas but they are not without their own limitations. A transect grid, as described by Woodbridge and Hargis was overlaid over initial forested habitat. Using the the above criteria, the final suitable habitat layer was developed and used to define the survey area. Call stations are located in, and cover all suitable habitat within the survey area.. Spacing for the most part reflect the lack of contiguous suitable habitat. Additional text has been added to Appendix B-4 that describes in more detail the methods used to determine suitable habitat and survey area. In addition, a screenshot approach has been developed and provided to the USFS for the project record.
17			LSD	10. "All ground clearing would occur outside of the avian breeding season, which should reduce the risk of removing or damaging active nests." - There should probably be a contingency for nest searches and avoidance of active nests in case vegetation clearing needs to occur during the breeding season (due to an unforeseen change in the project implementation schedule).	This is addressed under Section 4 of the Work Plan (Phase 3).
18			LSD	11. Great grey owl survey methods - The published survey protocol requires 6 survey visits where only 2 visits are identified in the work plan. The narrative states that surveys will be conducted at night, but the adapted protocol provided in Appendix B describes daytime surveys, as well. If an adapted protocol is provided in the survey work plan it should identify specifically how surveys will be conducted and should not include extraneous information regarding methods that will not be used. For example, it is unclear whether follow-up surveys will actually be conducted as part of the adapted protocol.	These methods reflect interagency coordination and reflect all suitable habitat based on photo interpretation and extend outside of USFS lands where habitat exists. The adapted survey methods were developed for the NW Forest Plan and the 6-survey requirement was to be applied within the range of the marbled murrelet. Day time surveys will be used to recon more remote areas and for follow up surveys as outlined in Appendix B.

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19			LSD	12. Flammulated owl survey methods - Not sure that areas with lower canopy cover (used for nesting by flammulated owls) are being captured in combining this survey with the great grey owl survey. It would be good to see the modeled habitat for this species. Also, it is impossible to tell what the specifics of this survey will be based on the protocol that is provided (for example, will there be 10 minute calling periods at each call point and call points every 500 meters, or is something else being proposed?)	Survey areas were delineated based on >60 percent canopy closure which is within suitable nesting habitat for FLOW.). Review of a study conducted by Evelyn Bull in close proximity to our study area showed that the mean canopy cover around FLOW nest trees was 55% and closely represents the model utilized to identify great gray callings stations (60% canopy closure). In addition, large diameter trees excavated by Pileated woodpeckers were the favorite nest site for FLOW and Pileated woodpeckers are positively correlated with old growth forests with high canopy closure. Survey methods include calling at the same locations as GGOW and will be conducted using 10 minute calling/listening periods. The spacing of calling stations in suitable habitat is more dense that a station every 500 m.
20			LSD	13. Three-toed woodpecker survey methods - The survey protocol that is referenced in Appendix B is a general survey protocol and there is a lack of specific information provided in the work plan as to how three-toed woodpecker surveys will be accomplished (e.g., calling/listening periods).	Additional details regarding the methods that would be used can be found in the body of the Work Plan (see Section 3.1.7)
21			LSD	14. Columbia spotted frog survey methods - The survey protocol that is referenced in Appendix B is a general survey protocol and there is a lack of specific information provided in the work plan as to how Columbia spotted frog surveys will be accomplished. The information provided in the narrative (page 31 of the survey work plan) is more useful than the protocol information provided in the appendix...	Comment noted.
22			LSD	15. TVES survey methods - See item #3 above.	See response to item 3 (comment 6) above.
23			LSD	16. Sage grouse leks from Idaho are not mapped. In comparing the B2H Map Title Key, Greater Sage-grouse map to the newly released Greater Sage-Grouse Range-wide Breeding Density Thresholds map from the BLM national website, the main concentration of active leks and large leks is in Idaho. The 2011 Proposed Sage-grouse Survey Areas of 12/6/10 Route, Map Tile 19 doesn't continue into Idaho past milepost 266.8, thus missing many Idaho leks.	Leks will be surveyed out to 4 miles from the corridor and the sage-grouse survey maps have been updated with ID lek data.
24			LSD	17. The Plan states that follow-up ground surveys maybe conducted at suspected lek sites. Why this is not "shall be." Without counts of male birds on the ground from 3 different visits spaced 7-10 days apart (as per Oregon protocol), we can't determine breeding density, nor compare breeding density for each lek to be able to state which leks are more important than others on a range-wide scale.	Any information on suspected leks from aerial surveys will be immediately provided ODFW biologists; they will be responsible for any follow up surveys to conduct male counts and determine breeding densities within the state. As time allows, and if assistance is requested by ODFW, staff will assist.
25			LSD	18. No integration mentioned of the value of geology maps in identifying special status plant habitats. Nationwide, this is often the #1 resource to best identify potential suitable microhabitat. No mention of using soils maps or landscape feature symbols in soil surveys in the same manner. Northwest ReGAP lacks the resolution and precision to be used as the primary source to identify special status plant microhabitats.	Northwest ReGAP includes the use of SSURGO data to differentiate unique soil characteristic and in turn delineate communities such as Sandy vs. other Prairie grasslands (Lennartz 2006). Additional datasets used include species occurrence data from Oregon Natural Heritage Information Center (ORNHIC), Idaho Fish and Wildlife Information System (IFWIS). Observational data was provided by agency botanists and approved by the Agencies Biological Program Lead.

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26			LSD	19. States that helicopter surveys for leks will continue to 2.5 to 3 hours after sunrise. More than 2 hours after sunrise doesn't conform to Oregon sage-grouse lek survey protocols, nor to those of any other state or agency. The birds disperse by that time, thus creating false negatives for fly-overs of known leks and not revealing leks where they may occur. Oregon protocol calls for aerial surveys to be done within a March 15-April 30th window. TetraTech is surveying after that date, when birds on lesser density leks may already have left the lek for the breeding season.	The Survey Methods for Greater sage-grouse in the BSWP has been clarified as follows: The survey area will include IPC's Proposed Route and route alternative corridors and 3 miles on either side of the corridors, within areas that the ODFW and IDFG biologists have identified as areas that could potentially support greater sage-grouse. Areas surveyed in 2010 will not need to be surveyed in 2011. Details of the field survey protocol are provided in Appendix B-2 (Hagan 2005). Depending on survey area and weather conditions, sage-grouse within the project area will start attending leks anywhere from early March (lower elevations in a warm year) and can remain there until mid May (higher elevations after a long winter). The protocol notes that there may be local variation between districts that may dictate minor survey modifications. Helicopter surveys of greater sage-grouse leks will be conducted between March and April; however, due to weather constraints and survey schedule restrictions, some surveys may extend into early May. Best efforts will be made to reschedule if communication with ODFW and IDFG's greater sage-grouse specialists identifies a need. Aerial surveys will be flown between 30 and 100 feet above ground surface. Distance between transects will be 0.5 mile. Helicopter surveys will ideally be conducted within the first 2 hours after sunrise, but due to flight time and survey window restrictions some surveys may extend to 2.5 hours after sunrise; however, no surveys would extend beyond 3 hours. If any leks are observed, the location will be confirmed and documented with the appropriate resource agency.
27			LSD	20. What are the survey dates for many-flowered phlox and Malheur yellow phacelia?	May to August for man-flowered phlox, and May through June for the Malheur yellow phacelia
28			LSD	21. Appendix E should reflect all species potentially occurring in the project area. However, several species discussed in the Bio Resource Study Work Plan that will be surveyed for are not reflected in the Appendix E list. Why is this? Species omitted include: golden eagle, brewers sparrow, northern waterthrush, dimeresia, Malheur yellow phacelia, and Simpson's hedgehog.	These 6 species have been added to Appendix E. However, note that this list (i.e., Appendix E) is not meant to be all-inclusive list from a survey protocol standpoint; and all Type 1-4 special status wildlife species that are observed during surveys would be documented (even if they are not on this list). The species list found in Appendix E was prepared in part by looking at all species that could be encountered based on existing information, life requisites, and species listed by agencies as T&E, Special Status, Sensitive, MIS, etc. The ODFW, BLM, USFS, and NMFS have provided input on this list during multiple review and comment cycles, regarding the likelihood of their presence in the project area. In addition, this list was developed in part from species that require some type of seasonal restriction which may affect construction. It highlights species in which specific surveys have been requested; however, it is not a comprehensive list of species.
29			LSD	22. Appendix E should reflect all species occurring in the project area. The Plan should provide an exclusion table documenting all species considered on BLM, USFS, ODFW, and USFWS lists and the reason why species that are excluded from further evaluation are being excluded?	This list (i.e., Appendix E) is not meant to be all-inclusive list from a survey protocol standpoint. The species list found in Appendix E was prepared in part by looking at all species that could be encountered based on existing information, life requisites, and species listed by agencies as T&E, Special Status, Sensitive, MIS, etc. The ODFW, BLM, USFS, and NMFS have provided input on this list during multiple review and comment cycles, regarding the likelihood of their presence in the project area. In addition, this list was developed in part from species that require some type of seasonal restriction which may affect construction. It highlights species in which specific surveys have been requested; however, it is not a comprehensive list of all species that could occur.

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30			LSD	23. Many sensitive species from the BLM and USFS are not found in Appendix E. Why were these species left out of Appendix E? Species omitted include but are not limited to: Tahoe sucker, woodhouse toad, cope's giant salamander, and a variety of invertebrates and plants.	This list (i.e., Appendix E) is not meant to be all-inclusive list from a survey protocol standpoint. All Type 1-4 special status wildlife species that are observed during surveys would be documented (even if they are not on this list). The species list found in Appendix E was prepared in part by looking at all species that could be encountered based on existing information, life requisites, and species listed by agencies as T&E, Special Status, Sensitive, MIS, etc. The ODFW, BLM, USFS, and NMFS have provided input on this list during multiple review and comment cycles, regarding the likelihood of their presence in the project area. In addition, this list was developed in part from species that require some type of seasonal restriction which may affect construction It highlights species in which specific surveys have been requested; however, it is not a comprehensive list of all species that could occur.
31			LSD	24. Please provide all the sources (e.g., BLM sensitive species lists, ODFW species lists, and USFS sensitive species lists) for the species listed in Appendix E.	See response to comments 28, 29, or 30.
32			LSD	25. Critical habitat has been designated for more fish species than indicated in the table (see NMFS website for mapping of CH).	Table altered to remove un-necessary information. Designated critical habitat will be included in habitat mapping. In addition, occurrences of designated critical habitat have influenced the Project's sighting process and will influence the classification of ODFW habitat mitigation categories (discussed in Appendix F; i.e., these habitats would be Category 1); however, designated critical habitat will not play a substantial role in the survey effort.
33			LSD	26. Fish: the report defined sensitive species as all sensitive species considered (e.g., ESA, FS, BLM, State listed), but then this section refers to listed sensitive and non listed sensitive species. For which species is habitat to be mapped?	"Listed species" includes ESA and state listed species. "Non-listed sensitive species" includes all other sensitive species. Both listed and non-listed sensitive species will be assumed present in all waterbodies/watersheds where data indicates they might be present.
34			LSD	27. On multiple USFWS county species lists, wolverine and greater sage-grouse are listed as candidate species. This is not indicated in the USFWS column in App E.	Typo corrected
35			LSD	28. There are two endangered snails (Bruneau hot springsnail and Snake River physa snail) in Owyhee Co that are not included in the USFWS column in App E.	See response to comments 28, 29, or 30.
36			LSD	29. There is one threatened fish (Lahontan cutthroat trout) in Malheur County that is not included in the USFWS column in App E.	See response to comments 28, 29, or 30.
37			LSD	30. There is one threatened plant (slickspot peppergrass) in Owyhee Co that is not included in the USFWS column in App E.	Slickspot peppergrass is included in Appendix E
38			LSD	31. There are several mammals (Canada lynx, N. ID ground squirrel, S. ID ground squirrel), fish (middle Columbia R. Steelhead, Snake R. basin steelhead, Snake R. Chinook, Snake R. sockeye salmon, Coho salmon), and an invertebrate (bliss rapids snail) that are included in the USFWS column as T, E, and C status that do match with the USFWS county lists.	Species status in Appendix E will be checked.
39			LSD	32. The grouping for fishes was difficult to reconcile with the USFWS list - there are multiple fish included here as T&E that were not on USFWS species list.	Species status in Appendix E will be checked.
40			LSD	33. The grouping for fishes was difficult to reconcile with the ODFW sensitive species list - common names, scientific name (westslope cutthroat trout), and sub-species names did not match in some cases.	Species status in Appendix E will be checked.
41			LSD	34. The ODFW status in the ODFW column for fishes did not match with the ODFW sensitive species list for current status (2008) for multiple species.	Species status in Appendix E will be checked.
42			LSD	35. There are two missing ODFW status in the ODFW column for reptiles and amphibians (Columbia Spotted Frog and Northern Leopard Frog, both should have been critical [SC] but nothing was listed) based on the current (2008) sensitive species list.	Species status in Appendix E will be checked.
43			LSD	36. Need to confirm that the Inland Tailed Frog (included in App E) and the Rocky Mountain Tailed Frog (ODFW sensitive species list) are the same.	Status/name will be checked.
44			LSD	37. There are sixteen additional reptile and amphibian species included on the ODFW sensitive species list that are not included in App E, need to determine why excluded.	See response to comments 28, 29, or 30.
45			LSD	38. There are eight missing ODFW status in the ODFW column for avian species based on the current (2008) sensitive species list.	See response to comments 28, 29, or 30.
46			LSD	39. There are ten additional avian species included on the ODFW sensitive species list that are not included in App E, need to determine why these were excluded.	See response to comments 28, 29, or 30.

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47			LSD	40. There are several avian species were the ODFW status included in App E does not match the status in the sensitive species list.	See response to comments 28, 29, or 30.
48			LSD	41. There are nine additional mammal species included on the ODFW sensitive species list that are not included in App E, need to determine why excluded.	See response to comments 28, 29, or 30.
49			LSD	42. There are two mammal species were the ODFW status included in App E does not match the status in the sensitive species list.	See response to comments 28, 29, or 30.
50			LSD	43. Could not locate the original version of the Washington ground squirrel survey protocol on-line, not certain (based on the citation) where this came from, who wrote it, and if it is common practice to use this protocol.	State and federal agencies have reviewed the proposed Washington ground squirrel protocol, and have made recommendations regarding its implementation. Their recommendations would be incorporated into the protocol.
51			LSD	44. How was the 5,530 ft buffer of the T-line determined for Section 1 Land Cover? I now think I understand this - 1 mi (5,280 ft) plus half of the 500 ft corridor equals 5,530. In section 2.2.2.1 of Vol 1 it notes a 3-mile (15,840 ft) corridor? Did this then get scaled down to one mile on either side? Not sure what else section 1 maps provide as these maps are not referred to directly in Vol 1.	Correct. The reference to the 3-mile corridor was developed to collect all ReGAP vegetation and other layers used to define greater sage-grouse survey areas.
52			LSD	45. In Section 1, is the big game range the winter range? If not we will need this GIS layer. And were elk, deer, and big horn sheep grouped together with this big game range layer?	The big game ranges used in the habitat mapping will be as defined and maintained by the state wildlife agencies.
53			LSD	46. In Section 2, where did the Washington ground squirrel (WGS) burrow data come from? Heritage data?	State agency wildlife data
54			LSD	47. Was the 2011 WGS survey areas determined by aerial interpretation only? If so what year are the aerials from?	The survey area was developed using known locations, aerial images and through coordination with state and federal agencies.
55			LSD	48. How was the 1,035 ft buffer of route features determined? Table 4 in Vol 1 notes that the survey distance for wgs is just within the 500 ft corridor.	Table 4 has been revised. The 1,035 buffer was established using the WAGS no disturbance buffer of 785 feet + 250 feet = 1,035 feet.
56			LSD	49. On the maps there are wgs burrow locations within the buffer, but in areas that are not being surveyed in 2011. Why not survey if there is a known location? Private property constraints? Change in habitat since wgs was observed there?	The areas have been cultivated.
57			LSD	50. In Section 3, how were the 2010 and 2011 sage grouse survey areas determined? Seem to be applied inconsistently, not clear how determined.	Through consultation with the ODFW
58			LSD	51. How were the 2 mi buffer of the lek and 3 mi buffer of the route determined?	Through consultation with the ODFW
59			LSD	52. Where did the raptor point data come from in Section 4? Heritage data?	State and federal agencies data (see table 3)
60			LSD	53. How is the golden eagle habitat layer that is included on this map being used? Will more intense surveys take place in those areas? Not clear from map.	Aerial nest surveys for golden eagles (2 miles from the corridor) would be conducted in areas identified in these maps as golden eagle habitat
61			LSD	54. How was the ferruginous hawk survey areas determined? It seems to start and stop abruptly, was it based on aerial interpretation?	Through consultation with the USFS. The abrupt changes indicate primarily those areas that are cultivated lands.
62			LSD	55. Are the calling stations for N. goshawk or 3 toed woodpecker, or both, not clear from map. How were the locations determined?	They are the same. The locations and number of stations was determined through coordination with the state and federal agencies.
63			LSD	56. What are the N. goshawk observation points, just past observations? Heritage data? They seem to show up on the first map of the set but not on the successive maps, so not clear.	The observation data is based on agency data; the maps will be updated as necessary if additional data is provided by BLM or the USFS.
64			LSD	57. How was the 1/2 mile buffer of route features determined in Section 5, (goshawk and woodpecker)? Table 4 in Vol 1 notes 1/2 mi for N. Goshawk but 1/4 mi for three-toed woodpecker. The map just shows the 1/2 mi buffer.	Survey butters reflect established no-disturbance buffers from USFWS and would be used as seasonal restrictions along any portion of the route where a nest is documented.
65			LSD	58. Are the calling stations for great gray owl or flammulated owl; both? This is not clear on map. Also it seems that some points are the same as the goshawk/ woodpecker call points and some are not. How were the locations determined?	They are the same. The locations and number of stations was determined through coordination with the state and federal agencies.
66			LSD	59. How was the 1/4 mile buffer of route features determined in Section 6 (great gray owl and flammulated owl)?	Survey buffers reflect established no-disturbance buffers from USFWS and would be used as seasonal restrictions along any portion of the route where a nest is documented.

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67			LSD	60. How were the special status plant survey areas determined? Was there a species exclusion list created, where certain areas were determined unnecessary to survey? Because large areas are going completely unsurveyed. It appears that areas are being surveyed if a plant was found there previously and potentially suitable habitat is available nearby. But this does seem to hold true across the whole project area.	Northwest ReGAP includes the use of SSURGO data to differentiate unique soil characteristics and in turn delineate communities such as Sandy vs. other Prairie grasslands (Lennartz 2006). Additional datasets used include species occurrence data from Oregon Natural Heritage Information Center (ORNHIC), Idaho Fish and Wildlife Information System (IFWIS). Observational data was provided by agency botanists. Species occurrence data were then reviewed by botanists and through a process of integrating aerial photo interpretation, GIS datasets including elevation, ReGap land cover, and knowledge of species habitat requirements botanists identified areas of likely habitat for further survey. This process was conducted along the entire route.
68			LSD	61. What is the source of the plant location data? Heritage data?	Datasets used include species occurrence data from Oregon Natural Heritage Information Center (ORNHIC), Idaho Fish and Wildlife Information System (IFWIS). Observational data was provided by agency botanists and approved by the Agencies Biological Program Lead.
69			LSD	62. What is the width of the special status plant survey area? Seems to vary.	250-foot buffer on both sides of the centerline (500 foot total corridor); 250 feet around project facilities, 50-foot buffer along any proposed new roads.
70		Special Status Plants Phase 1	BLM	Table 1. Resource Category. Terrestrial visual encounters. Is this saying that ssp habitat and species are considered target species? When it says all species observed will be recordered is that referring to flora and fauna? Punctuation is misleading.	In this context, "targeted species" means that surveyors would be informed that these species had a high likelihood of occurring and that the agencies have expressed heightened concern over these species. In this context, "all species" refers to wildlife species. Text has been revised in order to clarify this.
71		Special Status Plants Phase 1	BLM	Table 3. should include more specific direction for how microhabitats, geologic outcrops will be detected for special status plant habitats. (low-level aerial photography, google earth, geologic maps). (see B. Palmer, comment #8)	Botanist were instructed to identify, and label with the appropriate sensitive plant, any microhabitats and geologic outcrops using available aerial imagery and supplemental datasets as part of the sensitive plant habitat review (see comment 67). Additional microhabitats and other potential sensitive plant habitat not identified during desktop mapping will be identified during TEVS and surveyed for sensitive plants.
72		Special Status Plants Phase 1	BLM	Table ES-1. Add shading for blooming period for many flowered phlox and phlox multiflora (both may & june).	Shading has been added.
73		Special Status Plants Phase 1	BLM	Add shading to May for Cusick's flase yarrow.	Shading has been added.
74		Special Status Plants Phase 1	BLM	Add all species listed below that will be added to target species list.	See response to comments 28, 29, or 30.
75		Special Status Plants Phase 1	BLM	Is this also a section to include 'methods' for mapping of potential microhabitats of special status plants known or suspected to occur within the survey corridor?	See response to comments 60, 62, and 71 above.
76		Special Status Plants Phase 1	BLM	Shouldn't a map of unique microhabitats for special status plants be constructed…Vegetation maps will also identify unique special status plant habitats (ash or calcareous outcrops, ash lenses, sand inclusions, etc.).	See response to comments 60, 62, and 71 above. Additionally, observation of likely special status species habitats will be documented during the TVES and used to supplement current mapped special status species habitat requiring field survey.
77		Special Status Plants Phase 2	BLM	There are '26' non-federally listed….this number does not match with Appendix C, E.	Appendix E has been updated with the 3 missing species identified in Appendix C
78		Special Status Plants Phase 2	BLM	Howell's & Slickspot Peppergrass (below refers to both species write-ups) Second to last sentence: Confusing…What is a survey period? If it is the timeframe I am not sure what is being conveyed in this sentence. Last sentence: Confusing unless 'if' is a typo.	Text has been revised.

Comment ID	Page #	Section #	Agency/ Commenter	Comment	Page Number or Section Number where Comment is Addressed
79		Special Status Plants Phase 2	BLM	Botanists will be cataloging all species encountered in order to provide a total floristic inventory for the corridor. Botanical surveys are conducted in order to determine the environmental effects of proposed projects on all botanical resources, including plant (vegetation) communities, not strictly limited to special status plants. Special status plants are not only those that have been listed by state and federal agencies but include any plants that, based on all available data can be shown to be rare, threatened, or endangered. As stated in the 'Intuitive Controlled Survey' method "…botanists will compile a species list of all plant taxa seen en route and keep track of the plant community or habitat type where each taxon occur. Areas within the project area that are not the focus of a complete survey must be surveyed sufficiently so that the botanist and BLM reasonably believe that few if any additional species would be added to the complete species list for the project area."(Survey Protocols Required for NEPA/ESA Compliance for BLM SSPS. Page 3). I believe it is important to state this in the survey work plan.	Comment noted. Tetra Tech will implement the Special Status Plant protocol as indicated in the work plan. The document Survey Protocols Required for NEPA/ESA Compliance for BLM SSPS. Page 3, was identified as a guidance document for the CA-NV BLM but was identified as part of the OR State Office direction for survey protocol..
80		Special Status Plants Phase 2	BLM	If a target species is located and occurs on fragile soils, the survey method would be modified to protect the habitat from human traffic/disturbance. This will ensure negative impacts are not imposed upon the species and its habitat.	Foot traffic will be limited on fragile soils where target species are present.
81		Special Status Plants Phase 2	BLM	Plant Specimens: A voucher specimen for each sensitive species found, pressed in newspaper and properly labeled, should be submitted to the Vale District if the collection will not adversely affect the health of the population at the site. Any other species considered by the surveyor to be of particular interest also should be collected, identified, and at least one specimen submitted to the Vale District for inclusion in the herbarium.	Comment noted. Any voucher specimens collected would only be done within areas of numerous individuals and would be submitted to Vale District office.
82		Special Status Plants Phase 2	BLM	Photographs should be taken of the areas inventoried, of all special status plants found, and of the habitat associated with each special status plant occurrence.	Inventory protocol will include photographs of all special status plants found, habitats associated with the species, and areas surveyed.
83		Special Status Plants Phase 2	BLM	Please add the microhabitats unique to the Owyhee Uplands and Snake River Plains such as ash outcrops or lenses, sand inclusions, calcareous outcrops… These are the most likely areas to encounter uncommon/special status species.	These areas, if not presently identified during the special status species mapping exercise, will be identified during the TVES if the potential for special status species exists requiring further survey.
84		APPENDIX C.	BLM	What references used for this section?	Appropriate references will be provided in the work plan revision.
85		APPENDIX C.	BLM	Biennial Stanleya – flower color is cream or yellow color. Bigelow's Four o'clock - Flowering time missing. Packard's wormweed – add – grows on basalt rock outcrops in shallow poorly developed soil.	Text added to Appendix C
86		TABLE E.	BLM	ADD ALL SPECIES BELOW Those species missing from table - Idaho species suspected to occur within the survey area– Least snapdragon, Sairocarpus kingii Janish's penstemon, Penstemon janishiae Stiff milkvetch, Astragalus conjunctus Malheur cryptantha, Cryptantha propria Within the survey corridor the following is one BLM Oregon 'Strategic' species either documented or suspected to occur within the survey corridor and should be added to the target list for surveys. Strategic species are not sensitive species for management purposes. Special management efforts do not need to be taken when strategic species are found. Strategic species only need to be recorded when they are located and their locations input into the Geographic Biotic Observations database (GeoBOB), which is the Oregon/Washington BLM database for special status species. Cusick's false yarrow, Chaenactic cusickii Those species to be added to the table as they are suspected in the survey area in BLM Oregon. Information derived after conversation with USFWS in Boise: Packard's milkvech, Astragalus packardiae	These species will be added to Appendix E and C
87		APPENDIX E.	BLM	Under USFWS column species that are categorized as SOC (Species of Concern) should be noted. Not sure but NRM DPSD and CH may just apply to wildlife.	Comment noted.
88		APPENDIX E.	BLM	Biennial Stanley – U for unlikely to encounter currently listed. This should be a Y for Yes as it is highly likely to be encountered.	"U" has been changed to "Y"

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89		APPENDIX E.	BLM	Section 7 Special Status Plant Survey Map Outside of the apparent vegetation shifts from what appears to be arid lands to coniferous forest or wetland, why are there so many gaps in areas designated for plant surveys? Ownership? (i.e. mile post 220-222, Tile 32). As described in 3.2.5 'Survey Methods','…botanists will maintain a list of all vascular plant species and their habitat associations observed during the survey'. This needs to be a complete floristic survey for the entire corridor.	In an effort to identify special status species habitat for field survey, botanists used available GIS information in a desktop exercise. ORHNIC special status plant occurrence data, elevation models and ReGAP were overlaid on aerial imagery, specialists then identified special status plants within 5 miles of the study area and their habitat requirements. Botanists applied a broad interpretation of ReGAP Ecological Systems resulting in overestimates of special status plant habitat in an effort to avoid under sampling for potential plant habitat. Additionally, botanists identified potential habitat based on combinations of elevation, ReGAP, and imagery interpretation in the absence of occurrence data. Changes in land use such as farming or recently burned areas where accounted for; ownership was not a factor when determining potential plant habitat. Gaps in special status plant habitat would result from a combination of the following: lack of suitable habitat and/or appropriate elevation, or recent changes in land use. Supplementing identified special status plant habitat with local knowledge from Agency Botanists would further improve the quality of this desk exercise. The TVE survey will make note of any special status plant habitat not previously identified as part of the above desk exercise. The additional plant habitat will be surveyed following Tetra Tech's Special Status Plant survey protocol. A comprehensive list of vascular plants and their habitats will be developed as part of this survey. Also, see response to comment 79 above.
90		APPENDIX E.	BLM	Refine maps to include highlighted area with ash outcrops, ash lenses, sand inclusions, calcareous outcrops.	See response to comment 83 above.
91		APPENDIX E.	BLM	Several plants on the target list are lacking as species to be surveyed for on specific tiles. For example: Mentzelia mollis should be a target starting at mile post 263 all the way to the Idaho border. In addition Chaenactis cusickii is often grows in association with mentzelia mollis so should be added to all those sites where Mentzelia mollis is likely to occur. Mirabilis laevis var. retorsa at mile post 260-263 needs to be added to the survey target (I do not believe this isolated population is entered into GeoBOB at this time).	Survey areas for special status plant will be updated accordingly.
92		APPENDIX E.	BLM	The maps need a good comb over with each botanist from each office (BLM/FS) in order to verify all species are accounted for in likely habitats.	These maps and the Work Plan has been provided to the BLM for review. Any additional information they can provide is welcome.
93		WEEDS	BLM	Russian olive was submitted as a noxious weed occurring or mapped within five miles of the corridor. It is recommended this species be put in Appendix C so it can be inventoried for and treated before, during and after construction (Owyhee FO BLM Botanist Elisabeth Corbin).	The Idaho BLM does not list Russian olive as a noxious weed nor is it part of the State of Idaho's 64 noxious weed species.
94		Action Item #1: Review sage-grouse survey areas	ODFW	• Map Tile 1 – expand the northern survey boundary to MP 122 due to an incidental sighting in 2010	Surveys in areas included on map tile 1 will be conducted as requested.
95		Action Item #1: Review sage-grouse survey areas	ODFW	• Map Tile 5, 6, 7, 8 – no surveys are needed west/south of I-84	Comment noted
96		Action Item #1: Review sage-grouse survey areas	ODFW	• Map Tile 9 – starting at MP 182, survey the west side of I-84 where suitable habitat/topography exist (i.e. no need to survey timber, steep slopes, draw bottoms, etc.), survey east of I-84 where suitable topography exists	Surveys in areas included on map tile 9 will be conducted as requested.
97		Action Item #1: Review sage-grouse survey areas	ODFW	• Map Tile 10 – survey all areas identified where suitable topography exists	Surveys in areas included on map tile10 will be conducted as requested.

Comment ID	Page #	Section #	Agency/ Commenter	Comment	Page Number or Section Number where Comment is Addressed
98		Action Item #1: Review sage-grouse survey areas	ODFW	• Map Tile 15 to 18 – from MP 258 to Malheur River near MP 237, exclude low elevation and interior of large burns that have no residual sagebrush. Survey all mosaic burns, and areas with, or in the vicinity of intact sagebrush habitat. Surveyors will have to use professional judgment to determine areas to survey as this landscape has been heavily impacted by fire and invasive weeds, however the areas of intact sagebrush have potential to provide sage-grouse habitat. The area from Highway 20 to the Malheur River had use by sage-grouse this winter.	Surveys in areas included on map tiles 15 to 18 will be conducted as requested.
99		Action Item #1: Review sage-grouse survey areas	ODFW	• Map Tile 18 to 19 – exclude where the corridor follows the existing line, from the OR/ID state line to the top of the canyon at approximately MP 258 on the east side of the Owyhee River.	Surveys in areas included on map tiles 18 to19 will be conducted as requested.
100		Action Item #2: Review great gray, flammulated owl, goshawk and three-toed woodpecker survey areas to ensure that all areas need to be surveyed:	ODFW	We reviewed the areas identified for survey and do not have any areas to add or remove from the survey area.	Comment noted.
101		Action Item #3: Review Washington ground squirrel survey area and ensure that all areas need to be surveyed	ODFW	We reviewed the survey areas and found some areas identified for surveys that do not need to be surveyed and other areas that need to be added to the survey.	Comment noted.
102		Action Item #3: Review Washington ground squirrel survey area and ensure that all areas need to be surveyed	ODFW	Washington ground squirrel habitat that is adjacent to cultivated land, does not need to be surveyed if all of the impact will occur in the cultivated area. For example, if all the ground disturbing impact (road, tower footprint, etc.) will be in a wheat field, you do not need to survey the ground squirrel habitat next to the field even if it falls within the designated buffer distance.	Comment noted. It is understood that ODFW will be providing a revised policy for WGS that may differ from this guidance, and IPC will meet the guidance once it is provided. Currently, we have identified all suitable habitat for survey as defined in Appendix B-1.
103		Action Item #3: Review Washington ground squirrel survey area and ensure that all areas need to be surveyed	ODFW	We would like to clarify our set back distance policy due to concerns we have heard from landowners. Ground disturbing impact within Washington ground squirrel habitat may not occur within 785 feet of known burrows. If the disturbance is in cultivated areas, then the 785 feet buffer does not apply.	Comment noted.

Comment ID	Page #	Section #	Agency/ Commenter	Comment	Page Number or Section Number where Comment is Addressed
104		Action Item #3: Review Washington ground squirrel survey area and ensure that all areas need to be surveyed	ODFW	The overall area identified for Washington ground squirrel surveys does not adequately cover their potential range along the power line route. Surveys should be conducted in all suitable Washington ground squirrel habitat where ground disturbing impacts may occur west of mile post 83.	Surveys in areas west of mile post 83 will be conducted as requested.
105		Additional Comments	ODFW	Burrowing owls/pygmy rabbits: We are concerned that the Terrestrial Visual Encounter Surveys (TVES) will not adequately survey for presence of burrowing owls and pygmy rabbits. Both of these species are hard to detect visually and both can be identified by sign at the burrow. Furthermore, burrowing owls are often heard before they are seen. To increase the likelihood of detection, TVE surveyors should be trained on identification of burrowing owl and pygmy rabbit sign at burrows and burrowing owl calls.	TVE surveyors will be trained to identify burrowing owl and pygmy rabbit signs.
106		Additional Comments	ODFW	Ferruginous hawk: Surveys need to be extended to the west side of the corridor from mile post 128 to 133.5.	Surveys in areas west of corridor (from mile post 128 to 133.5) will be conducted as requested.
107		Additional Comments	ODFW	Bats: Large snags are not mentioned as important hibernacula or roost sites. These also provide feeding and shelter/nesting sites for other sensitive species. These features should be identified and numerated in at least the direct impact area.	Large snags are identified in Table 1 as a unique habitat feature and would be recorded during TVE surveys.

Comment ID	Page #	Section #	Agency/ Commenter	Comment	Page Number or Section Number where Comment is Addressed
108		Additional Comments	USFWS	March 9, 2011 To: Aaron English, Tetra Tech From: Suzanne Anderson, USFWS Subject: In reference to the Service's comments dated February 22, 2011 Specifically comment #2, should the survey distance for raptor nests be 0.5 miles as stated in the January 28, 2010 B2H work plan or 1.0 mile as recommended by ODFW and the Service. I checked with our Portland folks and am passing on the following: The goal of the raptor nest surveys should be to identify potential sources of energy project impact – not just from the construction phase, but also the operational phase. Therefore the Utah FWS guidance (which is focused on avoidance distances for disturbance from project activities – as addressed via aerial surveys out to that disturbance distance) is NOT a good guidance document for raptor nest surveys that need to provide key information to avoid both DISTURBANCE from human activities (such as transmission) as well as insights into project specific "micro-locations" for higher protective efforts associated with use and mortality monitoring, associated adaptive management, and (as necessary) compensatory mitigation. So these disturbance-related buffers in the Utah guidance are not necessarily appropriate for the B2H surveys. For a transmission project of the B2H size (500 Kv), we are most concerned with construction phase-related disturbance to nesting raptors as well as operational-phase collision and displacement. But we are not concerned generally with electrocution for a 500 Kv project. Therefore, the Service suggests 2 mile aerial surveys for golden eagle nests from the centerline of the B2H transmission project. This should provide sufficient information for avoidance during construction as well as data to better locate the towers and wires away from nest areas and other high use (foraging, migration, etc.) habitats, and to develop proper monitoring and adaptive management around these higher risk sites. The Service recommends a 1.0 mile minimum for other raptor species.	IPC shares the FWS's concern regarding the potential impacts that could occur to raptor species from both construction and operation of a high voltage transmission line. As a result of this shared concern, IPC has developed a survey approach that would provide the necessary information for us to limit or eliminate disturbance to nesting raptors, based on established FWS guidance. The goal of the proposed survey effort is to locate nests within areas where disturbance from both construction and operation of the proposed project may impact raptors. IPC recognizes the necessity to micro-site these types of projects during final construction, and the associated need to survey a large enough area to facilitate this micro-sitting effort. This is why the survey distances reported in the Biological Work Plan extend from the outer edge of the 500-foot-wide corridor, as opposed to from the projects centerline. This 500-foot-wide corridor allows for micro-sitting of the project, while still maintaining the survey distances established in current FWS guidance. The Biological Work Plan makes a distinction between raptor surveys that would utilize listening stations (e.g., ground surveys for great grey owls and flammulated owls), and "raptor nest surveys" that would be conducted via helicopters. As noted in Section 3.1.3 of the Biological Work Plan, the default survey area used for raptor nests during the "raptor nest surveys" is 0.5 mile from the corridor; however, note that this is 0.5 mile from the outer edge of the 500-foot-wide corridor, not from the project's centerline (which will allow for micro-sitting). Note that areas greater than a 500-foot corridor may be identified and a 0.5-mile buffer would be extended in those areas as well. The 0.5-mile survey area has been extended in areas that could support raptor species that have been determined (based on the extent of "no disturbance buffers" around these species' nests) to be more sensitive to disturbances than other raptor species. The survey area has been increased to 1 mile from the outer edge of the 500-foot corridor in areas that could support ferruginous hawks, and 2 miles in areas that could support golden eagles (Appendix B-3 provides additional detail on how the survey boundaries were established). Nests of any raptor species that are observed would be recorded during these surveys. Of the total 299 mile length of this project, about 236 miles would fall within areas determined to potentially support ferruginous hawks or golden eagles, and would therefore be surveyed out to at least 1 mile from the 500-foot corridor. The remaining 63 miles of the project that do not support either the ferruginous hawk or golden eagle, and would subsequently only be surveyed out to 0.5 miles from the 500-foot corridor, mainly occur along the northern portion of the project that contains cultivated lands.

Comment ID	Page #	Section #	Agency/ Commenter	Comment	Page Number or Section Number where Comment is Addressed
109		Additional Comments	IPC	IPC would like to modify the survey area at five locations. Please ensure the BSWP includes survey's for all identified species at the following locations and to the revised survey width, as provided: 1. Glass Hill – (Milepost 106 – 115) because of routing changes that could occur--survey a 2,000' wide corridor for both the main route and the alternative at this location 2. Weatherby area – (Milepost 184-190) to cover both the 69 and 138 kV line routes because of the existing transmission lines being double circuited and the 500 line being placed along the existing 138 kV line route-- survey a 250' wide corridor along the exising ROWs. 3. I84 route towards Brogan – (Milepost 193-199) because of the potential of BLM moving the line completely away from the leks-- survey a 1,000' wide corridor.. 4. Mile post (270-275) because of the potential of moving the route further to the south because of landowner issues-- survey a 1,000' wide corridor. 5. Mile post (286-289) because of the potential of moving the route further to the south because of landowner issues-- survey a 1,000' wide corridor.	These areas will be included in revisions to the various survey maps and will be buffered out to include all species protocols.
110		Additional Comments	BLM	Pygmy Rabbit Survey Criteria for Oregon BLM lands Areas with big sagebrush species including Mountain, Basin and Wyoming sage with more than 5% canopy cover in areas with deeper soils should be surveyed using the Pygmy Rabbit Survey Protocol and data record sheets in Appendix B-11. Results of surveys for pygmy rabbits on the northern part of the Malheur Resource Area have documented burrow systems in micro-sites of deeper soils with some occurrence of sagebrush and taller plants. Soil composition needs to be able to support a burrow system with numerous entrances, but also must be soft enough for digging. We recommend doing these surveys during Phase II of the biological survey process. The pygmy rabbit surveys can be conducted during Phase III of the biological survey process as long as the surveys are performed using the Pygmy Rabbit Survey Protocol in all habitats meeting the above mentioned criteria and not as part of the Terrestrial Visual Encounter Survey (TVES) protocol. The protocol is very straight forward and actually very quick. Looking for the rabbits themselves isn't the best way to survey. The burrows are much easier to see and will require less effort to detect. A great time to survey is when there is fresh snow on the ground, but any time will work if you know what you're looking for. Tracks, burrows and pellets are very easy to see and a surveyor can move very quickly. The contractor the BLM is currently using is covering 8-12 linear miles / day.	On lands not managed by the BLM, surveyors will perform pygmy rabbit protocol level surveys (Appendix B-11) if any pygmy rabbits or evidence of pygmy rabbit activity (rabbit burrows or pellets) is identified during protocol level surveys. On BLM-administered lands, protocol-level surveys for pygmy rabbits will be conducted in all areas with deep soil that contains big sagebrush species (including Mountain, Basin, and Wyoming sage) with more than 5% canopy cover. Surveys will be conducted on BLM-administered lands, regardless of whether or not surveyors identify rabbit activity. Pygmy rabbit surveys will be performed exclusively for the species and will not be conducted concurrent with other survey efforts.
111		Additional Comments	ODFW	**From:** Steve Cherry [mailto:steve.p.cherry@state.or.us] **Sent:** Wednesday, March 16, 2011 10:40 AM **To:** Ray Outlaw **Subject:** RE: B2H: Biological Survey Work Plan Meeting Summary (02-15-2011) Ray, In your summary you section regarding WGS you list that " Survey protocol does not include scat, burrows or other criteria and is based solely on listening for the animal." Looking for holes and scat is a very large part of the survey protocol and is stated in your Biological Survey Work Plan sent out on January 28th. I assume that the reference in your summary is an error and that your surveys will be completed as outlined in the Work Plan. If this is not the case please let me know. Thanks	The draft meeting notes did mis-state the protocol to be used for the Washington Ground Squirrel. The protocols outlined in the BSWP, specifically Section 3.1.1 will be used.

Revised
Final Biological Survey Map Book
Volume II

Boardman to Hemingway Transmission Line Project

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April 2011

Final Biological Survey Map Book

VOLUME II – BIOLOGICAL SURVEY MAP BOOK (Under Separate Cover)

Section 1	Land Cover Classifications Map Book
Section 2	Washington Ground Squirrel Survey Map Book
Section 3	Sage-Grouse Survey Map Book
Section 4	Raptor Aerial Survey Area Map Book
Section 5	Northern Goshawk and Three-toed Woodpecker Survey Map Book
Section 6	Great Gray and Flammulated Owl Survey Map Book
Section 7	Special Status Plant Survey Map Book

The above maps can be accessed at the following website:

http://projects.ttsvcs.com/eec/NEPA-B2H/default.aspx

ATTACHMENT P1-3
RECLAMATION AND REVEGETATION PLAN

Reclamation and Revegetation Plan

Boardman to Hemingway Transmission Line Project

1221 West Idaho Street
Boise, Idaho 83702

June 2017

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ACRONYMS AND ABBREVIATIONS

BLM	Bureau of Land Management
ESA	Endangered Species Act
ESCP	Erosion and Sediment Control Plan
FWS	U.S. Fish and Wildlife Service
GPS	global positioning system
IPC	Idaho Power Company
kV	kilovolt
OAR	Oregon Administrative Rule
ODA	Oregon Department of Agriculture
ODOE	Oregon Department of Energy
OHV	off-highway vehicle
Project	Boardman to Hemingway Transmission Line Project
RL	reclamation level
ROW	right-of-way
RZ	reclamation zone
T&E	threatened and endangered
TVES	Terrestrial Visual Encounter Surveys
USFS	United States Forest Service

1.0 INTRODUCTION

This Attachment to Exhibit P1 of Idaho Power Company's (IPC's) amended preliminary application for site certificate contains information describing the framework for application of reclamation and revegetation actions on lands disturbed by the Boardman to Hemingway Transmission Line Project (Project).

Specifically, this Reclamation and Revegetation Plan (hereafter referred to as the Reclamation Plan) describes existing habitat types within the Site Boundary; reclamation zones (RZ); reclamation levels (RL) based on the type, duration, and level of disturbance; and finally, preferred reclamation and monitoring methods. The Final Reclamation and Revegetation Plan will include site-specific treatments, identify seed mixes for use in specific habitat types, address atypical situations, and be subject to agency approval on public lands. The Final Reclamation Plan will be a framework for the subsequent development of site-specific treatment plans.

The Project area, or Site Boundary, as defined in Oregon Administrative Rule (OAR) 345-001-0010(55) includes "the perimeter of the site of a proposed energy facility, its related or supporting facilities, all temporary laydown and staging areas, and all corridors and micrositing corridors proposed by the applicant." The Site Boundary for this Project includes the following related and supporting facilities in Oregon:

- The Proposed Route, consisting of 270.8 miles of new 500-kilovolt (kV) electric transmission line, removal of 12 miles of existing 69-kV transmission line, rebuilding of 0.9 mile of a 230-kV transmission line, and rebuilding of 1.1 miles of an existing 138-kV transmission line;
- Four alternatives that each could replace a portion of the Proposed Route, including the West of Bombing Range Road Alternative 1 (3.7 miles), West of Bombing Range Road Alternative 2 (3.7 miles), Morgan Lake Alternative (18.5 miles), and Double Mountain Alternative (7.4 miles);
- One proposed 20-acre station (Longhorn Station);
- Ten communication station sites of less than ¼ acre each and two alternative communication station sites;
- Permanent access roads for the Proposed Route, including 206.3 miles of new roads and 223.2 miles of existing roads requiring substantial modification, and for the Alternative Routes including 30.2 miles of new roads and 22.7 miles of existing roads requiring substantial modification; and
- Thirty-one temporary multi-use areas and 299 pulling and tensioning sites of which four will have light-duty fly yards within the pulling and tensioning sites.

The Project features are fully described in Exhibit B and the Site Boundary for each Project feature is described in Exhibit C, Table C-24. The location of the Project features and the Site Boundary is outlined in Exhibit C.

1.1 Purpose

The purpose of this Reclamation Plan is to provide a framework for reclamation treatments to be applied to areas impacted by Project construction, operation, and maintenance activities. This Reclamation Plan will describe and recommend construction and reclamation treatment actions that will meet the goals and objectives for land health standards under the applicable authorities, described below in Section 2.0 – Applicable Rules and Statutes; it will also provide requirements for implementing and monitoring reclamation, and will meet the reclamation success standards described in Section 6.4.

Important actions in mitigating the effects associated with the Project include (1) minimizing to the greatest degree practicable the effects associated with right-of-way (ROW) preparation and the construction of facilities, and (2) stabilizing disturbed areas to facilitate eventual desirable plant revegetation for the purpose of maintaining a safe and stable landscape that meets the desired outcomes of land management plans. The procedures outlined in this Plan will assist in:

- Restoring plant communities and associated wildlife habitat and range;
- Preventing substantial increases in noxious weeds in the Project area;
- Minimizing Project-related soil erosion; and
- Reducing visual impacts on sensitive areas caused by construction activities.

1.2 Responsible Parties

IPC will have the overall responsibility of ensuring implementation and monitoring of reclamation efforts for the Project.

The Construction Contractor(s) will be responsible for development of the Final Reclamation Plan. This Reclamation Plan will provide the Construction Contractor(s) the baseline and framework for developing the Final Reclamation Plan that addresses site-specific conditions for reclamation areas identified based on the final design layout of the Project. The Construction Contractor(s) will also be responsible for field-verifying habitat types within the Project disturbance area, identifying and mapping reclamation treatment and control monitoring sites, and collecting preconstruction qualitative and quantitative data at monitoring sites. Once postconstruction reclamation procedures are complete, the Construction Contractor(s) will be responsible for reclamation monitoring, reporting, and installing signage at each reclamation area to indicate that reclamation is in process.

On federal lands, the appropriate land management agency, including either the Bureau of Land Management (BLM) or the United States Forest Service (USFS), will be responsible for the review of the Final Reclamation Plan, on-the-ground reclamation activities, reclamation monitoring reports, and sign-off that reclamation has been completed to the conditions included in the Record of Decision and the ROW Grant.

The Oregon Department of Energy (ODOE) will review all reclamation activities on private, state, and federal lands under the agency's compliance monitoring program. The ODOE Compliance Officer will be responsible for the review of the Final Reclamation Plan, on-the-ground reclamation activities, reclamation monitoring reports, and sign-off that reclamation has been completed to the conditions of the Project Order.

Reclamation on agricultural lands will be coordinated with local landowners to best meet landowners' needs and management goals. An agricultural mitigation plan is included in Attachment K-1 of Exhibit K.

Sensitive biological resources will be mapped in accordance with a Biological Monitoring Plan.

2.0 APPLICABLE RULES AND STATUES

This Reclamation Plan is intended to fulfill OARs requiring disclosure of methods used to mitigate for impacts to wildlife habitat, to monitor mitigation efforts, and to protect soil resources.

Specifically, OAR 345-021-0010(1)(p) requires Exhibit P1 to include:

> *(G) A description of any measures proposed by the applicant to avoid, reduce or mitigate the potential adverse impacts described in (F) in accordance with the ODFW mitigation goals described in OAR 635-415-0025 and a discussion of how the proposed measures would achieve those goals. (H) A description of the applicant's proposed monitoring plans to evaluate the success of the measures described in (G). Additionally, OAR 345-022-0022, requires that Exhibit I demonstrates that construction and operation of the Project, taking into account mitigation, will not result in significant adverse impact to soils.*

Authority for the reclamation practices defined in this Plan is provided under the following.

2.1 Endangered Species Act of 1973, as amended

Take of federally listed species is prohibited without specific exceptions or permits issued under Sections 7 or 10 of the Endangered Species Act (ESA). Under the ESA, the definition of "take" includes to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct. The U.S. Fish and Wildlife Service (FWS) has further defined harm to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Federal agencies must consult with the FWS under Section 7 of the ESA on actions they authorize, fund, or carry out to ensure these actions are not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat.

2.2 Federal Land Policy and Management Act, Section 101(a)(8)

The Federal Land Policy and Management Act requires "public lands be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resources, and archeological values; that, where appropriate, will preserve and protect certain public lands in their natural condition."

2.3 BLM National Sage-Grouse Habitat Conservation Strategy, Section 1.4.1

BLM's goal is to "Sustain or reestablish the integrity of the sagebrush biome to provide the amount, continuity, and quality of habitat that is necessary to maintain sustainable populations of sage-grouse and other sagebrush-dependent wildlife species" (BLM 2004).

2.4 BLM Oregon Standards for Rangeland Health and Guidelines for Livestock Grazing

The Standards for Rangeland Health, as applied in the State of Oregon, are: "to promote healthy sustainable rangeland ecosystems; to accelerate restoration and improvement of public rangelands to properly functioning conditions; and to provide for the sustainability of the western livestock industry and communities that are dependent upon productive, healthy public rangelands" (BLM 1997).

2.5 BLM Oregon, Vale Field Office, Southeastern Oregon Resource Management Plan

"Restore, protect, and enhance the diversity and distribution of desirable vegetation communities including perennial native and desirable introduced plant species. Provide for their continued existence and normal function in nutrient, water, and energy cycles" (BLM 2002).

2.6 BLM Oregon, Vale Field Office, Baker Resource Area Resource Management Plan

"Attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences" (BLM 1989).

2.7 USFS, Wallowa-Whitman Land and Resource Management Plan

The Wallow-Whitman Land and Resource Management Plan establishes the following management goals: "To maintain native and desirable introduced or historic plant and animal species and communities. Maintain or enhance ecosystem function to provide for long-term integrity and productivity of biological communities. To provide habitat for viable populations of all existing native and desired nonnative vertebrate wildlife species and to maintain or enhance the overall quality of wildlife habitat across the Forest" (USFS 1990).

2.8 The Oregon Sage-Grouse Action Plan 2015, Section iii

"The overarching habitat goal is to maintain or enhance the distribution of sagebrush habitats in Oregon with the objective to retain greater than 70% of sage-grouse range as sagebrush habitat in advanced structural stages and to manage the remaining 30% (areas of juniper encroachment, non-sagebrush shrubland, and grassland) to increase available habitat within the range of the sage-grouse" (Sage-Grouse Conservation Partnership 2015).

3.0 OVERVIEW OF EXISTING ENVIRONMENTS

Reclamation actions will be specific to the setting and habitat types impacted by the Project.

3.1 Description of Vegetation

The Proposed Route crosses four ecoregions (Thorson et al. 2003). Starting in Morrow County, at the Longhorn Station, the route crosses approximately 34.8 miles of the Columbia Plateau ecoregion. Vegetation in this ecoregion is characterized by grasslands of bluebunch wheatgrass (*Pseudoroegneria spicata*), Sandberg bluegrass (*Poa secunda*), and Idaho fescue (*Festuca idahoensis*), and associated sagebrush species (*Artemisia* sp.) (Thorson et al. 2003). Cheatgrass (*Bromus tectorum*) is common understory component. Major irrigation projects in the area have converted much of land along the route to poplar tree plantations and irrigated agriculture.

In Umatilla County, the route generally runs from west to east, crossing the Columbia Plateau, and rising into the Blue Mountains ecoregion. Vegetation in this portion of the Columbia Plateau ecoregion is similar to that found in Morrow County, supporting bunchgrass communities without the associated sagebrush species (Thorson et al. 2003). Dryland farming is common in this area. Generally, vegetation in the Blue Mountain ecoregion consists of a diverse shrub layer beneath an open canopy of ponderosa pine (*Pinus ponderosa*) and Douglas-fir (*Pseudotsuga menziesii*). Areas of mesic spruce-fir forest exist as the route crosses the Blue Mountains, in Union County (Thorson et al. 2003). In Baker County, the route descends as it runs to the southeast, passing through bunchgrass, sagebrush, bitterbrush (*Purshia tridentata*), and some juniper (*Juniperus*) communities (Thorson et al. 2003). Again, irrigated agriculture is a major land use in the valleys of Baker County.

As the route leaves Baker County, it also leaves the Blue Mountains ecoregion, entering Malheur County and the Snake River Plain ecoregion (Thorson et al. 2003). Aside from irrigated agriculture, Wyoming big sagebrush (*Artemisia tridentata* subsp. *wyomingensis*), basin big sagebrush (*A. tridentata* subsp. *tridentata*), bluebunch wheatgrass, and cheatgrass are common (Thorson et al. 2003). In saline areas, shadscale (*Atriplex confertifolia*), greasewood (*Sarcobatus vermiculatus*), and saltgrass (*Distichlis spicata*) occur.

Before leaving Malheur County and entering Owyhee County, Idaho, to eventually terminate at the Hemingway Substation, the route crosses a small portion of the Northern Basin and Range ecoregion, before returning to the Snake River Plain, in Idaho. Northern Basin and Range ecoregion along this portion of the route is characterized by sagebrush steppe containing deep river canyons, barren lava fields, badlands, and tuffaceous outcrops (Thorson et al. 2003).

3.2 Grouping of Vegetation

IPC used data from the Terrestrial Visual Encounter Surveys (TVES) to identify the ecological systems and assign a habitat type and category based on vegetation characteristics. However, due to limitations on access to private lands, surveys have not been completed within the entire Site Boundary. Approximately 67 percent of the Site Boundary was surveyed for TVES (see Exhibit P1). In areas where survey information was not available due to unsigned right-of-entry agreements or changes in route alignment, biologists used desktop analysis methods to assign habitat type and category. Gap Analysis Project (or GAP) and aerial imagery interpretation were used to delineate habitat type and agency designated habitats (e.g., Oregon Department of Fish and Wildlife designated big game habitats), known occurrences of special status species, and conditions in adjacent surveyed areas were used to approximate the appropriate category type. Detailed descriptions of the modeling and criteria used to identify and categorize habitats within the Site Boundary are included in Attachment P1-1, Habitat Categorization Matrix, and Attachment P1-6, Habitat Mitigation Plan.

TVES and subsequent desktop analysis for the habitat categorization process identified various habitat types present within the Site Boundary. These habitat types were then assembled into RZs for purposes of this Reclamation Plan. Habitat types grouped into RZs are useful in presenting and describing reclamation methods used for specific habitat types. The extent of each habitat type within the Site Boundary is presented in Table 1. RZs are discussed in greater detail in Section 4.1 below.

Table 1. Habitat Types within the Site Boundary and Corresponding Reclamation Zone

Reclamation Zone	Percent of Site Boundary	Habitat Types Included in each Reclamation Zone
Shrubland	37	Desert Shrub Shrub-Steppe with Big Sage Shrub-Steppe without Big Sage
Grassland	18	Native Grasslands
Agriculture	8	Agriculture
Forest and Woodland	13	Douglas Fir / Mixed Grand Fir Ponderosa Pine Western Juniper / Mountain Mahogany Woodland Forested - Other

Reclamation Zone	Percent of Site Boundary	Habitat Types Included in each Reclamation Zone
Wetland / Riparian	1	Aquatic Bed Wetland Emergent Wetland Scrub-Shrub Wetland Forested Wetland Ponds and Lakes Ephemeral, Intermittent, and Perennial Stream Herbaceous Riparian Introduced Riparian Riparian Woodland and Shrubland
Other	23	Introduced Upland Vegetation and Burned Areas Developed / Disturbed Bare Ground, Cliffs, Talus

4.0 RECLAMATION PLAN METHODOLOGY

This section of the Reclamation Plan describes the process used to identify reclamation actions that will be required within areas subject to ground disturbance as a result of Project construction, operation, and maintenance. Reclamation will occur across all areas impacted by the Project unless occupied by a permanent structure, regardless of land ownership. The following discussion focuses on two key components: (1) identification of RZs, and (2) identification of RLs that have been used to designate or prescribe the required actions for each RZ. The implementation of the reclamation actions described in Section 5.0 – Reclamation Plan varies based on these two components, as well as the habitat types potentially affected.

4.1 Identification of Reclamation Zones

This Reclamation Plan identifies six RZs (RZ1 to RZ6), which are an aggregation of the habitat types listed in Table 1. Additionally, this Reclamation Plan describes the applicable reclamation actions for each RZ. While species composition will vary within the RZ, similar habitat types will likely be found within the designated zone that will support similar reclamation actions.

The following subsection describe each RZ applicable within the Site Boundary.

4.1.1 Reclamation Zone 1 – Shrublands (RZ1)

Reclamation Zone 1 (RZ1) includes shrubland habitat types, which is an aggregation of desert shrub, shrub-steppe with big sage, and shrub-steppe without big sage habitat types. Shrublands are the most common zone found within the Site Boundary, accounting for nearly 37 percent of the total cover. Over 84 percent of the Shrublands RZ is dominated by big sagebrush (*Artemisia*) species. Shrub-steppe without big sage and desert shrub habitat types account for 4 percent and 1 percent of the Site Boundary, respectively.

This zone is typically composed of a variety of low, shrubby, and woody vegetation, with a limited to moderate grass understory (NatureServe 2006). This zone is found throughout the Project, from 375 to 4,700 feet in elevation, and receives approximately 8 to 21 inches of rainfall annually (PRISM 2010). All reclamation actions described in Section 5.0 – Reclamation Plan with the exception of selective clearing are potentially applicable to this zone, dependent on site conditions.

4.1.2 Reclamation Zone 2 – Grasslands (RZ2)

Reclamation Zone 2 (RZ2) includes an aggregation of native grassland habitat types. Grasslands are the third most common RZ identified, occupying roughly 18 percent of the Site Boundary. The two most common grassland ecological systems found are the Columbia Basin foothill and canyon dry grassland (9 percent of the Site Boundary) and lower montane foothill and valley grassland (7 percent of the Site Boundary). These once-extensive grasslands have been largely converted to farmland and are now found in small fragments in isolated areas throughout the Site Boundary. Additionally, cheatgrass has invaded and converted many of these grasslands into invasive annual grasslands, which are included in the “Other” habitat type described below.

Within the Site Boundary, grasslands are typically found in both valley and montane environments ranging from 550 to 5,000 feet in elevation and receives approximately 10 to 32 inches of rainfall annually (PRISM 2010). All reclamation actions described in Section 5.0 – Reclamation Plan with the exception of selective clearing and vertical mulch are potentially applicable to this zone, dependent on site conditions.

4.1.3 Reclamation Zone 3 – Agriculture (RZ3)

Reclamation Zone 3 (RZ3) includes both irrigated and dry-land farming, which are important land uses within the Site Boundary. Agriculture, accounting for nearly 8 percent of the Site Boundary, is typically found from approximately 300 to 3,900 feet in elevation, and receives approximately 8 to 15 inches of rainfall annually (PRISM 2010). All reclamation actions described in Section 5.0 – Reclamation Plan with the exception of selective clearing and vertical mulch are potentially applicable to this zone, dependent on site conditions.

4.1.4 Reclamation Zone 4 – Forest and Woodland (RZ4)

Reclamation Zone 4 (RZ4) includes an aggregation of all forested habitats crossed by the Project and accounts for 13 percent of the Site Boundary. Forest and woodlands are mostly made up of mixed grand fir and Douglas-fir forest (47 percent of the Forest and Woodland RZ) with lesser amounts of ponderosa pine forest and juniper woodlands. These mixed grand fir/Douglas-fir forest are common in the Blue Mountains and are found on drier sites, lacking the characteristic mesic understory of wetter grand fir forest types. Ponderosa pine is a common component on warmer sites in this RZ. Other seral species found in this type are lodgepole pine, western larch, and western white pine (NatureServe 2006).

Forested habitats in the Site Boundary are found in the Blue Mountains in Umatilla and Union counties, from just south of La Grande to south and east of Pendleton. Logging and other disturbance such as grazing are common in these habitat types. Juniper woodlands are mostly found in Baker County west of the town of Durkee. Forest and woodland habitats typically range from 1,900 to 8,800 feet in elevation, and receive approximately 22 to 36 inches of rainfall annually (PRISM 2010). All reclamation actions described in Section 5.0 – Reclamation Plan are potentially applicable to this zone, dependent on site conditions.

4.1.5 Reclamation Zone 5 – Wetland and Riparian (RZ5)

Reclamation Zone 5 (RZ5) is composed of wetland and riparian habitat types. These types account for 1 percent of the Site Boundary. This is a minor RZ limited in extent by available moisture that is found mostly along stream banks and adjacent to springs and seeps. While not commonly found, these types provide highly important fish and wildlife and livestock habitat. Forested, scrub-shrub, and herbaceous wetland and riparian habitats are all present in the Site Boundary.

In wetland and riparian areas, reclamation actions associated with the other RZs may not be applicable due to site-specific conditions requiring modification from standard actions or as a result of agency coordination. In these more sensitive areas, the appropriate land management agency and ODOE or the Construction Contractor(s) must coordinate on reclamation actions to be applied and in some cases the land management agency may require additional, detailed planting plans to accommodate riparian habitats and land management agency objectives.

Permanent impacts to wetland habitats are regulated by the U.S. Army Corps of Engineers and are discussed in detail in Exhibit J.

4.1.6 Reclamation Zone 6 – Other (RZ6)

Reclamation Zone 6 (RZ6) includes an aggregation of disturbed and developed areas and areas dominated by invasive annual and perennial plant species, and is the second most prominent RZ, accounting for 23 percent of the Site Boundary. This zone is typically dominated by invasive plant species or seeded nonnative plants capable of existing in disturbed environments. Introduced forbland and introduced annual and perennial grasslands are the main habitat types of this zone, and together account for 90 percent of the total cover within RZ6. Restoration of these communities to a native plant dominated community is generally not possible as changes in soils and chronic disturbance have altered site potential. This zone is found across a wide range of sites with elevations ranging from approximately 300 to 4,100 feet, receiving from approximately 9 to 31 inches of rainfall annually (PRISM 2010). All reclamation actions described in Section 5.0 – Reclamation Plan with the exception of selective clearing and vertical mulch are potentially applicable to this zone, dependent on site conditions.

Several substrate-dominated natural communities are included under “Other” in Table 1, including cliffs, canyons, and ash and tuff badlands. These sparsely vegetated types are generally found in Malheur County in small, isolated pockets scattered among the sagebrush steppe and shrubland and may require site-specific reclamation plans due to the unique nature of these sites.

4.2 Identification of Reclamation Levels

Determination of RLs that prescribe the types of required actions were based on (1) the type(s) of construction activity, facility features, and the area of associated disturbance; (2) the duration of disturbance (temporary or permanent) associated with these features; and (3) the type of disturbance associated with each activity as described below.

4.2.1 Types of Construction Activities and Facility Features

As presented in Exhibit B, Project Description, major activities associated with the construction of the Project will include, but are not limited to, the following tasks:

- Surveying the transmission centerline, other project features, and work areas;
- Upgrading or constructing temporary and permanent access roads;
- Clearing and grading activities for the ROW, tower sites, multi-use areas, substations, and regeneration sites;
- Developing the Longhorn Station;
- Excavating foundations;
- Installing foundations;
- Assembling and erecting towers with temporary and permanent pad sites;
- Stringing conductors and ground wires;
- Installing communication stations and distribution lines;

- Installing counterpoise (tower grounds) where needed; and
- Conducting cleanup and reclamation of affected areas.

The area disturbed by construction, operation, and maintenance of major facility features will vary as presented in Exhibit B, Project Description. For example, the extent of disturbance associated with bladed access roads will likely be much greater than the disturbance associated with primitive access roads. Likewise, construction disturbance at a tower location will typically be greater than operational and maintenance disturbance for the same tower site.

4.2.2 Disturbance Duration

This Reclamation Plan identifies two broad types of disturbance duration, as defined below.

4.2.2.1 Permanent

Permanent impacts are defined as those impacts that will exist for the entire life of the Project. Permanent impacts would occur along access roads, communication stations, Longhorn Station, and tower sites, as well as within the permanent ROW and vegetative maintenance zones along portions of the Project that cross forested/woodland habitats.

4.2.2.2 Temporary

Temporary impacts are those impacts that will last for a time less than the life of the Project; these include temporary impacts associated with permanent access roads, multi-use areas, pulling and tensioning sites, light-duty fly yards, areas around tower pads, and around the Longhorn Station. Temporary impacts during operation would result from the periodic disturbance associated with inspection and maintenance of the line; temporary impacts associated with retirement of the Project would be similar to those described for construction.

4.2.3 Disturbance Level

This Reclamation Plan defines four broad disturbance levels based on activities associated with construction, operation, and maintenance of Project facilities. Disturbance levels will be considered in the identification of RLs and implementation of specific reclamation practices. In general, the amount of ground disturbance increases with each disturbance level.

4.2.3.1 Disturbance Level 1 (D1) – No New Disturbance

D1 areas include existing access roads and previously disturbed locations that do not require further improvement (vegetation removal or grading) that will remain permanent (in place) after Project construction is complete.

4.2.3.2 Disturbance Level 2 (D2) – Primitive

In D2 areas, disturbance is caused by access to the Project site or construction activities within a work area that requires the clearing of large woody vegetation and other obstructions to improve or provide suitable access for equipment and vehicles. Most woody shrub vegetation is removed and soils are compacted, but no surface soil is removed (i.e., no blading of topsoil), preserving vegetation roots wherever practical to facilitate plant reestablishment. These roads are commonly called “two track” or “overland travel” roads. Examples include new access roads where overland access may be used in the construction of facilities, or in some areas where roads may be improved for access (selective tree and brush clearing). These roads are not intended for use as all-weather roads.

4.2.3.3 Disturbance Level 3 (D3) – Substantial Modification

In D3 areas, disturbance is caused by access to the Project site or construction activities within a work area that requires improving access for equipment and vehicles. Activities resulting in this type of disturbance may include: (1) increasing the width of the existing road prism; (2) changing the existing road alignment; (3) using materials inconsistent with the existing road surface; and/or (4) changing the existing road profile in a way that would alter vehicle use patterns.

Repairs using existing road surface materials within the existing road prism that would not change the road profile or alter the vehicle use patterns are considered substantial modifications if they comprise greater than 20 percent of the road surface area defined by road prism width and longitudinal distance over a defined road segment.

4.2.3.4 Disturbance Level 4 (D4) – Bladed

Disturbance in D4 areas is caused by removing vegetation and displacement of soils. The soils are compacted and the surface soil is displaced (i.e., blading of topsoil). Some examples include construction of a new road prism across a steep side slope or over rough and uneven terrain, tower sites that require clearing and grading, multi-use areas requiring grading, some light-duty fly yards, and existing access roads that require improvements. These roads are designed to support heavy equipment and vehicular traffic.

4.2.4 Reclamation Levels

Four levels of reclamation (RL1 to RL4) have been identified for the Project based on the potential disturbance level (D1 through D4), and duration of disturbance (temporary or permanent). These RLs are described in the following subsections and summarized in Table 2.

Table 2. Disturbance Level, Disturbance Duration, and Associated Reclamation Level

Disturbance Level	Disturbance Duration	
	Temporary	**Permanent**
D1 – No New Disturbance	*Does Not Apply*	**RL1** – Minimal Level of Permanent Disturbance
D2 – Primitive	**RL2** – Low Level of Temporary Disturbance	**RL1** – Minimal Level of Permanent Disturbance
D3 – Substantial Modification	**RL3** – Moderate Level of Temporary Disturbance	**RL4** – Moderate / High Level of Permanent Disturbance
D4 – Bladed	*Does Not Apply*	**RL4** – Moderate / High Level of Permanent Disturbance

4.2.4.1 Reclamation Level 1 (RL1) – Minimal Level of Permanent Disturbance

Project activities in RL1 areas do not result in new disturbance, require minimal preconstruction treatment, and will normally require no postconstruction reclamation actions (outside of routine maintenance). Routine maintenance will include removal of woody vegetation within the transmission line ROW, which is described in Exhibit P1, Attachment P1-4, Vegetation Management Plan. RL1 can include an existing disturbance, such as an existing road.

4.2.4.2 Reclamation Level 2 (RL2) – Low Level of Temporary Disturbance

Project activities in RL2 areas are low level and temporary that will result in disturbance confined to overland construction, including vegetation crushing, and will require limited reclamation actions. RL2 can include temporary facilities such as pulling and tensioning sites and the temporary portions of structure work areas. Low-level temporary disturbance associated with permanent access roads not needing substantial modification or blading may also occur.

4.2.4.3 Reclamation Level 3 (RL3) – Moderate Level of Temporary Disturbance

Project activities in RL3 areas will result in moderate temporary disturbance, limited to clearing and cutting of vegetation. RL3 can include temporary facilities such as pulling and tensioning sites and the temporary portions of structure work areas. Moderate-level temporary disturbance associated with permanent access roads may also occur. RL3 is distinguished from RL2 by a higher level of construction disturbance.

4.2.4.4 Reclamation Level 4 (RL4) – Moderate / High Level of Permanent Disturbance

Project activities in RL4 areas will result in a moderate to high level of permanent disturbance (e.g., blading). Reclamation actions will be minimal because RL4 areas will be permanently occupied by Project components and facilities. RL4 applies to rebuilt existing roads, new access roads that will serve for maintenance and operation of the transmission line, regeneration stations, and the permanent portions of the structure pads. In RL4 locations, seeding and alternative seeding will be applied where appropriate and replacement of soils and vertical mulch will be limited.

For RL2 through RL4, pretreatment of existing noxious weed occurrences may be required before construction to prevent infestation and spread.

Table 3 identifies the various RLs to be applied for each of the related and supporting facilities and associated disturbance levels and durations. In general, the order of disturbance levels from least to greatest is overland drive-and-crush, overland clear-and-cut, and blade-and-shape. RL does not imply level of effort to meet reclamation success criteria. For instance, a RL2 in native shrub-steppe habitat may require more time and effort to meet success criteria than a RL3 in an introduced upland vegetation habitat.

Table 3. Construction Component and Reclamation Level

Construction Component	Disturbance Level	Disturbance Duration		Reclamation Level
		Temporary	Permanent	
Structure work areas	**D2** – Primitive	●		RL2 – Low Level of Temporary Disturbance
	D3 – Substantial Modification	●		RL3 – Moderate Level of Temporary Disturbance
	D4 – Bladed		●	RL4 – Moderate / High Level of Permanent Disturbance
Pulling and tensioning sites, multi-use areas, and other ancillary facilities that result in temporary disturbance	**D2** – Primitive	●		RL2 – Low Level of Temporary Disturbance
	D3 – Substantial Modification	●		RL3 – Moderate Level of Temporary Disturbance
Longhorn Station, communication sites, and other ancillary facilities that result in permanent (long-term) disturbance	**D2** – Primitive		●	RL1 – Minimal Level of Permanent Disturbance
	D3 – Substantial Modification		●	RL4 – Moderate / High Level of Permanent Disturbance
	D4 – Bladed		●	RL4 – Moderate / High Level of Permanent Disturbance

Construction Component	Disturbance Level	Disturbance Duration		Reclamation Level
		Temporary	Permanent	
Existing paved roads, access roads (no improvement)	**D1** – No New Disturbance		●	RL1 – Minimal Level of Permanent Disturbance
Existing access road (with improvements)	**D2** – Primitive		●	RL1 – Minimal Level of Permanent Disturbance
	D2 – Primitive	●		RL2 – Low Level of Temporary Disturbance
	D3 – Substantial Modification		●	RL4 – Moderate / High Level of Permanent Disturbance
	D3 – Substantial Modification	●		RL3 – Moderate Level of Temporary Disturbance
	D4 – Bladed		●	RL4 – Moderate / High Level of Permanent Disturbance
New access road	**D2** – Primitive		●	RL1 – Minimal Level of Permanent Disturbance
	D2 – Primitive	●		RL2 – Low Level of Temporary Disturbance
	D3 – Substantial Modification		●	RL4 – Moderate / High Level of Permanent Disturbance
	D3 – Substantial Modification	●		RL3 – Moderate Level of Temporary Disturbance
	D4 – Bladed		●	RL4 – Moderate / High Level of Permanent Disturbance

5.0 RECLAMATION PLAN

This section presents reclamation actions specifically required for each level of reclamation (RL1 to RL4 as described in Section 4.2.4 – Reclamation Levels) within the reclamation zones previously discussed (RZ1 to RZ6 as described in Section 4.1 – Identification of Reclamation Zones).

Reclamation actions are physical treatments and activities that will occur throughout each phase of the Project and are specific to RL, as identified in Table 4. Table 4 presents pre- and post-construction reclamation actions for each RZ and RL. Table 3, which identifies the RLs for various construction components, is to be used in conjunction with Table 4 to determine appropriate site-specific reclamation actions.

Table 4. Reclamation Action Identification

Reclamation Activity	RZ 1 (Shrublands)				RZ 2 (Grasslands)				RZ 3 (Agriculture)				RZ 4 (Forest and Woodland)				RZ 5 (Wetlands and Riparian)				RZ 6 (Other)			
	RL 1	RL 2	RL 3	RL 4	RL 1	RL 2	RL 3	RL 4	RL 1	RL 2	RL 3	RL 4	RL 1	RL 2	RL 3	RL 4	RL 1	RL 2	RL 3	RL 4	RL 1	RL 2	RL 3	RL 4
PRECONSTRUCTION ACTIONS																								
Noxious weed plan implementation	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Selective clearing			●	●											●	●			●	●				
Topsoil segregation			●				●				●				●				●				●	
Reclamation monitoring site selection			●				●				●				●				●				●	
POSTCONSTRUCTION ACTIONS																								
Management of waste materials	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Earthworks			●	●			●	●			●	●			●	●			●	●			●	●
Topsoil replacement			●				●				●				●				●				●	
Seeding		●	●	●		●	●	●		●	●	●		●	●	●		●	●	●		●	●	●
Alternative seeding		●	●	●		●	●	●		●	●	●		●	●	●		●	●	●		●	●	●
Vertical mulch replacement			●												●				●					
Signage		●	●			●	●			●	●			●	●			●	●			●	●	
Reclamation monitoring (general and site-specific)		●	●	●		●	●	●		●	●	●		●	●	●		●	●	●		●	●	●

Notes:
RL – Reclamation level
RZ – Reclamation zone

If a variance to the expected disturbance level for a particular construction component is required due to unforeseen environmental or engineering constraints, Table 3 provides direction for determining the revised RL, which can then be used to identify the appropriate reclamation actions per Table 4.

These reclamation actions will facilitate resource protection during construction, enhance recovery for areas temporarily disturbed by Project construction, and promote the re-establishment of vegetation in disturbed areas.

The Construction Contractor(s) will coordinate with the appropriate land management agency and ODOE or landowner(s) during the development of the Final Reclamation Plan. This coordination will include the development of site-specific reclamation treatments where disturbance occurs, determining appropriate seed mixes, and delineation of the geographic extent in which each seed mix will be distributed within the areas disturbed by construction. The Construction Contractor(s) and appropriate land management agency and ODOE, or landowner(s) coordination will occur during the preconstruction phase of the Project to ensure the proper amount of each seed mix can be purchased and is available when needed. The goal of identifying site-specific reclamation treatments will be achieved through analysis of existing data and ground verification of habitat types documented during TVES surveys in areas subject to Project-related ground disturbance. In particular, habitat types important to threatened and endangered (T&E) species may require additional reclamation actions to mitigate disturbance impacts associated with the Project and maximize the probability of reclamation success.

5.1 ROW Preparation and Preconstruction Actions

Preconstruction actions are those that occur before construction of the Project is initiated, and includes activities associated with ROW preparation. ROW preparation includes general site preparation involving flagging of the ROW boundaries, construction areas and sensitive resources (wetlands, T&E plants, cultural) to avoid accidental entry into these areas. It also includes identification and pre-treatment of noxious weed infestations located within proposed Project disturbance footprint (see Exhibit P1, Attachment P1-5, Noxious Weed Plan) and storage areas for windrowed plant and soil materials. Monitoring sites will be established, as described in Section 6.2.2 – Site-Specific Reclamation Monitoring.

Preconstruction actions will focus on protection of environmentally sensitive areas and resources identified for preservation, monitoring site selection and baseline data collection, and identification and pretreatment of noxious weed infestations located within proposed Project disturbance. Preconstruction actions and ROW preparation are the responsibility of the Construction Contractor(s).

Disturbance related to Project construction may begin only after all ROW preparation and preconstruction actions have been completed.

5.1.1 Noxious Weed Plan Implementation

Noxious weeds and invasive plant species will be managed in conformance with the Noxious Weed Plan (Exhibit P1, Attachment P1-5). Specific measures and agency directives will be detailed in the Noxious Weed Plan once finalized, as well as information regarding noxious weed control measures and monitoring requirements. Noxious weed treatment and monitoring will continue following Project construction.

5.1.2 Monitoring Site Selection

As discussed below in Section 6.2.2 – Site-Specific Reclamation Monitoring, preliminary monitoring site locations will be established along the ROW. A single monitoring site includes both a treatment site and a control site. The treatment site is an area expected to be disturbed during construction and that will be revegetated. The control site will be paired with the treatment site, meaning the control site will be in the vicinity of the treatment site and will have the same general slope, aspect, and habitat type as the treatment site (prior to disturbance).

Monitoring sites will be selected for each of the habitat types expected to be subject to Project-related surface disturbance as described below in Section 6.1 – Monitoring Requirements.

5.1.3 Selective Clearing

Selective clearing is the normal practice for mitigating impacts in areas where trees or brush of high densities have been cleared due to Project activities. Selective clearing is to be considered in shrubland (RZ1) or forest and woodland RZ (RZ4) areas of the Project. See the Vegetation Management Plan (Exhibit P1, Attachment P1-4) for further discussion of vegetation management.

5.1.4 Topsoil Segregation

Ground disturbance will be avoided and minimized where practical; however, even with avoidance and minimization of disturbance, there will still be extensive areas of temporary soil disturbance resulting from construction of the Project. The Final Reclamation Plan will identify locations where the management of topsoil is warranted (e.g., stripping off the topsoil layer and storing it separately from subsoils), such as areas where topsoil currently supports native plant species or in areas that are important to private landowners (e.g., agricultural soils). Generally, the topsoil layer is considered the upper 6 to 12 inches of soil, but this can vary by soil type, and soils deeper than 12 inches may need to be considered as “topsoil” in certain agricultural areas. Furthermore, top soils in dry shrubland and desert-like environments may be much thinner than 6 inches in many instances.

Topsoil segregation includes the separation of topsoil from subsoil. Topsoil contains organic material, including the seeds of plants growing on the site. Topsoil segregation will be performed where earthworks cause disturbance to vegetation and soil. Topsoil will be set aside for postconstruction replacement. The goal of this activity is to maintain the biological, chemical, and physical integrity of the topsoil and subsoil (where appropriate).

If topsoil is removed, care will be taken to ensure it is not mixed with the underlying subsoil. Topsoil will be stored in a separate stockpile. It will be returned to the area from which it was taken and will not be spread in adjacent areas. If topsoil is not suitable for backfill, it will be spread in other previously disturbed areas or transported to a predetermined off-site disposal area.

Additionally, subsurface soils and waste rock will be spread where practicable and in proximity to the disturbance (within the ROW). This material will be spread uniformly to match existing contours and covered with topsoil, when available, and re-seeded. Large rocks excavated during foundation work will be kept separate from topsoil during construction and during surface preparation as part of restoration. These rocks will be moved to designated on-site locations.

5.2 Postconstruction Reclamation Actions

Postconstruction reclamation actions occur after Project construction has terminated, and primarily focus on stabilizing permanent use areas and restoring temporary areas to allow revegetation. Postconstruction reclamation actions that may be used are defined below and are organized by their sequence of implementation. The Construction Contractor(s) will incorporate the reclamation actions identified in the Final Reclamation Plan that will be reviewed and approved by the appropriate land management agency and ODOE, or landowner, before postconstruction actions commence.

If reclamation actions identified below cannot be implemented following construction, appropriate interim erosion control measures as proposed by the Construction Contractor(s) and approved by the appropriate land management agency, ODOE, landowner, and/or discussed in the Erosion and Sediment Control Plan (ESCP [discussed in Exhibit I, Soil Protection]), will be installed until revegetation can occur.

5.2.1 Management of Waste Materials

Management of waste materials will be performed in conformance with the Spill Prevention, Containment, and Countermeasures Plan (see Exhibit I, Soil Protection). Final cleanup will ensure all construction areas are free of construction debris including, but not limited to, assembly scrap metals, oil or other petroleum-based liquids, construction wood debris, and worker-generated litter. Permanent erosion control devices will be left in place.

5.2.2 Earthworks

Earthwork activities will include the re-establishment of slope stability, surface stability, desired topographic diversity, and drainage features. Subsurface soils and waste rock will be spread where practicable and in proximity to the disturbance (within the ROW). This material will be spread uniformly to match existing contours and covered with topsoil, when available, and re-seeded. Earthwork activities will include re-contouring, to the extent feasible, of areas that are not needed for operation and maintenance of the Project. Temporarily disturbed lands within the ROW will be re-contoured to match surrounding landscapes. Re-contouring will emphasize restoration of the existing drainage patterns and landform to preconstruction conditions, to the extent practicable. Structure pads and permanent access roads may be reseeded to reduce pad and road erosion, but these permanent features will not be re-contoured. Earthwork activities will also include application of appropriate hydrologic stabilization methods and soil erosion measures in conformance with the ESCP (see Exhibit I, Soil Protection).

Detrimental soil disturbance such as compaction, erosion, puddling, and displacement will be minimized through implementing measures identified in the ESCP. Measures may include road ripping, frequent water bars, cross-ditching (e.g., rolling dips), or other methods to reduce compaction while preventing gully formation. Ripping pattern will be altered to a crossing, diagonal, or undulating pattern of tine paths to avoid concentrated runoff patterns that can lead to gullies.

5.2.3 Topsoil Replacement

Areas within the ROW, laydown or staging yards, and other areas of extensive vehicle travel and material storage may contain compacted soils. These soils will be de-compacted on a case-by-case basis. In areas of droughty soils, the soil surfaces will be mulched and stabilized to minimize wind erosion and to conserve soil moisture in accordance with the ESCP. Topsoil and subsurface soils will be replaced in the proper order during reclamation.

5.2.4 Seeding

Seeding involves planting new seed of native or desirable introduced plant species to establish desired self-perpetuating plant communities within Project-affected areas. It is important to establish a species composition, diversity, structure, and total ground cover appropriate for the desired habitat type to meet the objectives of the BLM and USFS Resource Management Plans on public lands. As stated above, the BLM (2002) plan states that action on BLM lands should “Restore, protect, and enhance the diversity and distribution of desirable vegetation communities including perennial native and desirable introduced plant species.” While native plant communities are generally preferred, in some cases, as determined by the appropriate land management agency, ODOE, or landowner, desirable introduced species may be recommended in seed mixes as a treatment to improve chances of reclamation success where the RZ(s) contain large quantities of invasive species such as cheatgrass or medusahead (*Taeniatherum caput-medusae*), or where there are other limiting factors such as precipitation variability or limited ecological site potential. Under these circumstances, a desirable introduced species seed mix may provide optimal ground cover and long-term protection against annual plant establishment. This treatment is identified as alternative seeding in this Reclamation Plan and is discussed in Section 5.2.5.

In addition to restoring temporarily disturbed areas, IPC will re-seed some permanently disturbed areas. To minimize potential damage from wildland fires, IPC will not reseed areas within a 20-foot radius around structures. Additionally, as stated in the Vegetation Management Plan (Exhibit P1, Attachment P1-4), brush and grass will be cleared around wood poles to help protect structures from range fires.

Appendix A – Preliminary Agency-Approved Seed Mixes includes a list of approved seed mixes provided by the BLM and USFS. These preliminary seed mixes were provided to IPC in a memo from Susan Fritts of the BLM, dated December 16, 2015. The objective of these seed mixes is to provide native or desirable introduced vegetation to compete with invasive and noxious weeds as well as reclaim continuous habitat for wildlife and pollinators species. The seed mixes presented in Appendix A are intended for rehabilitation of sites disturbed during Project construction and are not intended for mitigation of impacts to wetlands or traditional foods. Furthermore, in areas where the preconstruction vegetation is dominated by invasive annual species such as cheatgrass, a desirable introduced species mix has been developed to keep noxious weeds from invading, this mix is not intended to provide habitat for wildlife or pollinators. Soils with exposed or shallow bedrock may require adaptive seed mixtures and implementation of revegetation practices (i.e., fertilization, mulching, monitoring) to enhance revegetation success. Revegetation of areas with extensive rock outcrop may not be possible.

Because the Project crosses four ecoregions, botanists and wildlife biologists from the BLM and USFS designed these seed mixes to be used across each ecoregion and general vegetation community while still tailoring the mixes to be site appropriate. Information from *Natural Vegetation of Oregon and Washington* (Franklin and Dyrness 1973), BFI Native Seed, LLC, Natural Resource Conservation Service, as well as professional experience helped determine the seed mixes. Agency-approved seed mixes will be applied Project-wide, except in agricultural areas, to the appropriate habitat type, unless directed otherwise by the land management agency and/or landowner. The Construction Contractor(s) or weed specialist may recommend modified seeding application rates and timing of implementation to achieve site-specific weed management objectives. Final seed mixes will be determined by soil type and site-specific conditions and will be provided to the Construction Contractor(s) by a BLM or USFS specialist or landowner.

It is important to consider the source of seed used for revegetation. Seed that is genetically adapted to a particular ecoregion will have a much higher success rate in that ecoregion; however, ecoregion-specific seed is not always readily available. Wildland seed collection is a method of increasing seed supply that may be considered if commercially harvested seed is not available.

Before construction begins, the Construction Contractor(s) will produce the Final Reclamation Plan in coordination with the appropriate land management agency, ODOE, or landowner. The Final Reclamation Plan will specifically correlate agency-approved seed mixes to Project-identified RZs and habitat types.

Reclamation seeding methods will include broadcast seeding, drill seeding, or hydroseeding/hydromulching (or a combination of methods). Seeding methods will be chosen based on the type of seed, disturbance level, soil type, terrain, and precipitation levels for the area to be reclaimed. Seeding methods will be reviewed and approved by the land management agency or private landowner.

Broadcast seeding will apply the seed directly on the ground surface. The type of broadcast spreader will depend on the size of the area to be seeded, and the terrain. Seed will be placed in direct contact with the soil, ideally at a depth of approximately 0.5 to 1 inch deep. It will then be covered by raking or dragging a chain or harrow over the seed bed to remove air pockets. Studies have shown that good soil-to-seed contact is required for successful seed germination (Pyke et al. 2015).

Drill seeding will be used on areas of sufficient size with moderate or favorable terrain to accommodate mechanical equipment. Drill seeding provides the advantage of planting the seed at a uniform depth. This is important because seeds buried too deeply either germinate and die before reaching the surface or they may become dormant until they reach enough light to stimulate germination (Pyke et al. 2015).

Hydroseeding, which is the spraying of seeds and water onto the ground surface, or hydroseeding/hydromulching, which is the spraying of seeds, mulch, and water, may be implemented on steeper slopes. Tackifier may be added to facilitate adherence of hydromulch to slopes greater than 25 percent or on sandy or other highly erodible soils.

IPC may use soil amendments (e.g., fertilizer, wood or straw mulches, tackifying agents, or soil stabilizing emulsions) on a case-by-case basis. Straw, hay, mulch, gravel, seed, and other imported materials must be certified weed-free. If certified weed-free materials are not available, then alternative materials will be used with agency approval.

To help limit the spread and establishment of noxious weed species in disturbed areas, desired vegetation must be established promptly after disturbance. IPC will rehabilitate disturbed areas as soon as possible after ground-disturbing construction and operations and maintenance activities and during the optimal period. If areas are not immediately seeded after construction due to weather or scheduling constraints, all noxious weeds will be controlled before seeding. Appropriate herbicides will be used to ensure fall seedings are not affected by residual herbicides.

Additionally, to promote recolonization by T&E plant species and reduce competition between T&E and other plant species, the Construction Contractor(s) will prepare the site-specific revegetation, reseeding, and soil stabilization plans for all areas disturbed by construction or maintenance within 100 feet of mapped T&E plant occurrences. The site-specific plans will be approved by the BLM, USFS, or Oregon Department of Agriculture (ODA) Authorized Officer or his/her designated representative prior to implementation. The plans will be designed to ensure T&E plant species are not disadvantaged. The plans will include proposed seed mixes, seeding application rates, seeding methodologies, seeding timeframes, and any other revegetation or soil stabilization techniques (e.g., natural recolonization, alternative seeding, supplemental planting, supplemental watering, supplemental mulch, surface pocking, the use of soil stabilizers). The seed mixes will be developed in consultation with the BLM, USFS, or ODA botanist, favor the T&E plant species, and be based on site-specific vegetation found on the undisturbed areas adjacent to the areas to be revegetated or reseeded.

5.2.5 Alternative Seeding

Alternative seeding is employed to establish ground cover in disturbed or weed-infested areas by seeding of nonnative grasses and/or forbs. While nonnative species are generally not desirable, they provide soil cover, stabilization, and a source of organic litter until other vegetation can become established in areas where systems have crossed abiotic and biotic thresholds to an alternative successional state and are unable to recover to their original state (Pyke et al. 2015). Similar to regular seeding, alternative seeding mix compositions and seeding methods will be determined prior to construction through Construction Contractor(s) coordination with the applicable land management agency, ODOE, or landowner.

5.2.6 Vertical Mulch/Slash

Vertical mulch/slash is brush and tree limbs less than 6 inches in diameter removed during woody vegetation removal operations. Vertical mulch/slash is not entirely in contact with the soil surface; rather, parts of the mulch rise above the surface. Removed and stored trees and shrubs are the sources of vertical mulch/slash. For cleared areas, vegetation windrowed to the outside of the disturbance boundary will be replaced back onto the site. Additionally, during topsoil segregation, small rocks will be incorporated and vegetation combined as vertical mulch.

5.2.7 Signage

Reclamation areas will require informational signs to prevent further human disturbance within these recovering areas. Signs stating "Restoration in Progress – No Vehicle Traffic Allowed," or similar, will be installed as necessary at locations where the ROW intersects permanent access roads to deter vehicular damage to the site. The Construction Contractor(s) will provide reclamation signs and t-posts. Sign locations will be provided by the appropriate land managing agency and ODOE to the Construction Contractor(s) following completion of postconstruction reclamation procedures and prior to the initiation of reclamation monitoring.

5.2.8 Reclamation Monitoring

Monitoring will be initiated prior to construction and will continue through the postconstruction phases of the Project. Monitoring data will be documented and reported to facilitate revised reclamation strategies, if applicable. Revised strategies will be implemented as needed. Evaluation of reclamation success will be based on criteria as described in Section 6.4 – Reclamation Goals and Success Standards.

Reclamation monitoring and reporting will be conducted as described below in Section 6.2 – Monitoring Methods.

5.3 Modifications and Field Changes

The reclamation actions described in this Reclamation Plan will be incorporated into the Final Reclamation Plan, to be developed by the Construction Contractor(s) and subject to the approval of the appropriate land management agency, ODOE, or landowner.

Adjustments to RLs or actions by the Construction Contractor(s) may be necessary if Project conditions change (e.g., disturbance levels change at a specific tower work site, access roads change based on Project needs, etc.).

This Reclamation Plan is intended to provide flexibility with respect to construction and unknown constraints that may be encountered in the field. Changes to the original disturbance level or duration, previously described, will be documented by the Construction Contractor(s) and will be reassessed to ensure appropriate reclamation actions are implemented.

6.0 RECLAMATION SUCCESS STANDARDS, MONITORING, AND MAINTENANCE

Postconstruction reclamation monitoring is required to ensure soil protection is achieved, to evaluate reclamation success of reclaimed areas associated with the construction of Project facilities, to identify the need for adaptive management measures, and to make a final determination regarding reclamation success to release IPC (and the Construction Contractor(s) by contractual obligation) from further monitoring and reclamation actions. Reclamation success standards will be used by the appropriate land management agency and ODOE to determine if the implemented reclamation actions have adequately achieved the goals and objectives provided in the Final Reclamation Plan, with consideration for local site conditions.

The monitoring practices include standard techniques for monitoring sites, data collection, as well as the quantitative (numerical) and qualitative (descriptive) measures to be used in monitoring reclamation success. Specific monitoring requirements, including the site-specific data analysis protocol, will be developed by the Construction Contractor(s), in coordination with the appropriate land management agency and ODOE prior to the start of construction activities. Data will be collected as described below at both the treatment and control sites upon establishment of monitoring sites during preconstruction activities. The data will provide a baseline for comparison to post construction conditions and allow decision makers to make more accurate conclusions pertaining to reclamation success based on site-specific conditions, such as habitat type and climatic conditions.

Reclamation monitoring will be conducted annually for up to 5 years following completion of construction (as discussed above). The first annual monitoring event will occur during the first growing season after reclamation actions occur. When it is determined that an area of the Project has been successfully reclaimed at any point during the 5 years of monitoring by satisfying all success criteria (as defined in Section 6.4 – Reclamation Success Standards), IPC will request concurrence from ODOE. If ODOE concurs, IPC will conclude that it has no further obligation to perform reclamation activities in that area of the Project. Where this is the case, the monitoring effort may require less than 5 years. If after 5 years of monitoring some sites have not attained the success criteria or if at any point during the annual monitoring it is clear that reclamation cannot be successful (including private landowner denial of reclamation activities), IPC will coordinate with ODOE regarding appropriate steps forward. At this point, IPC may suggest additional reclamation techniques or strategies, or IPC may request a waiver from further reclamation obligations at these sites. If a waiver of reclamation actions is granted, it will include justification for how the waiver is consistent with the Energy Facility Siting Council's Fish and Wildlife Standard (OAR 345-022-0060) and all other standards applicable to reclamation activities.

The Construction Contractor(s) or third-party contractor will prepare and submit a Reclamation Monitoring Report for the entire Project length to IPC, the appropriate land management agency, and ODOE on an annual basis for up to 5 years (as described above) following completion of each phase of construction. If after 5 years, additional reclamation actions are determined necessary (as described above), annual reporting will continue until reclamation areas have satisfied all success criteria or IPC has been waived from further reclamation obligations. The purpose of the Reclamation Monitoring Report is to provide a summary and status update on progress toward meeting reclamation goals and success standards as described in the Final Reclamation Plan. Because construction and reclamation activities will occur in phases, the monitoring report will also be organized by construction phase. The Reclamation Monitoring Report will, at a minimum, include:

- A reiteration of reclamation goals and success standards as described in the Final Reclamation Plan;
- A description of the monitoring practices implemented;
- A list and map identifying the location of all reclamation areas;
- A presentation of the reclamation monitoring data collected;
- A discussion of the demonstrated or lack of demonstrated progress toward the success standards;
- A discussion of adaptive management;
- A proposed list of sites to be released from further monitoring; and
- Site-specific recommendations for remedial actions, as appropriate.

Adaptive management may be necessary to determine appropriate remedial actions, based on monitoring observations from any year, for sites that have not demonstrated progress toward reclamation success standards. If required, implementation of remedial actions will be determined by the appropriate land management agency and ODOE based on the monitoring data and annual report. The last year's report will be submitted with a summary of monitoring data, observations, and the overall trend toward reclamation for each habitat type. The appropriate land management agency and ODOE will release IPC from further reclamation and monitoring requirements for specific areas upon acceptance of the annual monitoring report documenting that reclamation success criteria have been met, as discussed above.

Monitoring reclamation activities and remedial measures on disturbed private lands (e.g., agricultural lands) will be determined based on agreements made between the landowner and IPC. Monitoring of agricultural lands is not proposed; restoration of agricultural lands will be considered complete upon replacement of disturbed soils and seeding or planting of crops.

6.1 Monitoring Requirements

Monitoring requirements will vary according to RL as shown in Table 5. RL1 areas (e.g., maintenance of the ROW, existing roads) are permanent disturbance areas that will not require reclamation monitoring. However, all areas disturbed by Project construction will follow measures for noxious weed control as applicable and specified in the Noxious Weed Plan (Exhibit P1, Attachment P1-5).

RL2, RL3, and RL4 are disturbance areas that will require reclamation actions and subsequent reclamation monitoring efforts. Reclamation monitoring includes both general reclamation monitoring and site-specific reclamation monitoring as described in Section 6.2.

The specific location of monitoring sites associated with these different activities will be in key areas and these sites will be reviewed and approved by the appropriate land management agency and ODOE prior to initiation of construction activities. Once monitoring sites have been approved, the Construction Contractor(s) will establish the sites in the field, and baseline data (e.g., photo points, biometrics, and soil conditions) will be collected. The Construction Contractor(s) will conduct annual monitoring following postconstruction activities as described in Section 6.0.

Table 5. Reclamation Monitoring Requirements

Construction Component	Disturbance Level	Disturbance Duration		Reclamation Level	Monitoring
		Temporary	Permanent		
Structure work areas	**D2** – Primitive	●		RL2	General
	D3 – Substantial Modification	●		RL3	General, Site-specific
	D4 – Bladed		●	RL4	General
Pulling and tensioning sites, multi-use areas, and other ancillary facilities that result in temporary disturbance	**D2** – Primitive	●		RL2	General
	D3 – Substantial Modification	●		RL3	General, Site-specific
Longhorn Station, communication sites and other ancillary facilities that result in permanent (long-term) disturbance	**D2** – Primitive		●	RL1	General
	D3 – Substantial Modification		●	RL4	General
	D4 – Bladed		●	RL4	General
Existing paved roads, access roads (no improvement)	**D1** – No New Disturbance		●	RL1	Not Required
Existing access roads (with improvements)	**D2** – Primitive		●	RL1	Not Required
	D2 – Primitive	●		RL2	General
	D3 – Substantial Modification		●	RL4	General
	D3 – Substantial Modification	●		RL3	General, Site-specific
	D4 – Bladed		●	RL4	General
New access roads	**D2** – Primitive		●	RL1	General
	D2 – Primitive	●		RL2	General
	D3 – Substantial Modification		●	RL4	General
	D3 – Substantial Modification	●		RL3	General, Site-specific
	D4 – Bladed		●	RL4	General

6.2 Monitoring Methods

Identification and establishment of monitoring sites will be accomplished prior to ground-disturbing activities. Identification of monitoring sites (both a treatment site and control site) will include the collection of baseline data for comparison with subsequent postconstruction monitoring. Postconstruction annual monitoring and collection of data will be conducted during the growing season after reclamation actions occur for each phase of construction.

An annual Reclamation Monitoring Report will be prepared by the Construction Contractor(s) and provided to IPC, the appropriate land management agency, and ODOE for review and discussion of reclamation conditions. Construction activities will result in varying disturbance levels that will require two types of monitoring:

1. **General reclamation monitoring**. General field reconnaissance (windshield survey) and reporting of conditions in areas disturbed during construction where reclamation actions have been implemented.

2. **Site-specific reclamation monitoring**. Detailed field data collection and reporting at designated reclamation monitoring sites as identified in the Final Reclamation Plan.

A description of the activities associated with these two monitoring methods (practices), and how these practices will be assigned to areas affected by construction of the transmission line and associated facilities, is presented below. The Construction Contractor(s) will consult with the appropriate land management agency and ODOE to adapt these practices, as needed, to meet localized conditions and concerns.

6.2.1 General Reclamation Monitoring

A general field review of the transmission line layout, where accessible by vehicle and right-of-entry is granted, will be conducted in conjunction with annual site-specific reclamation monitoring. The intent of this review is to document overall recovery conditions associated with the Project. Conditions of concern warranting documentation may include establishment of noxious weed populations resulting from Project construction, a lack of desirable vegetation cover, soil compaction, or lack of soil parent material due to erosion. In lieu of establishing monitoring sites, documentation may include establishing single photo points at locations agreed upon with the appropriate land management agency and ODOE and/or recording the apparent cause of unsuccessful reclamation. Site locations may be documented by noting the direction and estimated distance to the nearest transmission line tower (by number) or global positioning system (GPS) coordinates.

Adaptive management actions may be implemented based on findings of general reclamation monitoring as recommended by the appropriate land management agency and ODOE and described in Section 6.5 – Adaptive Management and Site Release. Each annual visit will be used to assess designated general reclamation monitoring locations and document new locations where appropriate.

6.2.2 Site-Specific Reclamation Monitoring

Preliminary site-specific reclamation monitoring locations will be established prior to ground-disturbing activities within areas that will be disturbed by the Project. Site identification will be based on habitat type and habitat category previously identified during the TVES survey, as well as agency recommendation. A single monitoring site includes both a treatment site and a control site. The treatment site is an area expected to be disturbed during construction that will be reclaimed. The control site will be paired with the treatment site, meaning the control site will be in the vicinity of the treatment site and will have the same general slope, aspect, and habitat type as the treatment site (prior to disturbance). A control site may be paired with multiple treatment sites provided there is a high degree of similarity between sites.

Sites will be selected for each of the reclamation zones and habitat types traversed by the Project, in accordance with the processes identified below.

- Site selection will be prioritized to include T&E plant species occurrences and locations with high visual resource values.
- At least one paired monitoring site will be established for each area of disturbance affecting T&E plants.

- The final number of monitoring sites per habitat will be based on the extent and diversity of vegetation within each habitat type, with an anticipated average of two to five paired monitoring sites per habitat type.
- Selection of monitoring sites will be stratified based on proportions of each habitat type subject to reclamation activities (e.g., if 40 percent of the total area subject to disturbance and subsequent reclamation activities is sagebrush, then 40 percent of the total number of monitoring sites will be located in sagebrush).
- Selection of monitoring sites shall be further stratified based on the presence of noxious weeds, nonnative, or invasive species infestations (e.g., if the total habitat type area is approximately 70 percent cheatgrass, approximately 70 percent of the monitoring sites will be located in cheatgrass-infested areas, and approximately 30 percent of the monitoring sites will be located in noninfested areas).

Final determination of monitoring sites will be approved by the appropriate land management agency and ODOE prior to construction. Cooperation with the Construction Contractor(s) may be necessary prior to construction if changes to construction work area(s) affect the location(s) of the preliminary monitoring site(s).

For each monitoring site, paired transects will be installed and documented as treatment or control for quantitative monitoring. In general, the treatment transect will be placed within an affected area (normally within the immediate ROW), and the control transect will be placed immediately adjacent to the ROW, on undisturbed ground if on public lands. If control plots are on private land, they will be installed within the private land easement. Transect size and quantity will be determined based on the final footprint of disturbed areas, in cooperation with the appropriate land management agency and ODOE. Transect pairs will be sized and oriented in a similar manner, for consistency, unless terrain or construction conditions require deviation. In addition, the location of monitoring sites will avoid areas susceptible to future human disturbance (off-highway vehicles [OHV], transmission line maintenance, planned future utilities), where possible, to preserve the integrity of each monitoring site for the duration of the monitoring period.

Once monitoring site locations are finalized, photo points will be established prior to any construction-related disturbance. Photo points will be marked by a metal pin or metal T-post and location recorded with GPS technology to ensure that subsequent photographs are taken from the same location. The cardinal direction of photographs taken will be recorded to allow duplication, to the extent possible, of the same view during annual monitoring events. Photographs will be taken at each photo point (1) when the photo point is established, (2) when initial reclamation efforts have been completed, and (3) during each annual monitoring visit, with a maximum of five monitoring events. Photo points will be collected at the same time of year for each year of monitoring, and with the same camera, if possible. Each photo point will include:

- A close-up photograph (0.5-meter by 0.5-meter photo plot) depicting soil surface characteristics and amount of vegetation and litter; and
- A general overview photograph of the site and/or photographs depicting north, south, east, and west views.

Site-specific reclamation monitoring sites will be examined annually, and a variety of vegetation data will be collected including quantitative and descriptive information. Parameters that will be used to measure reclamation success are presented in Section 6.4 – Reclamation Goals and Success Standards. Reclamation monitoring sites will also assess noxious weed, nonnative, and invasive species establishment that may require remedial actions such as removal or treatment. However, it should be noted that postconstruction monitoring for Project-related impacts to noxious weeds might occur independently of reclamation monitoring, as outlined in Exhibit P1, Attachment P1-5, Noxious Weed Plan.

Reclamation monitoring will also include the consideration of erosion control as a key indicator to measure the trend toward reclamation success (where applicable), and remedial actions may be taken in conjunction with monitoring efforts to control erosion, as needed. These remedial actions will also follow requirements as stipulated in the ESCP discussed in Exhibit I, Soil Protection. In conjunction with, and complementary to, reclamation monitoring, IPC is responsible for monitoring to ensure soil protection is achieved, and providing a monitoring report on reseeding success and/or other methods to stabilize soils to the appropriate land management agency and ODOE annually until it has been determined that an area of the Project has satisfied all success criteria and/or IPC has been released from reclamation obligations (as described above).

6.3 Data Collection

The collection of baseline data during preconstruction establishment of treatment and control monitoring sites and annual postconstruction reclamation monitoring will include both quantitative (numerical) and qualitative (descriptive) data collection. Quantitative monitoring will document the trend and degree of change at each site, and qualitative monitoring will enable investigation of potential reasons for reclamation success or lack thereof and identification of unanticipated issues. Additional baseline data to be collected during preconstruction establishment of treatment and control sites will include the collection of site characteristics that are not expected to change throughout the monitoring period. In addition to the qualitative and quantitative data described below, information to be collected and/or recorded during the initial establishment of monitoring sites may include GPS location, slope, aspect, elevation, soil type, current habitat type, and existing disturbances.

Reclamation monitoring for the Project will use vegetation as the main indicator of recovery, but observations of soil conditions, such as of compaction, rutting, and erosion, will also be documented and considered when assessing progress toward functionality. Measurements and descriptions will be accompanied by photographs that will be used to visually document the status of recovery at all monitoring sites. Sampling points will be mapped and relocated using GPS technology. Photo points and field notes will be the primary methods of qualitative monitoring for the Project. A protocol for taking photographs and a standardized data-recording form (likely electronic form) will be developed by the reclamation subcontractor and approved by the appropriate land management agency and ODOE to ensure consistency of monitoring. Qualitative and quantitative information to be obtained during general reclamation monitoring and site-specific monitoring is described in detail below.

For disturbed areas affecting T&E species, at a minimum, photographs from permanent photo points, percent cover of T&E species within the affected areas, and noxious weed presence and treatment data will be collected and reported. Reclamation monitoring in T&E plant occurrences will be conducted during the blooming period for the species of interest.

6.3.1 Baseline Information

Site characteristics that are not expected to change throughout the monitoring period will be collected during the initial visit. These characteristics should be as similar as possible between control and treatment (i.e., paired) sites. Data to be collected and recorded during the establishment of control and treatment sites may include the following:

- *Location.* Record the location of control and treatment sites and photo points with a GPS.

- *Slope.* Slope of the control and treatment sites will be recorded. This may include a range if slope is not generally uniform throughout the monitoring site.
- *Aspect.* Record the aspect of the control and treatment sites (cardinal direction the site faces).
- *Elevation.* Record the elevation of the control and treatment sites.
- *Soil type.* Record the soil type(s) based on Natural Resources Conservation Service-mapped soil type.
- *Current habitat type.* Record the current habitat type using a field key such as NatureServe (2006). Ecological site information may also be recorded as it provides insight on site potential, productivity, successional patterns, and management implications.

6.3.2 Qualitative (Descriptive) Information

Qualitative data collection will occur annually for both general and site-specific monitoring. The goal of qualitative monitoring is to describe site conditions and assess the need for remedial actions to ensure sites are progressing toward the success standards to be established by the reclamation subcontractor in consultation with the appropriate land management agency and ODOE. The Project area typically has unpredictable weather patterns that may affect reclamation success. Comparing annual qualitative evaluations within similarly disturbed areas in the same habitat type will allow for identification of sites that are demonstrating a comparative lack of reclamation success and may require remedial action. Any non-Project-related disturbances that could affect reclamation will also be documented and described during the collection of qualitative information.

Reclamation success may be assessed by the presence or condition of certain site characteristics that encourage recruitment of native vegetation. If reclamation actions for a given site are implemented successfully, they will contribute to the stabilization of soils, native species seedling or seedbank recruitment, and prevention of noxious weeds establishment. The following items should be considered when creating a qualitative monitoring worksheet for use during monitoring:

- *Waste materials management.* Is the site free of trash and construction material? Is the area free of undesirable materials that may inhibit reclamation success?
- *Evidence of soil stabilization and lack of erosion.* Describe visible signs of soil erosion such as rock pedestals, overland flow patterns, and the formation of rills or gullies. Indicators that soils have not stabilized and erosion is negatively affecting reclamation success include rills greater than 2 inches, sheet flow, head cutting in drainages, eroded slopes occurring on or adjacent to reclaimed areas, and any signs showing accelerated erosion is occurring and soils are not being held by plants on site.
- *Occurrence of noxious weeds.* Noxious weeds compete with native species, and relatively high abundances can have negative effects on site conditions. Are noxious weeds on site both the treatment and control site? Are they inhibiting reclamation success beyond their level of influence at the control site?
- *Evidence of wildlife use.* Wildlife presence can indicate that habitat conditions are improving; however, concentrated or prolonged herbivory can negatively affect reclamation success if unmanaged. Are wildlife species over-browsing the site? Are wildlife using the site for cover, bedding, or feeding?
- *Livestock use.* Livestock can affect site conditions. Are livestock present on the site? Are livestock trails, prints, and scat present?

- *Recreation and other human-use.* Recreation and other human-use can affect site conditions. Are human trails, trash, or other items that indicate use?
- *Visual appearance.* Does the visual appearance compare similarly to surrounding habitats? Visual comparison with general patterns of established vegetation documented during preconstruction conditions or as observed in the control site will help to determine whether large bare areas are indicative of site conditions or simply a result of the innate patchiness of the habitat type.
- *Plant vigor.* Do mature plants and seedlings appear healthy? Are there signs of decadence, or are plants in poor, fair, good, or excellent condition?
- *Evidence of good reproductive capability and success.* Is seed production evident? Are flowers or seed stalks evident? Are seedlings present? Is vegetative reproduction occurring (e.g., rhizomes and tillers)? How does the number of flowering plants and seedlings compare to the control site or the expectations of the particular seed mix utilized for reclamation?

Each of these site characteristics will help determine trends that relate to reclamation success.

6.3.3 Quantitative (Numerical) Information

Desirable vegetation cover and composition will be quantitatively assessed at site-specific reclamation monitoring sites during annual monitoring to determine if there is progress toward reclamation success standards based on comparison with preconstruction treatment site conditions and the paired control site. Quantitative assessment will enable early identification of potential reclamation issues, and ensure that vegetation establishment of affected areas is occurring as expected based on climatic trends for the area. The following items should be considered when establishing a quantitative monitoring methodology:

- *Plant species list.* Record a complete plant list for each monitoring site. This provides a relative measure of diversity at the site. Each species should be categorized by its growth habitat (e.g., shrub, herbaceous forb, graminoid) and native status (e.g., native, nonnative, or listed as a noxious weed). T&E species will be indicated as such.
- *Total canopy cover.* A line-point intercept method (Herrick et al. 2005) is a rapid and accurate method for quantifying cover, including vegetation, litter, bare soil, rocks, and biotic crusts. This method provides measures for foliar cover, basal cover, and bare ground.
- *Vegetation type structure and composition.* Indicate percent cover of plant species by growth habitat and native status. This will allow for an assessment of whether treatment sites are trending toward achievement of the target habitat type structure and composition.
- *Percent cover of dominant species.* The percent cover for the species with the highest percent cover at each monitoring site will be reported. This information will enable comparison with the control site and provide an indicator of whether the treatment site is developing similar proportional cover of desirable dominant species.
- *Percent cover of T&E species.* The percent cover for T&E species will be recorded, regardless of whether they are most numerous or not, based on the line-point intercept method.

Diversity, composition, and cover data will be recorded on standard field data sheets (likely electronic forms) to be developed by the Construction Contractor(s) and approved by the appropriate land management agency and ODOE.

6.4 Reclamation Success Standards

Reclamation success, as presented in this Reclamation Plan, is defined by the progression of vegetation and soils toward control site and/or preconstruction conditions. Once reclamation success standards have been met, established vegetation is anticipated to contribute to the maintenance and functionality of the community to ensure continued success after monitoring has concluded.

IPC will be responsible for monitoring reclamation efforts for the Project. Reclamation success will be evaluated by the Construction Contractor(s) and approved by the appropriate land management agency and ODOE by comparing treatment sites to control sites in terms of desirable species cover. Reclamation of treatment sites will be considered successful if each site is within a specified percentage of the mean native species cover of the paired control site. Control sites will be representative areas that exhibit the same target habitat type located adjacent to, or near the Project-affected treatment sites. Control sites will be selected with the same slope, aspect, and elevation as treatment sites, to the extent practicable. The establishment of control sites within vegetation undisturbed by the Project will allow comparisons between the reclamation progress of the treatment site and sites undisturbed by the Project. Reclamation success is highly dependent on habitat type, environmental conditions (e.g., annual precipitation), avoidance of future disturbance, and proper implementation of reclamation actions. Recovery from construction disturbance activities such as clearing and grading in semi-arid and arid climactic zones in which the Project is located does not typically occur quickly.

Therefore, reclamation monitoring will assess the progress toward reclamation success standards presented in Table 6. Success standards will be developed based on preconstruction data collected at each monitoring site and/or data collected at each control site.

Table 6 presents preliminary reclamation monitoring success standards for each reclamation zone identified in Section 4.1 of this Plan. These standards will be considered the minimum requirement for each reclamation zone. Every reclamation zone includes a range of habitat types that will need to be considered to determine final reclamation standards for each monitoring site identified.

Table 6. Preliminary Reclamation Monitoring Success Standards

Reclamation Zone	Percent Desirable Vegetation Cover[1]
RZ1 – Shrublands	50
RZ2 – Grasslands	60
RZ3 – Agriculture	60
RZ4 – Forest and Woodland	50
RZ5 – Wetland and Riparian	70
RZ6 – Other	60

[1] As described in text below.

Reclamation monitoring success standards will be based on quantitative data collected (discussed in Section 6.3 – Data Collection above) during preconstruction baseline surveys at treatment and control sites. Percent cover for both sites will be compared to ensure that preconstruction baseline conditions are similar to the control site within a particular habitat type. Any major differences will be noted and discussed in the annual monitoring report. Success standards may be adjusted based on differences between the treatment and control site. Any adjustments to reclamation success standards will require the approval of the appropriate land management agency and ODOE.

After determining that the treatment and control sites are comparable, future reclamation success, based on percent cover measurements, will be compared against cover values collected at the control site. For example, if a treatment site is determined to be within the shrubland reclamation zone, the corresponding control site should also be within the shrubland reclamation zone. If the control site has 80 percent total native vegetation cover, with 60 percent cover of woody vegetation and 20 percent cover of herbaceous vegetation, the treatment site will be considered a reclamation success once the percent desirable cover reaches a total of 40 percent (which is 50 percent of the control site's total vegetation cover [see Table 6]), composed of 30 percent woody vegetation and 10 percent herbaceous vegetation.

If the annual monitoring report concludes (with agency concurrence) that typical environmental conditions, proper implementation of reclamation actions, and lack of disturbance is evident, reclamation success will be based on vegetation cover for each habitat type within the reclamation zone. If reclamation success is not evident by the last annual monitoring report (with agency concurrence), or if interim monitoring reports indicate that reclamation success is highly unlikely, adaptive management and/or remedial actions (Section 6.5 – Adaptive Management and Site Release) may be required.

6.5 Adaptive Management and Site Release

An adaptive management approach will allow frequent review and feedback on the progress of reclamation as a part of monitoring activities for the Project. Adaptive management greatly increases the potential for reclamation success by providing for early detection of problems and the opportunity to implement remedial actions to address these problems, if necessary. Effective monitoring is an essential element of adaptive management because it provides reliable feedback on the effects of reclamation actions. If adaptive management measures are determined to be necessary, monitoring data (both qualitative and quantitative) will provide information on reclamation components that are deficient, such as desirable vegetation cover, soil compaction, or lack of parent soil material due to erosion. Based on this information, appropriate remedial reclamation actions may include measures such as supplemental seeding, mulching, weed treatment, access control, herbivory prevention, and/or erosion control measures. Recommendations could also include waiting to determine if favorable germination/establishment conditions are expected such as ample seasonal moisture or favorable temperatures.

Progress toward reclamation success standards, as well as remedial/adaptive management actions (if necessary), will be identified in annual Reclamation Monitoring Reports.

Should remedial actions be required after year three, additional qualitative and quantitative monitoring in years four and five (as appropriate) will allow the effects of remedial action or climatic events to be discerned. Adaptive management actions to address unauthorized or excessive access, herbivory, or erosion may be appropriate on a case-by-case basis where feasible as early as year one or two, based on monitoring data analysis described in the annual Reclamation Monitoring Reports. Adaptive management actions such as supplemental planting or seeding may not be appropriate until analysis of year three monitoring data because in some situations it may take three growing seasons for plant establishment to stabilize, allowing for assessment of reclamation success. Recommendations for adaptive management actions will be included in the annual Reclamation Monitoring Report and implemented by IPC in coordination with the appropriate land management agency and ODOE.

All adaptive management actions will be subject to the review and approval of the appropriate land management agency and ODOE. The Construction Contractor(s) will use all reasonable methods to help IPC ensure reclamation is progressing toward the success standards identified in Section 6.4 – Reclamation Goals and Success Standards. To the extent possible, IPC will tailor ROW easements to reduce potential land use conflicts within reclaimed areas by proposing access control (Exhibit B, Attachment B-5) and other means to regulate potentially disruptive land use activities. It is possible some sites will be incapable of supporting adequate vegetation to progress towards the success standards due to conflicting land management and/or environmental limitations not associated with the Project. For instance, reclamation may fail in areas with non-Project related disturbance such as unmanaged OHV access, grazing of domestic livestock, natural disasters such as fire or flooding, and/or construction of other projects. If reclamation failure is determined to be caused by these non-Project related disturbance, IPC will request a waiver from reclamation actions as defined in Section 6.0.

7.0 PLAN UPDATES

Once the preferred route is selected, final engineering is completed, and complete coverage of the Project area is conducted, a Final Reclamation Plan can be prepared. The Final Reclamation Plan will be updated prior to the start of construction. As the construction order and schedule are refined, the Final Reclamation Plan will be updated to include the schedule for baseline vegetation and weed surveys, identification of any areas for preconstruction noxious weed treatment, and provide a more detailed reclamation schedule and plan. Details specific to noxious weeds are presented in the Noxious Weed Plan (see Exhibit P1, Attachment P1-5).

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APPENDIX A
PRELIMINARY AGENCY-APPROVED SEED MIXES

The seeding rates in the table below are only provided for grasses being planted using a standard rangeland drill. If other methods of seeding are to be used, the seeding rate would likely need to be adjusted. Additional time is needed to develop seeding rates for forb and shrub species. In general, these species would compose a small portion of the seed mix and would be seeded at 0.1 pound per acre (lb./acre) or less. IPC may consider planting well established sagebrush plants and other shrubs acquired from reputable nurseries in areas where shrubs have been removed or crushed. Planting of established sagebrush plants and other shrubs will require site-specific consideration and coordination with ODOE.

Owyhee and Malheur Counties/Northern Basin and Range and Snake River Plain

Loamy Soil Mix

Common Name	Scientific Name	Percent Composition	Seeding Rate (lb./acre)
Bluebunch wheatgrass	*Pseudoroegneria spicata*	50	7
Bottlebrush squirreltail	*Elymus elymoides*	20	2
Sandberg's bluegrass	*Poa secunda*	20	0.25
Basin wildrye	*Leymus cinereus*	5	1
Western yarrow	*Achillea millefolium*		
Basalt milkvetch	*Astragalus filipes*		
Sulfur buckwheat	*Eriogonum umbellatum*		
Bigseed biscuitroot	*Lomatium macrocarpum*		
Munro globemallow	*Sphaeralcea munroana*		
Wyoming sagebrush/ Basin big sagebrush[1]	*Artemisia tridentata* ssp. *tridentate /* ssp. *wyomingensis*		

Sandy Soil Mix

Common Name	Scientific Name	Percent Composition	Seeding Rate (lb./acre)
Indian ricegrass	*Oryzopsis hymenoides*	50	6
Needle and thread	*Hesperostipa comata*	30	4
Bottlebrush squirreltail	*Elymus elymoides*	20	2
Monroe globemallow	*Sphaeralcea munroana*		
Tufted evening primrose	*Oenothera caespitosa*		
Smooth desert dandelion	*Malaxothrix glabrata*		
Fourwing saltbush	*Atriplex canescens*		
Rubber rabbit brush	*Ericameria nauseosa*		
Antelope bitterbrush	*Purshia tridentata*		

Riparian

Common Name	Scientific Name	Percent Composition	Seeding Rate (lb./acre)
Baltic rush	*Juncus balticus*	80	1
Spike rush	*Eleocharis palustris*	20	3

Southern Baker County/Blue Mountains

Wyoming Sagebrush Mix

Common Name	Scientific Name	Percent Composition	Seeding Rate (lb./acre)
Bluebunch wheatgrass	*Pseudoroegneria spicata*	50	7
Idaho fescue[2]	*Festuca idahoensis*		
Bottlebrush squirreltail	*Elymus elymoides*	20	2
Sandberg's bluegrass	*Poa secunda*	15	0.25
Small fescue	*Vulpia macrostachys*	5	0.10
Basin wildrye	*Leymus cinereus*	5	1
Western yarrow	*Achilea millefolium*		
Basalt milkvetch	*Astragalus filipes*		
Parsnipflower buckwheat	*Eriogonum heracleoides*		
Bigseed biscuitroot	*Lomatium macrocarpum*		
Monroe globemallow	*Sphaeralcea munroana*		
Arrowleaf balsamroot	*Balsamorhiza sagittata*		
Hoary aster	*Machaeranthera canescens*		
Wyoming sagebrush	*Artemisia tridentata* ssp. *wyomingensis*		
Three tip sagebrush[3]	*Artemisia tripartita*		
Curl-leaf mountain mahogany[3]	*Cercocarpus ledifolius*		

Mountain Sagebrush Mix

Same as Wyoming sagebrush mix but replace Wyoming sagebrush with Mountain sagebrush

Riparian

Common Name	Scientific Name	Percent Composition	Seeding Rate (lb./acre)
Nevada rush	*Juncus nevadensis*	60	1
Spike rush	*Eleocharis palustris*	40	3

Northern Baker, Union, and Morrow Counties/Blue Mountains

Warm/Hot Forests

Common Name	Scientific Name	Percent Composition	Seeding Rate (lb./acre)
Bluebunch wheatgrass	*Pseudoroegneria spicata*	60	9
Sandberg's bluegrass	*Poa secunda*	20	0.3
Prairie Junegrass	*Koeleria macrantha*	20	0.15
Penstemon	*Penstemon* sp.		
Oregon sunshine	*Eriophyllum lanatum*		
Western yarrow	*Achillea millefolium*		
Tailcup lupine	*Lupinus caudatus*		
Heartleaf arnica	*Arnica cordifolia*		
Larkspur	*Delphinum* sp.		
Hoary aster	*Machaeranthera canescens*		
Missouri goldenrod	*Solidago missouriensis*		

Common Name	Scientific Name	Percent Composition	Seeding Rate (lb./acre)
Mountain monardella	*Monardella odoratissima*		
Hollyleaved barberry[4]	*Mahonia aquifolium*		

Warm/Hot Forests Riparian

Common Name	Scientific Name	Percent Composition	Seeding Rate (lb./acre)
Blue wildrye	*Elymus glacus*	50	5
Western wheatgrass	*Pascopyrum smithii*	50	5

Cool Forests

Common Name	Scientific Name	Percent Composition	Seeding Rate (lb./acre)
Blue wildrye	*Elymus glacus*	33	4
Mountain brome	*Bromus marginatus*	33	6
Pinegrass	*Calamagrostis rubescens*	33	0.25
Heartleaf arnica	*Armica cordifolia*		
Thickstem aster	*Eurybia integrifolia*		
Missouri goldenrod	*Solidago missouriensis*		
Aster	*Aster foliaceous*		
Snowberry[4]	*Symphoricarpos albus*		
Dwarf rose[4]	*Rosa gymnocarpa*		
Prickly currant[4]	*Ribes lacustre*		

Cool Forest Riparian

Common Name	Scientific Name	Percent Composition	Seeding Rate (lb./acre)
Blue wildrye	*Elymus glacus*	50	4
Mountain brome	*Bromus marginatus*	50	6

Umatilla County/Columbia Basin

Loamy Soils

Common Name	Scientific Name	Percent Composition	Seeding Rate (lb./acre)
Bluebunch wheatgrass	*Pseudoroegneria spicata*	50	7
Bottlebrush squirreltail	*Festuca idahoensis*	15	1.5
Sandberg's bluegrass	*Poa secunda*	15	0.25
Thickspike wheatgrass	*Elymus lanceolatus* ssp. *lanceolatus*	20	5
Wooly plantain	*Plantago patagonica*		
Narrow leaf milkweed	*Asclepias fascicularis*		
Silky lupine	*Lupinus sericeus*		
Common sunflower	*Helianthus annuus*		
Tiny trumpet	*Collomia linearis*		
Rubber rabbitbrush	*Ericameria nauseosa*		

Sandy Soils

Common Name	Scientific Name	Percent Composition	Seeding Rate (lb./acre)
Bluebunch wheatgrass	*Pseudoroegneria spicata*	46	7
Indian ricegrass	*Oryzopsis hymenoides*	12	1
Sandberg's bluegrass	*Poa secunda*	12	0.25
Needle and thread	*Hesperostipa comata*	6	1
Bottlebrush Squirreltail	*Elymus elymoides*	8	1
Sand dropseed	*Sporobolus cryptandrus*	6	0.025
Purple three awn	*Aristida purpurea*	10	0.5
Wooly plantain	*Plantago patagonica*		
Narrow leaf milkweed	*Asclepias fascicularis*		
Silky lupine	*Lupinus sericeus*		
Common sunflower	*Helianthus annuus*		
Tiny trumpet	*Collomia linearis*		
Rubber rabbitbrush	*Ericameria nauseosa*		

Riparian

Common Name	Scientific Name	Percent Composition	Seeding Rate (lb./acre)
Baltic rush	*Juncus balticus*	80	1
Spike rush	*Eleocharis palustris*	20	3

Areas Dominated by Invasive Annual Species (throughout Project)

Under 4,000 feet Elevation

Common Name	Scientific Name	Percent Composition	Seeding Rate (lb./acre)
Siberian wheatgrass/Vavilov	*Agropyron fragile*	100	10

Over 4,000 feet Elevation

Common Name	Scientific Name	Percent Composition	Seeding Rate (lb./acre)
Crested wheatgrass/Ephraim	*Agropyron cristatum*	100	10

Notes:
[1] Use of Wyoming sagebrush or Basin big sagebrush would depend on which species was present preconstruction.
[2] On moist north slopes, add Idaho fescue at a rate of 1 lb./acre and reduce bluebunch wheatgrass to 4 lb./acre.
[3] Species to be added site specifically.
[4] Species would be planted as one- or two-year seedlings into disturbed areas.

ATTACHMENT P1-4
VEGETATION MANAGEMENT PLAN

Vegetation Management Plan

Boardman to Hemingway Transmission Line Project

1221 West Idaho Street
Boise, Idaho 83702

June 2017

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ACRONYMS AND ABBREVIATIONS

ANSI	American National Standards Institute
BLM	Bureau of Land Management
IPC	Idaho Power Company
kV	kilovolt
NERC	North American Electric Reliability Council
ODOE	Oregon Department of Energy
OSHA	U.S. Department of Labor Occupational Safety and Health Administration
Project	Boardman to Hemingway Transmission Line Project
ROW	right-of-way
TVES	Terrestrial Visual Encounter Surveys
TVMP	Transmission Vegetation Management Program
USFS	United States Forest Service

1.0 INTRODUCTION

This Attachment to Exhibit P1 to Idaho Power Company's (IPC) Amended Preliminary Application for Site Certificate provides information on the Vegetation Management Plan that IPC will follow for the life of the Boardman to Hemingway Transmission Line Project (Project). The Project area, or Site Boundary, as defined in Oregon Administrative Rule 345-001-0010(55) includes "the perimeter of the site of a proposed energy facility, its related or supporting facilities, all temporary laydown and staging areas, and all corridors and micrositing corridors proposed by the applicant." The Site Boundary for this Project includes the following facilities in Oregon:

- The Proposed Route, consisting of 270.8 miles of new 500-kilovolt (kV) electric transmission line, removal of 12 miles of existing 69-kV transmission line, rebuilding of 0.9 mile of a 230-kV transmission line, and rebuilding of 1.1 miles of an existing 138-kV transmission line;
- Four alternatives that each could replace a portion of the Proposed Route, including the West of Bombing Range Road Alternative 1 (3.7 miles), West of Bombing Range Road Alternative 2 (3.7 miles), Morgan Lake Alternative (18.5 miles), and Double Mountain Alternative (7.4 miles);
- One proposed 20-acre station (Longhorn Station);
- Ten communication station sites of less than ¼ acre each and two alternative communication station sites;
- Permanent access roads for the Proposed Route, including 206.3 miles of new roads and 223.2 miles of existing roads requiring substantial modification, and for the Alternative Routes including 30.2 miles of new roads and 22.7 miles of existing roads requiring substantial modification; and
- Thirty-one temporary multi-use areas and 299 pulling and tensioning sites of which four will have light-duty fly yards within the pulling and tensioning sites.

The Project features are fully described in Exhibit B, and the Site Boundary for each Project feature is described in Exhibit C, Table C-24. The location of the Project features and the Site Boundary is outlined in Exhibit C. This Vegetation Management Plan includes a discussion of 1) the purpose, goals and objectives, 2) an overview of the vegetation community types within the Site Boundary where vegetation management will occur, and 3) methods of vegetation management.

1.1 Purpose

This Vegetation Management Plan describes the framework for the development of the final Vegetation Management Plan. The focus of this framework and the final Plan is to describe the methods in which vegetation along the transmission line will be managed during operation of the Project. The measures IPC will undertake to control noxious and invasive-plant species and prevent the introduction of these species within the Project Site Boundary are discussed in the Noxious Weed Management Plan (Exhibit P1, Attachment P1-5). The measures that will be taken to reclaim and revegetate areas that have been impacted by construction activities are discussed in the Reclamation and Revegetation Plan (Exhibit P1, Attachment P1-3).

This Plan is applicable Project-wide, and it is expected that modifications to this Plan will be made once final agreements are reached with the appropriate land management agencies and the Oregon Department of Energy (ODOE), as well as with counties and individual landowners. The final Vegetation Management Plan is intended to meet the guidance contained in the

Oregon Forest Practices Act (Oregon Administrative Rule Chapter 629), Chapter 2840 of the United States Forest Service (USFS) Manual (1990) as well as any applicable Bureau of Land Management (BLM) Resource Management Plans and local (i.e., county or city) management plans. Vegetation management specifications will follow those detailed in PacifiCorp's Transmission and Distribution Vegetation Management Program Specification Manual (Appendix A).

1.2 Goals and Objectives

IPC has two goals for conducting vegetation management during operation of the Project:

1. Access: IPC's access goal for conducting vegetation management is to maintain work areas adjacent to Project features but within the right-of-way (ROW), that will allow vehicle and equipment access; this access is necessary for operations, maintenance, and repair of the Project.
2. Safety/reliability: IPC's safety and reliability goal for vegetation maintenance is to maintain the safety and reliability of the transmission line, by preventing tall vegetation from coming into contact with conductors.

2.0 OVERVIEW OF EXISTING ENVIRONMENTS

Vegetation management activities may occur throughout the Project but will be heavily focused in forest and woodland areas, and forested riparian and forested wetlands where tall shrubs and trees may impact transmission lines and structures. IPC used data from the Terrestrial Visual Encounter Surveys (TVES) to identify the ecological systems and assign a habitat type and category based on vegetation characteristics. However, due to limitations on access to private lands, surveys have not been completed within the entire Site Boundary. Approximately 67 percent of the Site Boundary was surveyed for TVES (see Exhibit P1). In areas where survey information was not available due to unsigned right-of-entry agreements or changes in route alignment, biologists used desktop analysis methods to assign habitat type and category. The U.S Geological Service Gap Analysis Project data (USGS 2011) and aerial imagery interpretation were used to delineate habitat type and agency designated habitats (e.g., Oregon Department of Fish and Wildlife designated big game habitats). Known occurrences of special status species, and conditions in adjacent surveyed areas were used to approximate the appropriate category type. Detailed descriptions of the modeling and criteria used to identify and categorize habitats within the Site Boundary are included in Attachment P1-1, Habitat Categorization Matrix, and Attachment P1-6, Fish and Wildlife Habitat Mitigation Plan.

TVES and subsequent desktop analysis for the habitat categorization process identified various habitat types present within the Site Boundary. These habitat types were then assembled into vegetation cover types for purposes of this Vegetation Management Plan. Grouped cover types are useful in presenting and describing vegetation management methods used for specific habitat types, mainly forest and woodland. These vegetation cover types differ slightly from the "General Vegetation Type" identified as part of the habitat categorization process and are described below in Table 1.

The extent of each vegetation cover type and the habitat types included in each cover type within the Site Boundary are presented in Table 1. Descriptions of each cover type are provided in the Reclamation and Revegetation Plan (Exhibit P1, Attachment P1-3), but are described as Reclamation Zones in that plan. The vegetation cover types specific to the Vegetation Management Plan are described below.

Table 1. Vegetation Cover Types within the Site Boundary

Vegetation Cover Type	Percent of Site Boundary	Habitat Types Included in Each Vegetation Cover Type
Shrubland	37	Desert Shrub Shrub-Steppe with Big Sage Shrub-Steppe without Big Sage
Grassland	18	Native Grasslands
Agriculture	8	Agriculture
Forest and Woodland	13	Douglas-Fir / Grand Fir Ponderosa Pine Western Juniper / Mountain Mahogany Woodland Forested – Other
Wetland / Riparian	1	Emergent Wetland Scrub-Shrub Wetland Forested Wetland Aquatic Bed Wetland Ponds and Lakes Ephemeral, Intermittent, and Perennial Stream Herbaceous Riparian Introduced Riparian Riparian Woodland and Shrubland
Other	23	Introduced Upland Vegetation Developed / Disturbed Bare Ground, Cliffs, Talus

Forest and Woodland, where most vegetation management will occur, account for 11 percent of the Site Boundary. Forest and Woodland types are made up mostly of Douglas-fir (*Pseudotsuga menziesii*) forest and ponderosa pine (*Pinus ponderosa*) forest with lesser amounts of western juniper (*Juniperus occidentalis*) woodlands. Forested habitats are found predominantly in the Blue Mountains, in Umatilla and Union counties, from just south of La Grande to south and east of Pendleton. Small pockets of Douglas-fir forests are also mapped in the drainages and highest elevations southwest of the town of Durkee. Logging and other disturbance such as grazing is common in these cover types. Juniper woodlands are mostly found in Baker County northwest of Durkee to south of Weatherby.

Wetland and Riparian habitat occurs in 1 percent of the Site Boundary. These areas are found throughout the Site Boundary adjacent to rivers, springs, and seeps. Vegetation management may be required in forested wetland and riparian areas where trees and shrubs may grow sufficiently large to interfere with transmission lines and structures.

3.0 VEGETATION MANAGEMENT

General vegetation management strategies are described below, with specifications and methodologies detailed in the PacifiCorp Transmission and Distribution Vegetation Management Program Specification Manual (Appendix A).

IPC must maintain work areas adjacent to electrical transmission structures and along the ROW to allow access for vehicles and equipment necessary for operations, maintenance, and repair. Furthermore, vegetation management under the transmission line minimizes the potential for fires and power outages that can result when vegetation comes into contact with conductors.

Vegetation management is expected to be minimal for the Project, as the vast majority of the Project crosses through areas that contain low-growing vegetation cover types (e.g., grasslands and shrublands; Table 1). As these vegetation cover types will not grow to heights that could interfere with the transmission line, they will not be maintained or cleared under the line during operation of the Project. Forest and Woodlands make up 13 percent of the area within the Site Boundary and will account for the majority of the vegetation management activities. Some vegetation management may also be required in wetland/riparian areas that are dominated by trees or tall shrubs.

Vegetation management will be conducted in compliance with the American National Standards Institute (ANSI) Pruning Standards Best Management Practices for Utilities, the U.S. Department of Labor Occupational Safety and Health Administration (OSHA), and North American Electric Reliability Council's (NERC) Standard FAC-003-3 Transmission Vegetation Management Program (TVMP)[1], and IPC's TVMP. The vegetation management program will accomplish the following tasks:

- Lines that are 138-kV, 161-kV, 230-kV, and above are patrolled, at a minimum cycle of once a year, to identify hazardous vegetation, within or adjacent to the ROW, that could fall in or onto transmission lines or associated facilities. Hazardous trees, snags, or "hot spots" are removed. Any trees that will become a clearance violation prior to the next scheduled maintenance cycle are evaluated, and trimmed or removed.
- Trim trees and tall shrubs to the extent that the clearance lasts for the duration of the cycle.
- Remove vegetation, as necessary, to provide required electrical clearance and improve access to facilities.
- Remove tall-growing vegetation within structures. Clear brush and grass around wood poles to help protect structures from range fires.
- Facilitate a low-growing plant community that stabilizes the site, inhibits the growth of tall-growing shrubs and trees, and provides habitat for wildlife.

Clearing of vegetation near Project components will be accomplished using manual (i.e., hand pulling, lopping by hand crews), and mechanical methods (i.e., chainsaws, weed trimmers, rakes, shovels, mowers, brush hooks, and Slash Buster [a track-driven machine]), or a combination of these methods. The specific methods depend on site-specific conditions, such as slope, access, size/extent of vegetation, previous agreements with landowners, and the presence of sensitive resources. In order to meet vegetation maintenance objectives, herbicides may also be used to control vegetation in selected areas as described in Section 3.3 of this Plan.

Forested and woodland habitats are concentrated in the portion of the Project that crosses the Blue Mountains, but are also found northwest of Durkee to south of Weatherby. Unlike the portion of the Project that crosses low-lying vegetation (e.g., grasslands and shrublands), these forested and woodland areas, as well as some wetland and riparian areas, contain vegetation that will need to be maintained within the ROW in order maintain access, safety, and reliability of the Project. The vegetation management that will be conducted along these forested and woodland portions of the Project is discussed in the following sub-section.

[1] FAC-003-1 requires transmission owners to prepare, and keep current, a formal TVMP. The TVMP shall include the transmission owner's objectives, practices, approved procedures, and work specifications. Available at: http://www.nerc.com/files/FAC-003-1.pdf

3.1 Right-of-Way Maintenance

Vegetation management practices along the ROW will be conducted in accordance with PacifiCorp Transmission and Distribution Vegetation Management Program Specification Manual (Appendix A). As stated above, these practices will comply with the standards set by the ANSI Pruning Standards Best Management Practices for Utilities, and by OSHA and NERC requirements.

A wire-border zone method will be used during maintenance of the ROW in forested and woodland habitats to control tall vegetation and to ensure adequate ground-to-conductor clearances (Appendix A, Section 6.7.1.5.1). This method results in two zones of clearing and revegetation: the wire zone and the border zone. The wire zone includes the linear area along the ROW located under the wires as well as the area extending 10 feet outside of the outermost phase-conductor. After initial clearing, vegetation in the wire zone will be maintained to consist of native grasses, legumes, herbs, ferns, and other low-growing vegetation that remain under approximately 20 feet tall at maturity. The border zone is the linear area along each side of the ROW extending from the edge of the wire zone to the edge of the ROW. Vegetation in the border zone will be maintained to consist of tall shrubs or short trees (up to 34 feet high at maturity), grasses, and forbs. These cover plants along the border zone benefit the ROW by competing with and excluding undesirable plants. No clearing will be conducted in areas where the height of mature trees will not come within 50 feet of the wires (e.g., a canyon or ravine crossing with high ground clearance at mid-span). Minimum clearance values are affected by circuit voltage, terrain, span length, ruling span length, conductor size and tension, anticipated wind conditions, and structure framing parameters. Figures 6.4a, 6.4b, and 6.5 in Appendix A illustrate specifications for the wire-border zones.

Transmission lines are inspected and cleared on long-term cycles; however, shorter clearing cycles may occur if conditions dictate out-of-cycle trimming is needed to maintain the wire-border zone objectives. During operations, vegetation growth will be monitored and managed to maintain the wire-border zone objectives. The methods for maintaining vegetation within the wire and border zones will be similar to those described above, with the exception that mechanical as opposed to manual methods will be employed due to the scope and extent of area to the treated.

In addition to the cyclical inspection cycles described above, Transmission Patrolmen patrol and inspect lines once a year to identify any transmission defects and any vegetation hazards that may develop between the long-term clearing cycles. During these inspections, the Patrolman will identify hazardous vegetation, within or adjacent to the ROW, that could fall in or onto the transmission lines or associated facilities and cause an outage. The Patrolman will evaluate the hazardous vegetation as to the level of threat posed by categorizing the vegetation as an “imminent threat,” “medium hazard,” or “low hazard.” Any issues found are reported to the grid operator and to vegetation management, and documented on an Emergency Tree Action Form. If possible, the Patrolman will take photos of the “imminent threat” vegetation for further evaluation by vegetation management staff.

Imminent threats are any vegetation issue that poses an imminent threat of causing a line outage and that has a high risk of failure in the next few days or weeks. These imminent threats are normally tall trees that have one or more drastic defects that could cause the tree to fail and fall in or onto transmission lines and cause an outage. An “imminent threat” could also be vegetation that is in good condition but that has grown so close to the transmission line that it could be brought into contact with the line through a combination of conductor sag and/or wind-induced movement in the conductor or the vegetation. Hazards are any vegetation issue that poses a threat of causing a line outage, but that has either a low or medium risk of failure in the next month. These hazards are normally trees that have one or lesser defects that could cause the tree to fail and fall in or onto transmission lines and cause an outage.

On federal and state ground, IPC prefers to clear cut all tall-growing trees in the ROW. Clear-cut methods include crews that use chain saws, or track-driven machines such as Slash Buster and the Brontosaurus. On private property, removal is IPC's first choice, but if not approved, IPC will proceed to trim the trees. The typical trimming methods used are a top trim or side trim.

During tree- and shrub-trimming operations, strategies that minimize effects to wildlife will be used. Tree and shrub trimming will be avoided during the primary avian breeding season (April 1–July 15), especially in sensitive habitat (i.e., riparian). Upland habitat suitable to nesting migratory birds will be surveyed prior to ground clearing between April 1 and July 15 for active nests. A 100-foot no-construction-buffer around active nests will be implemented. No seasonal restrictions will be imposed on clearing upland habitat between July 15 and February 15. Ground clearance in riparian habitats will be allowed between August 1 and March 30, with the exception of a seasonal constraint for impacts to fisheries resources.

3.2 Slash and Debris Management

As the vast majority of the Project crosses through areas where little to no vegetation management will be conducted, substantial slash and debris is unlikely to be generated along most portions of the Project during operations. However, maintenance and construction along the portion of the Project that crosses forested and woodland areas could generate timber slash and debris. In general, this slash and debris can be either 1) chipped, with the chips scattered along the ROW or removed; 2) lopped and scattered on site; or 3) piled on site. IPC's preferred method for handling slash is to lop and scatter the slash on site, as long as the scattered material does not block access, represent a safety hazard, or adversely affect management goals for the area. The method for managing slash and debris in these areas will be determined based on the requirements and recommendations by the appropriate land management or regulatory agency and ODOE. Slash management strategies will be developed to minimize fuel loading and wildfire hazard.

3.3 Herbicide Use

On federally controlled lands, a Pesticide Use Plan will be submitted prior to any application as recommended in the Final Environmental Impact Statement on Vegetation Treatments Using Herbicides on BLM Lands in Oregon (BLM 2010). The Pesticide Use Plan will include the dates and locations of application, target species, herbicide, adjuvants, application rates and methods (e.g., spot spray vs. boom spray), and anticipated impacts to non-target species and susceptible areas. Private property will be sprayed only if written approval is obtained from the landowner. All herbicide applications will comply with U.S. Environmental Protection Agency label instructions; federal, state, and/or county regulations; permit stipulations; and landowner agreements. Herbicide contractors, certified and approved in the state of Oregon, will have current material safety data sheets and will take all reasonable precautions to prevent spills.

Herbicide use near special status species and waterbodies will follow label requirements, state and federal law, and BLM and USFS recommendations. Only herbicides approved by the land-managing agency as safe to use in aquatic environments and reviewed by IPC for effectiveness will be used within 100 feet of aquatic resources, and no herbicides will be applied within 100 feet of known threatened and endangered plants or waterbodies during preconstruction activities. Areas of flowing water, wetlands, or other sensitive resources where herbicide use will be prohibited will be described in the Final Noxious Weed Plan and be identified on construction maps and flagged. IPC will also comply with the Idaho and Oregon National Pollutant Discharge Elimination System permits related to the use of herbicides in and adjacent to waterbodies.

Care will be taken during transport and storage to minimize the potential for leaks. In the event of an herbicide spill, the spill will be promptly cleaned up by appropriately trained personnel, and contaminated materials will be transported to a disposal site that meets local, state, and federal requirements. If a spill occurs whose cleanup is beyond the capability of on-site equipment and personnel, an Emergency Response Contractor available to further contain and clean up the spill will be identified. Potential contractors will be identified prior to the start of construction activities. Emergency spill response kits will be maintained at all locations where hazardous materials, including herbicides and pesticides, are stored in sufficient quantities based on the amount of materials stored on-site. Spill kits will include materials to address spills both on land and into water. If a spill occurs, the applicator will report it in accordance with applicable laws and will contact Construction Contractor(s) supervisory personnel, the appropriate land management agency, and the ODOE. Spill preventive and containment measures or practices will be incorporated as described in Exhibit G, Materials Analysis, and Attachment G-4, Draft Spill Prevention, Control, and Countermeasures Plan.

Additional information pertaining to herbicide use is listed in the Noxious Weed Plan (Exhibit P1, Attachment P1-5).

4.0 PLAN UPDATES

Once the preferred route is selected and final engineering is completed, an updated Vegetation Management Plan will be prepared. The Vegetation Management Plan will be updated prior to the start of construction.

5.0 LITERATURE CITED

BLM (Bureau of Land Management). 2010. Final Environmental Impact Statement Vegetation Treatments Using Herbicides on BLM Lands in Oregon. BLM, Oregon State Office. Portland, Oregon. Available online at: http://www.blm.gov/or/plans/vegtreatmentseis/documents.php.

USFS (U.S. Department of Agriculture Forest Service). 1990. FSM Chapter 2840—Reclamation. Available online at: http://www.fs.fed.us/im/directives/fsm/2800/2840.txt.

USGS (U.S. Geological Service). 2011. Gap Analysis Program. National Land Cover, Version 2. GIS Dataset. May 2011.

APPENDIX A
PACIFICORP'S TRANSMISSION AND DISTRIBUTION VEGETATION MANAGEMENT PROGRAM SPECIFICATION MANUAL

PACIFICORP

A MIDAMERICAN ENERGY HOLDINGS COMPANY

Transmission & Distribution
Vegetation Management Program

Specification Manual

Rev	Status	Date	Author	Change Tracking
00	Issued for implementation	12/15/2008	R. H. Miller	Manual created
01	Reviewed/Updated	06/15/2012	R. H. Miller	1. Clarified language throughout 2. Revised Chapter 4 to reflect a process checklist used for project management. 3. Modified Clearance 2 to strictly reflect table 5 in IEEE 516-2003 Table 5. 4. Section 6.4.1 that if contract forest techs identify an imminent threat, that they contact the appropriate line patrolmen so they initiate the imminent threat procedure.

Approved Curtis Mansfield 07/02/2012

Printed Name of Approver Date

Managing Director, T&D Support Services

Title of Approver

Transmission & Distribution Vegetation Management Program

Specification Manual

June 15, 2012

PacifiCorp, Director, Vegetation Management
1407 West North Temple, Room 230
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Transmission & Distribution
Vegetation Management Program

Specification Manual

Mission Statement:

Manage trees and vegetation around PacifiCorp's transmission and distribution facilities in a professional, cost effective and environmentally conscientious manner to provide safe, reliable and outstanding service to our customers.

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1. PROGRAM OVERVIEW

1.1 Introduction

Trees growing into or near power lines are a constant concern for PacifiCorp because they can create safety and service reliability risks. Close growing branches can provide access for children and others to high-voltage lines, exposing them to the potential danger of serious injury or death due to electric contact. Branches touching power lines can spark and start fires and cause interruptions in electric supply. Trees whipped by winds or weighed down by rain or snow often interrupt power, disrupting business and home life, as well as compromising critical community infrastructure, such as hospitals and emergency services.

Three major electric grid failures, including the catastrophic blackout on August 14, 2003, were initiated by tree-caused outages on transmission lines (U.S.-Canada Power System Outage Task Force 2003).

For these reasons and others, the National Electrical Safety Code (ANSI 2011) Section 2l8-A-l, states:

Trees which may damage ungrounded supply conductors should be pruned or removed. Note: Normal tree growth, the combined movement of trees and conductors under adverse weather conditions, voltage and sagging of conductors at elevated temperatures are among the factors to be considered in determining the extent of pruning required.

PacifiCorp's distribution system averages over a 100 trees for every mile of line, any of which could potentially create problems. With that level of exposure, it is impossible to secure the system completely. Electric utilities, such as PacifiCorp, manage their systems to reduce electric supply and service reliability risks by clearing trees from power lines.

Often, particularly in the case of transmission lines, the best solution is to remove tall-growing trees and replace them with low-growing species that will never interfere with the high-voltage lines. However, it is not always possible to remove conflicting trees. Trees that cannot be removed must be pruned to clear the utility space using modern, arboriculturally-sound pruning practices.

PacifiCorp's specification manual covers the vegetation management program for both distribution and transmission. It includes program descriptions, specifications and protocols for customer relations. Its intent is to provide direction for foresters as well as contract GF/supervisors, forest techs and utility tree workers on PacifiCorp's system, and help inform PacifiCorp employees about vegetation management.

1.2 Professionalism

PacifiCorp employs a staff of professional foresters to manage its vegetation program and communicate effectively the community service it provides. Contractor front line managers, supervisors or general foreman (GFs) must be Society of Arboriculture (ISA) Certified Arborists and ISA Certified Utility Specialists. Forest techs must be Certified Arborists within 6 months of their appointment and be Certified Utility Specialists to receive the top pay grade.

In addition, the program is founded on the industry's best practices, including systematic maintenance, scientifically-based pruning, tree removal, tree replacement, cover type conversion, herbicide use and tree growth regulator applications; as well as specialized tools and equipment. Practices should follow those outlined in ANSI A 300 Part 1-pruning (ANSI 2008) and Part 7-Integreated Vegetation Management (ANSI 2006a) as well as International Society of Arboriculture Best Management Practices: Utility Pruning of Trees (Kempter 2004) and Integrated Vegetation Management (Miller 2007). PacifiCorp is progressive in trying innovative methods, products and equipment in order to improve safety and productivity.

1.3 Tree Line USA

PacifiCorp has been a Tree Line USA recipient utility every year since 2002. Tree Line USA is an award from the National Arbor Day Foundation, which recognizes utilities for utilizing practices that protect America's urban forests. To qualify, utilities must apply scientifically-based tree care, conduct annual worker training, plant trees, and conduct public education, including participating in Arbor Day celebrations. Contract employees should participate in annual worker training to cooperate with and help PacifiCorp continue to merit this award.

2. GENERAL SPECIFICATIONS

2.1 Safety

Federal and state OSHA requirements governing vegetation management activities shall be followed at all times. ANSI Z133.1 (ANSI 2006) and OSHA 1910.269, are examples of these requirements. Activities shall be conducted in a manner that minimizes both tree crew and public safety risks. Crews shall have functional radio or telephone communication on the job site at all times.

2.1.1 Holds and Clearances

Minimum approach clearances for qualified line clearance arborists specified in ANSI Z133 or PacifiCorp's *Accident Prevention Manual* (Joint Safety Committee 2003 [Table 2.1]), should not be compromised. If there is a difference in the distances required in the two standards, the greater of the two is operative. If work requires violating minimum approach distances, or if a crew leader determines conditions to be unsafe, crew leaders should contact their supervisor/GF before proceeding. The GF/supervisor should determine whether or not a clearance or hold is necessary at that work site.

A hold means deactivating automatic line reclosers on a circuit. It is intended to protect PacifiCorp facilities and should not be considered a safety measure. If, in the judgment of the crew leader, an energized line cannot be worked safely, the GF/supervisor should arrange a clearance. A clearance is de-energizing a line.

<u>PacifiCorp does not issue holds or clearances to tree crews</u>. Rather, the Company will issue holds or clearances to a journeyman lineman, who shall be present at the site during work. Holds require at least 48 hours notice to dispatch, vegetation management and the district operations manager. In some cases, a clearance on transmission lines must be requested weeks or even months in advance. Customers do not need to be notified if a clearance is necessary to safely work trees from lines in an emergency.

Customers who will be affected by planned power outages associated with clearances must also receive 48 hours notice, except during emergency situations such as storm restoration work. However, if a clearance is necessary to clear trees from lines in an emergency, customer notification is not necessary.

De-energized lines; whether due to a planned outage, wind or storm damage, or some other reason; must be worked as if they are energized. If a line cannot be worked safely assuming it is energized, it must be grounded. Linemen must set the grounds and be present during work, and give approval prior to tree crew members breaching minimum approach distances to ensure safety.

2.1.2 Emergencies

An emergency is major storm (as declared by PacifiCorp), or situation where vegetation has caused or presents a clear, imminent threat of causing an outage, fire or public electric contact.

2.1.2.1 Whistles

Every crew member, supervisor/GF and forester shall carry a whistle at all times while on work sites. A whistle shall be used as an alarm, indicating danger, commanding all crew members to immediately stop work and

Figure 2.1. Emergency procedure for a tree on line incident.

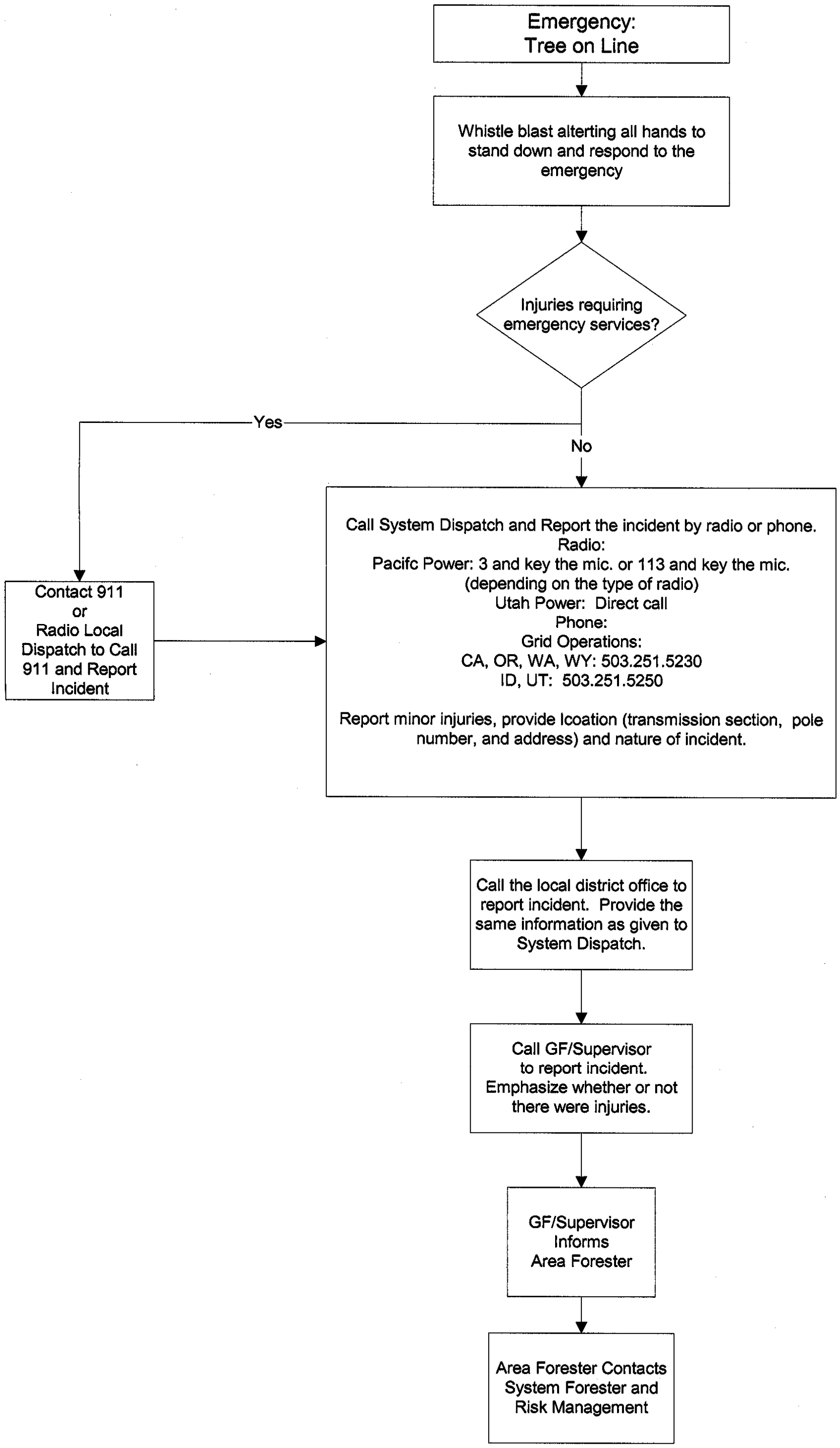


Table 2.1 Minimum approach distances for qualified line-clearance arborists and line-clearance arborist trainees.

Voltage Phase-to-Phase	Minimum Approach Dist.	Source
50-300 v	Avoid contact	APM/Z133
301-750 v	1 foot	APM/Z133
301 v-15 kV	2 feet, six inches	APM
15-46 kV	3 feet	APM/Z133
46-72 kV	4 feet, 2 inches	Z133
72-121 kV	4 feet, 6 inches	Z133
138-145 kV	5 feet, 2 inches	Z133
161-169 kV	6 feet	Z133
230-242 kV	7 feet 11 inches	Z133
345-362 kV	13 feet 2 inches	Z133
500-550 kV	19 feet	Z133

Note: APM is PacifiCorp's *Accident Prevention Manual* (Joint Safety Committee 2003). Z133 is the *American National Standard for Tree Care Operations* (ANSI 2006). Z133 distances are for sea level up to 5,000. Distances increase for elevations above 5,000 feet (ANSI 200).

respond to the emergency. Whistle blasts should also be used to initiate aerial rescue drills. Whistles are not to be used for non-emergency situations, such as getting another crew member's attention.

2.1.2.2 Tree on Line

If a tree or tree part accidentally falls onto an energized line, work should stop Immediately, and procedures outlined in Figure 2.1 followed.

2.1.3 Readily Climbable

Readily climbable trees have low limbs that are accessible from the ground and sufficiently close together and strong enough to support a child or average person so that the tree can be climbed by a child or average person without using a ladder or special equipment. Access into a tree by a vehicle does not render a tree climbable.

Readily climbable trees pose a hazard when a main stem would allow a child or average person to climb either within arm's reach of an uninsulated energized electric line or within such proximity to the electric line that the climber could be injured by direct or indirect contact. They are located near homes, schools, parks, businesses or other locations where people (particularly children) frequent.

If readily climbable trees are identified, within two weeks steps shall be taken to reduce the safety risk by removing the tree, or else by pruning to specification clearances, and if possible, removing branches to at least 8 feet from the ground or altering line construction.

2.1.4 Tree Houses

Tree houses built in trees growing near high voltage lines present possible electric safety risks. Safety risks in these cases could materialize if a tree house is sufficiently close to the conductors so that children or others may contact the line either directly or indirectly. Indirect contact may occur through any conductive object, including a tree as tree parts contacting power lines can conduct electricity.

Tree houses built in trees growing in proximity to power lines must meet two criteria in order to remain where they are located. First, no part of the structure may be any closer than twice the minimum approach distances for persons other than qualified line-clearance arborists as specified in Table 2 of ANSI Z133 (Table 2.1) and second, the tree must be pruned so that it grows no closer than ANSI Z133 Table 2 (Table 2.1) distances, at least until the next scheduled work. Maximum sag and sway should be taken into consideration. Tree houses that do not meet these conditions shall be removed within two weeks of their identification.

Tree house safety risks may be managed by changing facility construction so tree house clearances can be maintained. Facility reconfiguration for this purpose may be done at a property owner's request, provided they cover the expense of the facility modification.

2.1.5 Fire Protection

Federal, state and local fire protection laws and regulations shall be followed, and the contractor performing the work must obtain necessary work permits. Crews shall have all fire fighting tools and equipment required by the responsible state or federal agency. Contractors shall also adhere to fire restrictions concerning work hours, fire watch following work and other policies of the pertinent jurisdiction.

2.2 Environment

Environmental respect is a MidAmerican Energy Holding Company core value.

2.2.1 Species of Concern

Tree work should not disturb or harm any rare, threatened, endangered, or protected plant or animal species. Nesting season work restrictions are examples of important scheduling considerations necessary to accommodate threatened and endangered species. Prior to beginning projects on federal and state lands, PacifiCorp foresters shall contact the responsible agency to determine whether or not such species are present on the right-of-way. If there are, foresters should contact PacifiCorp environmental services for support.

All tree and brushwork shall conform to guidelines of the responsible governing agency. Field data inventories of threatened or endangered species may be on file in PacifiCorp district offices. Moreover, PacifiCorp environmental services should be contacted whenever threatened and endangered species are identified.

2.2.2 Wetlands

Wetlands are lands where water saturation is the dominant factor determining the nature of soil development and the types of plant and animal communities living in and on the soil (EPA 2004). Wetlands shall be worked by hand. Federal, State and local laws and regulations concerning wetlands shall be followed.

2.2.3 Stream Protection

Work shall be planned to prevent water pollution. Trees shall not be felled into streams or drainage ditches in a way that could obstruct or impair the flow of water, unless instructed otherwise by the responsible governing agency. Machine work shall not be performed within fifty feet of a stream. Soil or debris shall not be placed below the high water mark of streams, unless instructed otherwise by a responsible authority. Equipment shall use existing or designated stream crossings. State forestry or fish and wildlife agencies shall be contacted if tree removal in and around streams could cause erosion or if resulting exposure could increase water temperature. Federal and state laws and regulations shall be followed concerning stream protection.

2.2.4 Bird Protection

Vegetation management activities may affect migratory birds. Migratory birds are protected by the *Migratory Bird Treaty Act of 1918* (16 USC 703-712). The act was most recently amended in 1998. All but a handful of bird species are protected under the act. However, vegetation management's policy is that all bird species should be considered subject to the law's provisions. Foresters should provide annual training on bird protection to every tree crew.

The Migratory Bird Treaty Act prohibits removal of bird nests that have eggs or chicks and killing protected species. Active nests may be disturbed in rare cases of urgent fire or electrical safety risk (in the judgment of the responsible forester). If tree crews identify a possible immediate risk, they should contact the forester for authorization. The forester may approve work if the line can be cleared within an hour. If the forester approves work, he or she shall notify environmental services within 24 hours. In all other cases work should be postponed until after young have left the nest.

Eagle and colonial water bird nests (such as those of cormorants and herons) may not be disturbed regardless of whether or not they are active. Eagles are subject to additional protection insofar as it is illegal to disturb them near their nests or winter roosting sites.

Raptors (birds of prey) and herons require buffers around active nests to prevent them from being disturbed (Table 2.2). In general, if a bird leaves a nest and does not return within an hour, it is being disturbed, and the buffer should be increased. In these cases, environmental services should be contacted within 24 hours to monitor the nest and respond appropriately if the adults fail to return to the nest.

2.2.4.1 Reporting

Active bird nests and inactive eagle nests should be reported to the appropriate forester and environmental services following the procedure outlines in Figure 2.2. Anyone working in vegetation management encountering a dead bird should report it to environmental services.

2.3 Archaeological Sites

Vegetation management activities shall not disturb known archaeological sites (Figure 2.3). If a forest tech or tree crew identifies something that might have archeological significance, they should move off site and contact the appropriate forester. The forester should contact environmental services for advice on whether or not to continue. Work should not proceed without environmental service's authorization.

Prior to beginning work on federal and state lands, PacifiCorp vegetation management shall contact the appropriate agency to determine whether or not such sites are present on or near the right-of-

Figure 2.2. Bird nest procedure.

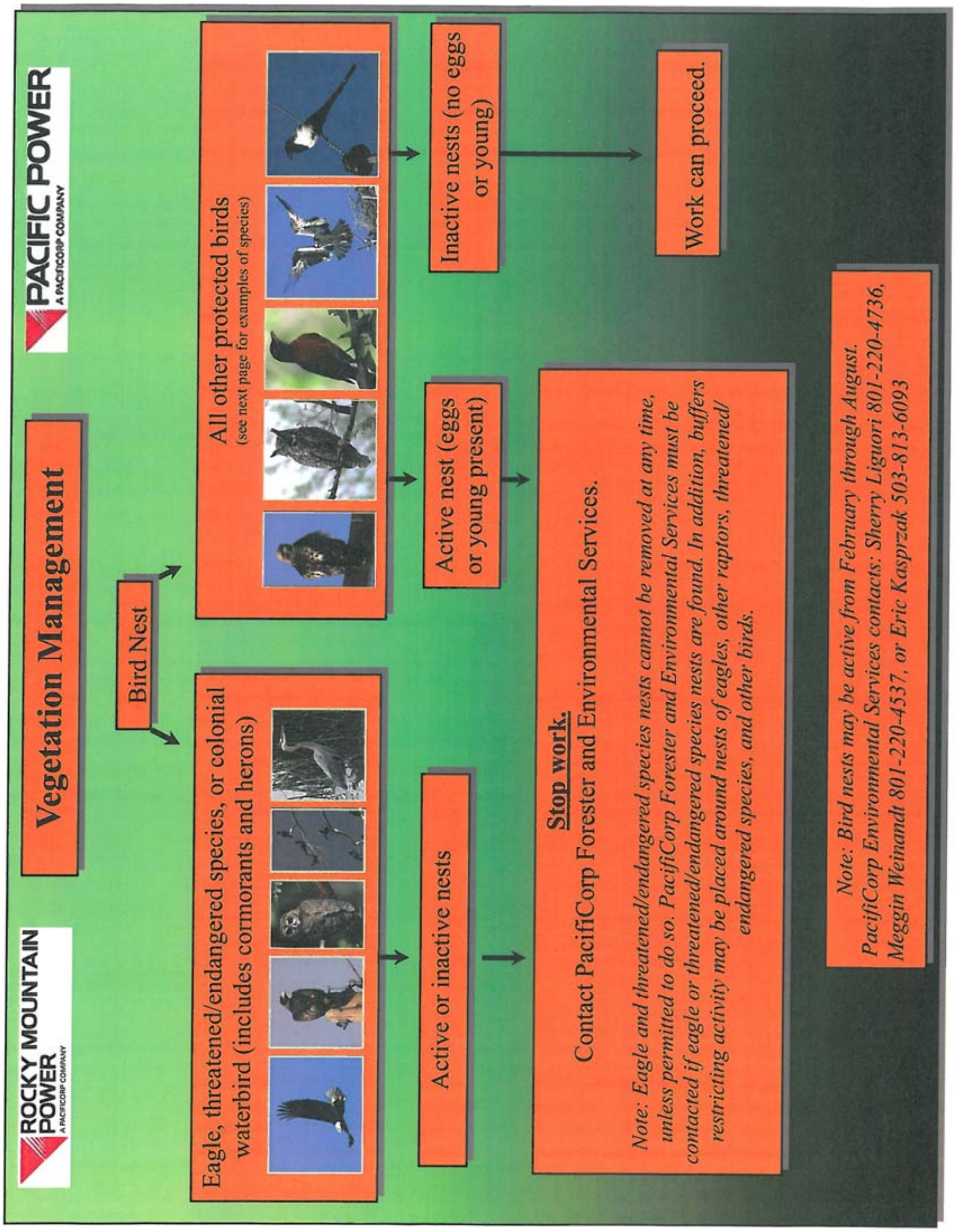


Table 2.2. Tree house clearances. Tree houses may only be allowed in a tree if they are more than minimum distances from conductors and the tree can be pruned to kept to clearances specified in this table at all times. Specified tree clearances are those for persons other than qualified line-clearance arborists specified in Table 2 of ANSI Z133. Minimum tree house distances are twice ANSI Z133 Table 2 distances.

Voltage (kV phase to phase)	**Minimum Tree House Distance From Conductors (ft-in)**	**Tree Clearance** (If tree house is built in a tree more than minimum distance from conductors)
0.31-0.75	20-00	10-00
0.751-15	20-00	10-00
15.1-36.0	20-00	10-00
36.1-50.0	20-00	10-00
50.1-72.5	21-06	10-09
72.6-121.0	24-08	12-04
138.0-145.0	26-04	13-02
161.0-196	28-00	14-00
230.0-242.0	32-10	16-05
345.0-362.0	40-10	20-05
500.0-550.0	53-04	26-08

Table 2.3. Work buffers around active nests of eagles and herons.

Species	**Work Buffer**
Herons	1000 feet
Owls	¼-mile
Hawks, ospreys, golden eagles	½-mile
Bald eagles	1 mile

Figure 2.3. An ancient food storage structure along the Camp Williams-Four Corners 345 kV right-of-way in Southern Utah. This is an example of the type of valuable archeological site that needs to be identified and protected during vegetation management work.

Rich Buelte photo

way. PacifriCorp district offices may have field data inventories of known sites to assist in the determination. If present, foresters should secure the assistance of PacifiCorp environmental services.

Archeological sites shall be located and marked. Work must conform to guidelines of the responsible governing agency. If archaeological artifacts are located on private lands, the finding shall be reported to PacifiCorp environmental services. Field data inventories of known sites could be on file in PacifiCorp district offices

2.4 Communication

Communication should be open and interactive. It should include everyone involved: management, planners, vegetation management crews, property owners, public land managers, appropriate governmental officials, members of organizations dedicated to related causes and others.

2.4.1 Internal Communication

Communication within a utility's vegetation management department needs to be clear and concise to ensure everyone involved understands the desired results. Specifications and performance goals should delegate decision-making authority throughout the organization, as appropriate. Communication between vegetation managers and workers ought to be both written and verbal. Written instruction should include PacifiCorp Vegetation Management Specifications. It should also include details regarding concerned customers and locations of environmentally sensitive or archeological areas. Written instruction should be reviewed verbally. Appropriate communication also involves post work debriefings to review challenges and prevent problems from recurring.

Communication between utility vegetation management staff and other internal employees, such as engineers and operations managers, includes why, where, when and how vegetation management projects will be conducted. This is important because people within an organization but outside vegetation management can help set priorities, anticipate and prevent potential problems, and provide historical perspectives. Communicating with operations staff during work can also add a margin of safety. By knowing there is a vegetation management job underway, operations staff may be able to provide a timelier and more appropriate incident response than they would if they were unaware of the project. At the beginning of every week, districts in which vegetation management work is being conducted shall be emailed a spreadsheet with the approximate tree crew work locations for the coming week.

2.4.1.1 Communication of Imminent Threats

Members of the vegetation management team must comply with *Transmission Grid Operations Operating Procedure PCC-215,* which institutes the *NERC Transmission Vegetation Management Program* standard Requirement R1.5 standard. The R1.5 standard requires notification of vegetation conditions that present an imminent threat of a regional transmission outrage. PacifiCorp may implement temporary action, such as rating reductions or taking transmission lines out of service until vegetation can be cleared. Inspectors should report the exact location of the subject trees (providing longitude and latitude if possible) as part of the process.

2.4.2 Communication with External Stakeholders

Public land managers, property owners, regulators, and civic organizations have interests in utility vegetation management activities. Educating potentially affected parties about the need for, benefits of and science behind vegetation management can clarify expectations. Members of the vegetation management team, including crewmembers, should know the facts about the program, be prepared to answer basic questions and refer more complex issues through to their GF/Supervisor.

Communication should begin well in advance of work and involve listening to and understanding people's concerns. Work on governmentally-managed property can involve administrative procedures that take months of advance work, including navigating through permit processes and the concerns of specialists who have responsibility for stewardship over public lands. It is not always clear to lands specialists how vegetation management helps balance their (the land manager's) responsibilities against the public's need for a safe and reliable electric grid. A memorandum of understanding among Edison Electric

Institute (EEI) member utilities and federal land management agencies (EEI 2006) establishes a framework for developing cooperative rights-of-way integrated vegetation management (IVM) practices among EEI shareholder-owned electric companies, federal land management agencies and the Environmental protection agencies.

2.5 Miscellaneous Items

2.5.1. Hydroelectric Facilities

PacifiCorp hydroelectric facilities and adjacent rights-of-way could have restrictions on vegetation management activities. PacifiCorp's hydro operations and implementation (compliance Group), PacifiCorp right-of-way services, or PacifiCorp environmental services shall be contacted before activities on or adjacent to hydroelectric facilities begin.

Herbicide use on or adjacent to PacifiCorp hydroelectric facilities shall be reported to the plant manager weekly. Tree crews working on property that is part of a hydroelectric project site should check in with the plant office before beginning work and check out after work each day.

2.5.2 Fences and Gates

Gates should be left open or closed as they were found, or as the property owner instructs. Damage to fences or gates shall be reported to the property owner and the appropriate supervisor/GF, and repaired as soon as possible.

2.5.3 Climbing Spurs

Climbing spurs shall not be used when climbing to prune trees.

Exceptions:

- when limbs are more than throw line distance apart and there is no other safe means of climbing the tree
- when the bark is thick enough to prevent damage to the cambium
- when working hazard trees that are to be reduced in height and left for wildlife.

2.5.4 Winching Vehicles.

Winch cables or ropes should not be wrapped directly around anchor trees. Doing so damages a tree's bark and cambium and can not only reduce its health and value, but also create hazards to overhead lines. If the need arises to winch a vehicle (including an all-terrain vehicle), a nylon strap (or equivalent) at least 2-inches wide shall be used around the tree, and cables or ropes attached to the strap. Utility poles or towers shall never be used as winch anchors.

2.6 Tree Removal

Tree removal is an important component of PacifiCorp's vegetation management program. Tree removal can reduce safety risks, improve access to facilities, clear lines of sight and moderate future workloads. Tree conditions are site and tree specific.

Tree removal on distribution facilities requires either written notification to or signed permission from the property owner, unless there is a right-of-way, easement or permit that expressly authorizes tree removal. If such an easement or permit exists, notification to the property owner may be verbal, provided it is documented. Signed permission may be obtained on the removal door hanger (see Section 8.2.1.3) or *Property Owner Permission Form* (see Section 8.2.2).

Stumps shall be cut to within six inches of the ground or as close to the ground as practical (for example, at the top wire of a barbwire fence with wire that has become imbedded in the trunk). Stumps of all deciduous trees, brush and vines that are removed shall be treated with an approved herbicide, where permitted (see Section 7.2.3.1).

PacifiCorp prefers to remove the entire tree in the following situations:

- Transmission rights-of-way where the conductors are less than 50 feet off the ground, or between 50 and 100 feet off the ground depending on the size of the tree (see Table 6.1 and Figure 6.3).
- Hazard trees (dead, dying, clearly diseased, deformed, or unstable trees which have a high probability of falling and contacting transmission or distribution conductors). Note that every tree is potentially hazardous. With millions of trees under management, it is impossible to identify and correct every potentially hazardous tree. Nevertheless, PacifiCorp has a responsibility to maintain its system by making a reasonable effort to identify trees that are clearly hazardous, and correct the problems they could cause in a timely manner.
- Trees that will take no more than twice the time to remove than to prune during distribution cycle work, with the exception of hazard or cycle-buster trees.
- Trees that take no more time to remove than to prune during interim and ticket work. Hazard trees excepted.
- Readily climbable trees.
- Trees with tree houses not meeting the clearance to transmission or distribution conductors shown in (Table 2.3)
- Fast-growing trees that could interfere with distribution conductors or violate specific state regulatory clearances before the next scheduled maintenance work (cycle-busters).
- Volunteer trees less than six-inches in diameter (DBH), which could eventually interfere with distribution conductors.

2.6.1 Equipment Mowing

Mowing is often more cost effective than manual methods of tree removal and should be pursued wherever practical (Figure 2.4). Mowing should be limited to fifteen feet either side of distribution primary wires and within transmission rights-of-way.

2.7 Mechanical "Trimmers"

Mechanical "trimmers" may improve productivity in rural, densely vegetated areas (Figure 2.5).

2.8 Slash Disposal

Slash is brush and limbs less than six-inches in diameter removed during tree operations.

2.8.1 Developed Areas

In developed areas, slash should be chipped and removed from the site unless an agreement has been reached with the property owner to leave it. Slash may be left temporarily, provided the crew has notified the property owner or tenant, and arrangements made to clean it up to the customer's reasonable satisfaction within two business days. Tree stems greater than six-inches in diameter should be left on site, and work locations left in a safe and orderly condition.

Figure 2.4. Side mower used on distribution rights-of-way.

Figure 2.5. Jarraff mechanical "trimmer" that may improve productivity in remote areas.

Figure 2.6. Cracked pole – an example of the type of conditions tree crews should report.

Figure 2.7. PacifiCorp Vegetation Management Maintenance inspection report form.

Maintenance Conditions Found by Crews			
Week Of			
Location - closest address, meter number if available and facility point number.			
Address (city and state)			
Meter #		Facility Point #	
Description of Problem:			
Employee Name:			

2.8.2 Rural Areas

In rural areas, slash should be disposed of on-site whenever possible.

For off-road, wooded areas, brush should be lopped into three-foot maximum lengths, and scattered in piles no more than two-feet high. Stems larger than six- inches in diameter should. They may be cut in firewood sized length at the customer's request.

Limbs and slash should be piled separately. Limbs and slash should be disposed of at the sides of distribution rights-of-way, and outside the wire zone of transmission rights-of-way, unless specified otherwise by the area forester. If brush is chipped, it should be broadcast on site wherever possible. Resulting chip piles should be no higher than two-feet. Debris piles should not limit or block access to the right-of-way, or create fire risk.

2.9 Storm Work

Storm work is done under the authority of the district operations managers. Tree crews and forest techs assigned to storms should work under the direction of circuit captains. Tree crews should report their progress at least daily to both the circuit captain and their GF/supervisor. The supervisor should report crew progress to the appropriate forester.

All storm work must be conducted as if the line is energized. If the line cannot be worked safely under the assumption it is energized it must be grounded in accordance with section 2.1.1. In general, PacifiCorp does not dispose of slash or debris resulting from storm damage. Trees that fall during storms would do so regardless of whether or not the lines are present. It should not be the utility's responsibility to clear the debris simply because the tree or trees from which it origionated damaged Company facilities on the way down. However, if an outage is preventable, slash may be cleaned-up and removed from a property at the forester's discretion.

2.10 Facility Inspection

While tree crew members are not facility inspectors, they can be helpful in identifying pronounced conditions, such as cracked poles (Figure 2.6) broken cross arms or insulators, loose guy wires, and other problems. Tree crew members should report the condition on the *Maintenance Condition Report Form* (Figure 2.7).

2.11 Freelance Work

Tree crew members shall not solicit or perform arboricultural-consulting or tree work (pruning, removal, insect or disease control, fertilization etc.) for interests outside of officially authorized PacifiCorp projects during work hours, at any time on property served by feeders or grids subject to an open work release or on property adjacent to or within 220 yards of transmission lines subject to an open work release. Outside projects may include side jobs for cash, work for private arboricultural firms (whether or not they are owned by the tree crew members doing the work), consulting or any other arboriculturally related enterprise.

3. TREE BIOLOGY AND PRUNING

Pruning is primarily on distribution facilities, although it can have application to transmission lines in some cases. The primary purpose of utility line clearance work is to minimize safety and service reliability risks caused by tree-power line conflicts.

Pruning to clear conductors shall adhere to the principles of modern arboriculture. The *American National Standard for Tree Care Operations* A300 (ANSI 2007), International Society of Arboriculture (ISA) *Best Management Practices: Tree Pruning* (Gilman and Lilly 2002), *Best Management Practices: Utility Pruning of Trees* (Kempter 2004), and *An Illustrated Guide to Pruning* (Gilman 2002), among other references, convey those principles.

While proper utility line clearance work should be consistent with practices that promote tree health, utilities cannot place tree health over public welfare. Sometimes, there is no way to obtain proper clearance in a manner that ensures the health of a tree (Lilly 2010). This is particularly true regarding foliage retention. In cases were the tree cannot be pruned without harming its health, tree removal is often best for the tree, tree owner and utility. If tree removal is not permissible, the tree should be pruned to specification clearances, even if that work is against a customer's wishes or could harm the tree.

3.1 Utility (Directional) Pruning

Directional pruning is natural target pruning applied to routing tree growth away from utility lines (Miller 1998). ANSI A300 (2007) and ISA's *Best Management Practices* (Kempter 2004) instruct that pruning to clear the utility space involves thinning cuts: removing at natural targets entire branches that are growing toward (or once cut will produce sprouts that will grow toward) the power lines.

While heading cuts produce sprouts that grow quickly back into the power lines, branch removal and reduction promotes growth away from conductors. Since the point of utility pruning is to train trees around power lines wherever practical, branches growing away from the electric facility should not be pruned. Instead, these stems should be allowed to develop to their natural height or length, provided that growth does not create unreasonable safety risks. This cannot be accomplished with strongly excurrent trees trapped directly beneath conductors.

Topping, round-overs, flush cuts, branch tipping and rip cuts are improper because they damage trees. Directional pruning is consistent with natural tree structure. Remaining branches retain their taper, strong attachments, growth regulators and spacing. They continue to grow and function normally, allowing the tree to reach to its natural height.

"V" shapes often result on properly pruned trees growing under power lines, particularly on decurrent, deciduous trees (Miller 1998, Shigo 1990, Gilman 2002, Kempter 2004) [Figure 3.1]). Limbs growing upward and toward the facility should be cut back to the trunk or to limbs growing away from the conductors.

Remaining branches should have sufficient clearance so they do not contact the conductors in inclement weather common for the locality (high wind, freezing rain, snow or other conditions). Excurrent trees (such as many conifers) are more problematic, but should be reduced to appropriate laterals or whorls.

"L" or one-sided shapes often result on properly pruned trees to the side of conductors. (Shigo 1990, Gilman 2002 [Figures 3.2]). Limbs on the wire side of trees located adjacent to facilities should be cut back to the trunk; or to limbs growing vertically, sideways or downward; depending on the distance to the line or available natural target.

3.2 Tree Biology

Understanding fundamental tree biology is essential to applying proper pruning to utility line clearance (Miller 1998).

3.2.1 Leaves

Leaves are the tree's food source. Tree survival depends on the leaves' ability to manufacture carbohydrates from the sun's energy, carbon dioxide and water. Current thinking among scientists is that if a tree abruptly looses a large portion of its foliage, as can happen with over-pruning, it could lack the energy resources to meet its needs. Trees with insufficient foliage could be weakened to the point where they become subject to attack by opportunistic insect and disease pests. Damage can extend to the roots as well as to above ground portions of the tree (Shigo, 1986). Trees can suffer sun injury after sudden excessive foliage loss (Miller 1998).

3.2.2 Stem Anatomy

Trunks and branches are tree stems. Their function is support, energy storage, and water, mineral, carbohydrate and growth regulator transport. The point of origin of a branch or limb is a node. A lead is an upright trunk or major limb with a dominant role in the tree crown, and a lateral is a branch off a parent stem. Some leads can also be laterals.

3.2.3 Xylem

Xylem is wood tissue. Sapwood is young, living xylem that stores carbohydrates, provides support, and conducts water and essential elements. Heartwood is old, dead xylem that provides support, and often contains anti-microbial compounds.

Long, hollow conducting cells (trachieds or vessels) predominate xylem structure. While trees need this vascular structure to conduct water and essential elements, it can be exploited by pathogens to spread up and down the stem. Trees attempt to block or "wall" off disease spread by plugging conducting cells in various ways, but pathogens can use food energy stored in the trunk or branch to breach these walls (Shigo1986).

Authorities disagree over how much foliage removal trees can tolerate in a given year. ANSI A300 (2007) recommends no more than 25%, while Gilman (2002) suggests less than 10 to 15 percent. Often, much more than 25% of foliage must be removed from the tree in order to appropriately maintain electric facilities. The ANSI committee did not intend the 25% provision to impede utilities from achieving appropriate clearances (Smith 2002). Utility arborists faced with the choice of maintaining public welfare by clearing the tree to specifications on one hand, or promoting tree health on the other, have no alternative but to safeguard the civic good.

Figure 3.1. "V"-shapes can develop from crown reduction on deciduous trees (left). The ultimate objective is to train trees up and around the wire wherever possible, so the facility is clear and the tree is healthy. These two photos are of the same tree, in 1992 (left) and 2007 (right).

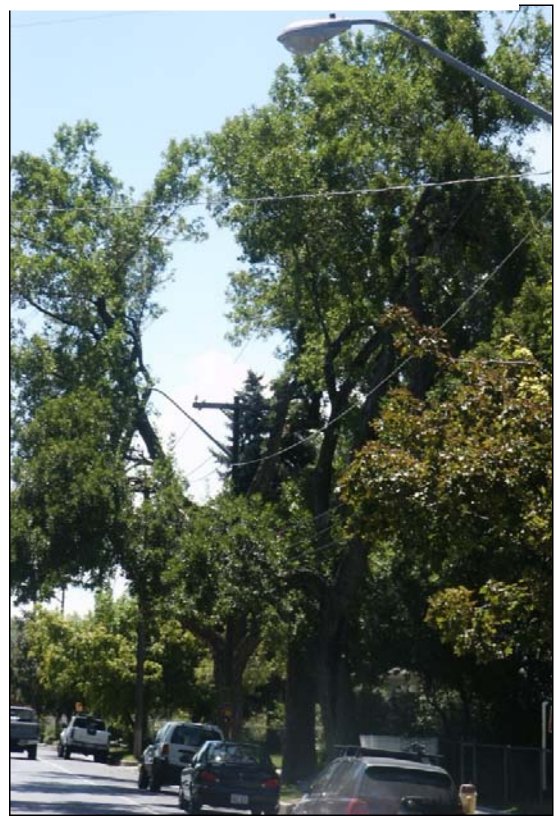
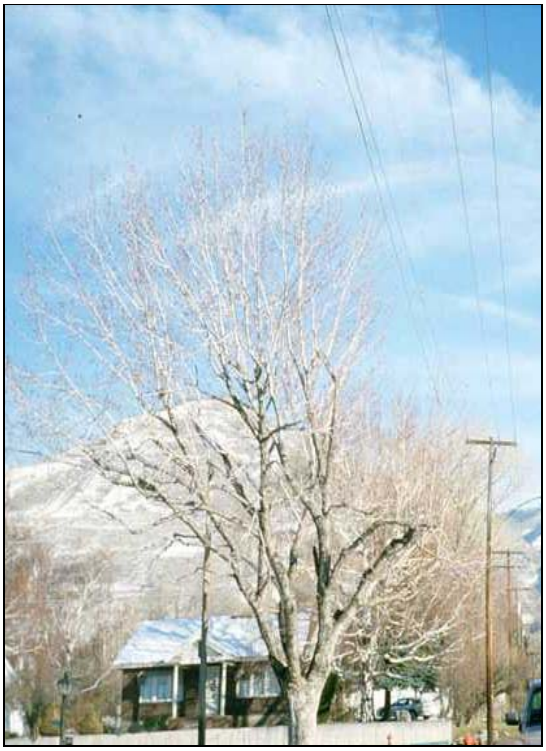
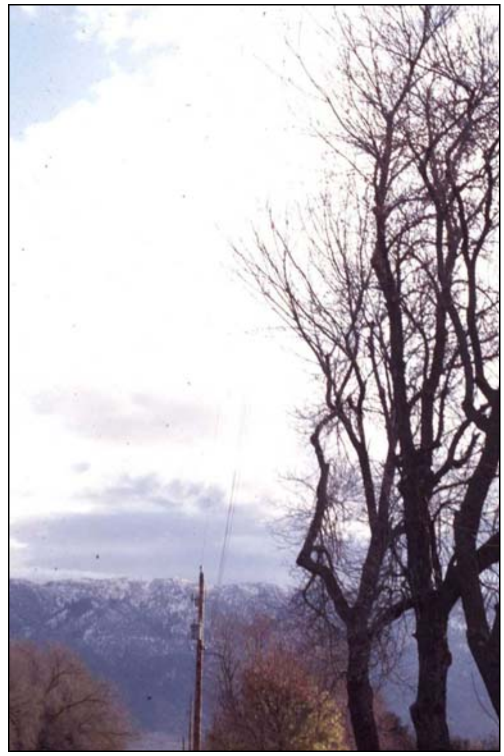


Figure 3.2 "L" or one-sided shapes often result on properly pruned trees growing to the side of conductors. Pruning may be mechanical in rural areas, below right.





3.2.4 Cambium

The tree's cambium is a thin layer of rapidly dividing cells around the outside of the sapwood. One of the functions of the cambium is to produce wood to its inside, creating diameter growth. This is the only source of wood production in the tree system, and the tree has no ability to replace damaged or decayed wood.

Pathogens gain access to wood through wounds. In response to wounding, the cambium generates a "barrier zone" containing antimicrobial compounds (Figure 3.3). It protects new wood by separating it from potentially infected wood that existed at the time of wounding. Following infection, a "race" develops between the cambium and wood-rotting microorganisms, with the structural integrity of the tree at stake. The cambium must produce new wood faster than pathogens can digest the former stem if the tree is to remain viable (Figure 3.3).

While the barrier zone contains strong antimicrobials, it is weak structurally. This structural weakness can be problematic, as cracks may develop along the barrier zone when the stem twists and flexes due to wind, ice or other stress loads. These cracks allow pathogens to breach the barrier zone and enter new wood, further threatening the tree (Figure 3.3 [Shigo 1986]).

3.2.5 Branch Collars

Branch collars are a combination of parent stem and branch tissue generated through coordinated growth around the branch attachment (Figure 3.4). In the spring of the year, diameter growth begins at branch tips, and works toward the base. When new wood meets the branch base, it turns at 90°, and wraps around the juncture. Later in the growing season, wood from the parent stem envelops branch wood laid down earlier. As a result, two layers of wood secure the branch every year, and the attachment increases in strength as the branch grows (Shigo1986).

3.2.6 Branch Bark Ridge.

An important structure associated with branch attachment is the branch bark ridge. The branch bark ridge is a line of raised bark, formed as the branch and parent stem grow together. It marks where branch wood meets stem wood Figure 3.5). A raised branch bark ridge is often a sign of a strong attachment.

3.2.7 Branch Protection Zone

Branch protection zones are areas of antimicrobial compounds that form internally at the base of diseased or injured branches (Shigo 1986). They inhibit pathogens in the branch from passing to the parent stem. While protection zones are effective, pathogens can overcome them using energy stored in the branch.

3.2.8 Taper

Tree stems taper from their bases, where they are widest, to twig tips, where they narrow to buds or apical meristems. Taper provides flexibility and strength that disperses loads from branch weight and from wind, snow or ice loads. The adaptation reduces the likelihood of failure under stress.

Figure 3.3 The cambium creates a barrier zone that contains discoloration and decay in old wood, protecting new wood. Note on the right, a ring shake formed along the old barrier zone. This is a structural flaw.

Figure 3.4. Branch collars form at branch bases.

Figure 3.5. A raised branch bark ridge is often a sign of a strong attachment. It marks where the branch meets the parent stem.

Figure 3.6. Codominant stems are at least 50% of the diameter of their parent stem. They have no branch collars or branch protection zones. Codominant stems can grow together and have bark included (embedded) between the stems in the attachment.

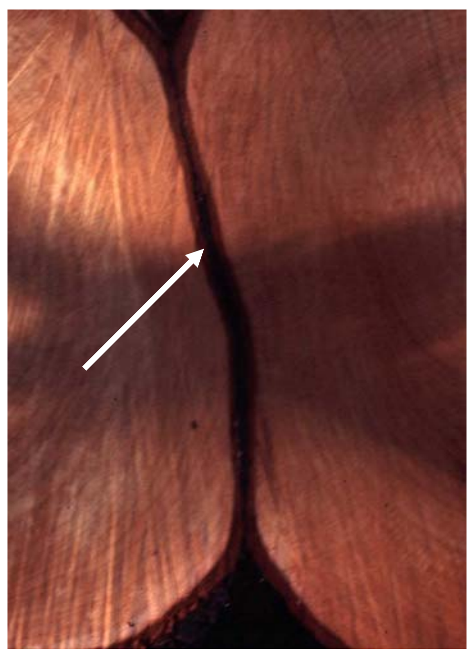


Figure 3.7. A before and after collar cut.

3.2.9 Codominant Stems

Codominant stems are stems that are at least half the diameter of their parent stem, and compete for dominance in the tree crown (Gilman 2002). They are similar to branches, but have no branch collars or branch protection zones. Disease moves from one codominant stem to another as readily as it moves through ordinary stems. Codominant stems can have a branch bark ridge. However, they are structurally flawed because they do not have room to develop (Figure 3.6). As crowded branches grow in diameter, they can press together, creating wounds and squeezing bark in between the two stems (Figure 3.6).

The resulting wounds allow disease entry and weaken branch attachments. Moreover, stems with included bark often pry one another apart as they grow, further weakening their attachments. Attachments with included bark often fail, and can be recognized by a crease between stems near their juncture (Figure 3.6).

3.2.10 Growth Regulators

Growth regulators are chemicals that coordinate plant growth. A growth regulator can have confusing, even contradictory roles depending on its concentration, the concentration of other growth regulators, environmental conditions the species of tree, and other factors. Nevertheless, scientists understand that growth regulators are responsible for orderly plant growth and development.

For example, auxin is a growth regulator produced in apical meristems, while cytokinin is another type synthesized in root tips. In response to environmental factors, roots grow and make cytokinens that stimulate shoot growth, which can result in auxin production that promotes root development. The resulting cycle is one way the tree system "communicates" to stay in balance as it grows. Auxin also functions in apical dominance. Auxin produced in apical meristems inhibits lateral growth, and helps to account for orderly branch development and spacing. Conversely, removing an apical bud or meristem promotes lateral growth, which alters the tree's normal growth habit, and can lead to codominant stems, poor spacing, and included bark.

Gibberellins are another class of growth regulators. Among other functions, gibberellins promote cell elongation. Marketed chemicals commonly known as "Tree Growth Regulators" (TGRs) are actually gibberellin inhibitors. By inhibiting gibberellins synthesis, TGRs reduce cell elongation, which in turn slows growth

3.3 Natural Target Pruning

Natural targets are proper final pruning cut locations at strong points in the tree's disease defense system. Removing branches at natural targets rarely damages the joining trunk or limb (Miller 1998). The ISA *Best Management Practices: Tree Pruning* (Gilman and Lilly 2002) and *A300* (ANSI 2007) describe the technique. Targets vary depending on whether a branch is removed or reduced.

3.3.1 Collar Cuts

Branches should be removed at the collar (Figure 3.7). Cutting into the collar, known as flush cutting, is inappropriate because it creates a direct port of disease entry into the parent stem.

Disease can weaken stems, potentially creating safety risks. On the other hand, proper branch removal does not leave stubs that pathogens can use as an energy source to overcome the tree's defense system and spread into the trunk. If the branch is removed correctly, only the branch protection zone is exposed, giving an advantage to trees in keeping out disease. As a result, collar cuts virtually prevent decay from entering the parent stem (Figure 3.7 [Miller 1998]).

3.3.2 Approximating the Collar

Occasionally, branch collars are not readily evident and the collar must be approximated using the branch bark ridge (Figure 3.8). Start the cut in the branch crotch, just outside the branch bark ridge, and follow an outward angle that mirrors the inward angle the branch bark ridge makes with the trunk or parent stem. The cut should end roughly opposite the bottom of the branch bark ridge (Figure 3.8).

3.3.3 Reduction Cuts

Reduction cuts shorten leads to appropriate laterals. An appropriate lateral is no less than one-third the diameter of the original limb and retains at least three-quarters of the lead's foliage (ANSI 2007 [Figure 3.9]). The reason for these requirements is that branches are autonomous in their energy requirements. Removing too much foliage from a limb could deprive it of sufficient energy to establish apical dominance, maintain its taper, close the wound, and compartmentalize and "out-race" disease which will enter the wound.

As a result, the lateral will not develop into a structurally viable leader. Moreover, shortening a lead removes apical meristems and other points of growth regulator production, which can disrupt orderly growth. If, for example, auxin concentrations are insufficient, on some species a crowded mass of upright, rapidly growing, poorly attached shoots can sprout from the cut and grow directly back into the lines.

Therefore, removing more than 25% of foliage from a limb has the same damaging result as a random topping cut (Figure 3.10), regardless of whether or not the cut is made to a proper-sized lateral. Even under the best circumstances, reduction cuts are potentially harmful, acting more like a heading than a thinning cut (Gilman 2002). Consequently, if a lead cannot be shortened to a limb at least one-third the diameter of the original lead, or if a cut removes more than 25% of the foliage, that limb should be either targeted for removal, or not pruned. Removal may be gradual over the course of several cycles.

3.3.4 Large Branches

Large branches (those 3-inches in diameter or greater) can seldom, if ever, be removed without harming the tree, particularly if they are codominant stems. Yet, large branches must be prevented from growing toward the utility space, and that nearly always means heading or removing them entirely. Either option can be harmful, but heading large branches not only injures the tree, but fails to effectively clear the conductors (Figure 3.10).

Removal may take a measured approach. For example, one or two large limbs might be removed out of three that are growing toward the conductors, and the remaining limb(s) targeted for removal on subsequent cycles.

Large branches selected for later removal can be subordinated, or removed gradually over subsequent cycles (either interim or cycle). Subordination thins a portion of a limb's foliage. Reducing a fraction of the foliage in this way suppresses the stem's growth, and allows the remaining tree parts to adjust and develop. In some cases, subordination can allow a codominant stem to develop into a branch over time, enabling ing a branch protection zone to form so a limb can be removed without unnecessarily subjecting a tree to disease (Gilman 2002). Using subordination over multiple cycles to remove large branches can reduce the effect of structural limb removal on tree health, while ultimately circumventing the permanent problems heading cuts can cause, even if that means temporarily heading the branch.

3.3.5 Old Heading Cuts

Removing large stems that have been headed often leaves wide gaps in the tree, because shoots that proliferate from the old heading cuts often dominate the crown (Figure 3.10), and gaps result when branches containing these shoot clusters are removed. Moreover, previously headed branches usually lack natural targets. When such branches are growing toward the conductors, there is often no alternative but to remove them entirely.

Headed branches growing away from the facility space should not be pruned as a matter of standard practice. However, shoots growing from the old heading cuts should be inspected for structural integrity during subsequent visits. Corrective action, such as crown restoration (ANSI 2007), could be necessary if these sprouts are found to be structurally weak. However, in some cases, structural defects resulting from heading cuts are so severe that they cannot be corrected (Dahle et al. 2005). In these cases, the customer should be contacted about removing the entire tree, or at least the subject branch or branches. If tree or branch removal is not possible, there could be no choice but to remove the weak growth with a new heading cut. This should be done only when extensive decay or hollow exists in the remaining branch, with the approval of the forester or GF/supervisor, for safety (not "aesthetic") purposes.

Figure 3.8 Approximated collar cut.

Figure 3.9. Crown reduction cut.

Figure 3.10. Old heading cut. Shoots that proliferate from these cuts often dominate the tree's crown, and gaps result when branches containing these shoot clusters are removed.

3.3.6 Reduction

Reduction is selective pruning applied to reduce the top or side of a tree or individual limb (ANSI 2007). In a utility context, the goal of reduction is to promote future tree growth away from the conductors, at least on decurrent trees (Figure 3.1)

3.3.6.1 Deciduous Trees

The "V" in many crown reduced deciduous trees quickly fills in with shoots. These shoots eventually require pruning to be kept from interfering with the lines (Figure 3.1) In subsequent cycles, it is important not to strip all these sprouts away, since that causes lion's tailing and can stimulate resurgent growth in many species. Rather, about half of the shoots should be removed, and the other half retained (Figure 3.11).

Shoots selected for removal should be the largest and most vigorous, leaving smaller sprouts behind. Growth selected for retention should be pencil-thin at the point of attachment. If need be, these remaining shoots may be headed back to obtain specification clearances. In this way, a rotation can be established where the largest, most vigorous shoots are removed each cycle, but smaller, suppressed shoots are left to soften the negative visual effect that many customers find objectionable.

Moreover, leaving shoots in the interior of a "V" provides shade and retains auxin production, both of which suppress vigorous sprouting, and helps the trees hold (Figure 3.11). Eventually the sides of the tree will overtop the wires, resulting in more of a "U," and shade the interior of the tree, suppressing shoot growth even more. In time, this top growth decreases the proportion of the crown occupied by the cleared utility space, and softens the negative aesthetics.

3.3.6.2 Conifers

Many conifers; such as pine (*Pinus spp.*), spruce (*Picea spp.*) and Douglas-fir (*Pseudotsuga menziesii*); have strong central leaders (excurrent form). When these types of trees grow directly under the lines, they should be reduced to the whorl or largest available lateral that provides specification clearance. Cuts made to conifer whorls are typically flat-topped in order not to damage any branches in the whorl (Figure 3.12). Laterals should be tipped on a conifers, which prevents them from forming compression wood and bending up toward the conductor.

3.4 Helicopter and Mechanical "Trimming"

Helicopter and mechanical "trimming" can be cost effective in rural areas. However, it can be difficult or impossible to hit natural targets with a mechanical saw. Consequently, decay and sprouts may develop that can cause problems in the long run. Therefore, care should be taken where to employ machines, and in subsequent years work needs to be monitored as hazard trees may develop.

Figure 3.11 On return visits to "V-Outs", under pruning should leave the smaller, suppressed shoots to retain foliage and soften the visual effect of crown reduction.

Figure 3.12. Crown reduction.

4. SCHEDULING AND REPORTING WORK

4.1. Scheduling Work

Scheduled work involves systematic cycle or interim projects on both distribution and transmission lines. Schedules should be based on the time elapsed since the last scheduled work, compliance, voltage (particularly for transmission lines), the frequency of tree-caused outages, customer count, the existence of important accounts (hospitals, factories, mines or other facilities), tree conditions, the number of customer complaints, the growth rate of predominant tree species, geography, whether the area is rural or urban, rainfall and other environmental factors.

4.2 Process Checklist

Scheduled distribution and transmission work should follow the *PacifiCorp Vegetation Management Process Checklist* (Figure 4.1). The purpose of the process checklist is to facilitate systematic project management. The project should be identified along with the start date on the top of the process checklist.

4.2.1 Authorize Project Work

PacifiCorp foresters are responsible for work authorization. No work should begin on a project until foresters have authorized it to proceed as outlined.

4.2.1.1 Contractor Work Release

Before beginning a scheduled project, the forester shall open a *Work Release* (Figure 4.2). The *Work Release* authorizes a contractor to proceed with a specific maintenance project, and provides written instructions for the work. Contractors will not get compensated for work performed on projects that have not been authorized through a work release.

The *Work Release* specifies the project type (distribution cycle or interim, transmission cycle or interim, TGR or chemical), and other systematic work. It provides instructions on tree removals, tree replacement, tree growth regulators (TGRs) and other particulars. It also assigns desired starting and ending dates. Before work begins, the GF/supervisor shall distribute copies of the *Work Release* to each crew assigned to the project, and review instructions for proceeding.

After the project is finished, the supervisor/GF shall sign the *Work Release* to certify the project is completed and closed. The contractor shall provide the actual starting and completion dates, as well as any pertinent comments. Comments should note work that is either incomplete (due to refusals, for example) or does not meet specifications at the time the *Work Release* is closed. By signing off on a project, the contractor guarantees that the work has been completed to PacifiCorp's specifications, and assumes responsibility for any failures to meet Company requirements, outside of exceptions noted in the comments.

4.2.1.2 Set Labor-hour Goals

The forester should set goals for labor-hours a tree and mile for distribution lines. These goals should be based on production data drawn from the last work on the feeder or grid, with a stretch goal of 10% improvement. Goals should also be established for transmission facilities at labor-hours an acre from previous or similar projects.

Figure 4.1 Process Checklist

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Vegetation Management Process Checklist

Work ID: ____________

Date: ____________

Authorize Project Work - Utility Forester

- ☐ Open Work Release and Set Goals. Distribute and Discuss with Vegetation Contract Supervisor
- ☐ Labor-hour Goals Set for Trees, Miles or acre (for transmission lines)
- ☐ Work Release Sent to Consultant LD/SR, Service Coordinator and System Forester
- ☐ ☐ N/A Notify Operations Managers, Community Relations Managers, Communications

Project Plan - Forester, Contract Supervisor and Forest Technician

- ☐ ☐ N/A Identify Overbuilt Transmission and Open Transmission Work Release
- ☐ ☐ N/A Research and Identify Governmental, Tribal, and Environmentally sensitive areas
- ☐ ☐ N/A Identify External Agencies and Notify if Necessary (Federal, State County, City and pertinent NGOs
- ☐ ☐ N/A Conduct Pre-job Meetings With Government Agencies
- ☐ ☐ N/A Contract Expert to Delineate Sensitive Sites or Areas and Identify On Maps
- ☐ Forester Inventories, Compiles, Assembles, Checks Out Maps to Vegetation Contract Supervisor

Project Plan Developed - Contract Supervisor and Forest Technician

- ☐ Pre Job Meeting With Forester, Supervisor and Forest Tech Date: ____________
- ☐ Identify Concerned/Dangerous Customers
- ☐ ☐ N/A Identify and Obtain Federal Special Use Permits:
- ☐ ☐ N/A Identify and Obtain Federal, State, and Local Herbicide Use Permit(s)
- ☐ ☐ N/A Identify and Obtain Other Required Permits: Specify:
- ☐ ☐ N/A Identify Outstanding Ticket Work
- ☐ ☐ N/A Identify Flagging Work
- ☐ ☐ N/A Distribution Configuration ☐ Wye ☐ Delta

Work Identification - Contract Forest Technician

- ☐ ☐ N/A Review of Special Precautions: (list)
- ☐ ☐ N/A Follow-up: Personal Contact Requirements, Special Access, Time Sensitive Instructions
- ☐ ☐ N/A Verify Facility Point Inspections Locations
- ☐ ☐ N/A Verify Aerial Waypoint Locations
- ☐ ☐ N/A Review Environmental and Cultural Requirements:
- ☐ Inspect, Prioritize Work Areas
- ☐ Notify Private Landowners and Public Land Managers

Work Assigned to Project Crews - Contract Forest Technician and Supervisor

- ☐ Activity Reports And Other Pertinent Feeder/grid Information Issued to Crews
- ☐ ☐ N/A Required Permits Issued to Crew
- ☐ Work Release and Project Specifics Communicated and Issued To Crews
- ☐ ☐ N/A Sensitive Sites or Areas Reviewed With Crews Date: ____________
- ☐ ☐ N/A Special Instructions: (list below in comments section)

Figure 4.1. Continued

Project Closure - Contract Supervisor and Forest Technician

- ☐ Post Inspection of Work to Verify Completion — Date: ________
- ☐ Inventory and Check In Maps
- ☐ Maps and Documentation Submitted
- ☐ ☐ N/A Concerned Customer Forms Submitted
- ☐ ☐ N/A Refusal Information Submitted
- ☐ ☐ N/A Dangerous Customer Information Submitted
- ☐ ☐ N/A Tree Replacement Voucher Copies Submitted
- ☐ ☐ N/A Hazard Forms - Copy in File and Copy to Utility General Foreman
- ☐ Daily Logs for Project Sent to Utility Area Forester

Project Closure - Forester

- ☐ Verify Receipt of All Maps, Daily Logs, Activity Reports, Tree Replacement Vouchers, and Hazard Forms
- ☐ Verify Receipt of Refusal and Concerned/Dangerous Customer Information
- ☐ Verify Receipt of Signed Work Release
- ☐ Close Work Release (Send to Consultant LD/SR, Service Coordinator and System Forester)

X________________________ X________________________

Contract Supervisor / Date — Area Forester/ Date

Comments:

Figure 4.2.

PacifiCorp Vegetation Management

Contractor Work Release

This work release authorizes *Contractor* to proceed with the specified maintenance project. All work shall conform to PacifiCorp's Vegetation Management Specifications. Following project completion, a *Contractor* representative shall sign this work release, and return it to PacifiCorp. Refusals or any work performed that does not conform to PacifiCorp Specifications shall be noted.

District: **Project #:**

Contractor: **Supervisor/GF:**

____ **Distribution Cycle Maintenance** **Feeder/Grid #:**
Work according to PacifiCorp *Specifications.* Identify and correct all climbable tree and tree house hazards, and remove danger trees.

____ **Tree Removals:** Limit removals to cases where removal time equals twice pruning time. Forester approval is required for removals outside of this constraint.

____ **Tree Replacement:** Use coupons to pursue removals as needed.

____ **Tree Growth Regulators:** Pursue TGRs on cycle busters.

____ **Bulk Transmission:** Work bulk transmission with distribution.

____ **Other:** ____________________

____

____

____

Desired Starting Date: ____________ **Completion Date:** ________

Area Forester Approval: ____________________ **Date:** ________

To be completed by the Contractor:

Starting Date: ____________ **Completion Date:** ________

Comments: ____________________

____

____

____

____

Supervisor/GF Signature: ____________________

4.2.1.3 Work Release Forwarded to Senior Business Specialist and Director of Vegetation Management

The forester should forward the work release and goals to the PacifiCorp senior business specialist and director of vegetation management. The consultant will authorize payment for work on the project.

4.2.1.4 Notify Appropriate Company Personnel

The forester should notify internal stakeholders in the project. Before beginning work in a new area, always notify the operations manager, and customer-community manager for that area. In addition, notify line patrolmen when working on transmission lines and site managers when working on hydro or other operations sites. Notify the PacifiCorp tariff policy department if work will be conducted in a location where either past or current state public utility commission complaints have been received. Notify the PacifiCorp communications department if work will be conducted in the vicinity where public relations issues have surfaced in the past.

4.2.2 Project Plan

The project plans section addresses foresters, contract supervisors and forest technicians.

4.2.2.1 ID Overbuilt Transmission and Open Transmission Work Release

Transmission overbuilt on distribution lines should be worked in conjunction with distribution feeder or grid projects. All work should be billed to the highest voltage lines. Consequently, if overbuilt transmission exists on an open feeder or grid, foresters need to open a second work release covering the transmission work.

4.2.2.2 Research and Identify Governmental, Tribal and Environmentally Sensitive Areas.

Governmental, tribal and environmentally sensitive lands present particular demands. Lands under governmental or tribal management and environmentally sensitive areas should be identified early to allow time to work through the required processes.

4.2.2.3. Identify External Agencies and Notify if Necessary.

Identify federal, state, county, city and pertinent non-governmental organizations potentially affected by the project. The appropriate entity should be notified of the impending project, to determine whether or not they have any concerns.

4.2.2.4 Conduct Pre-job Meetings with Governmental Agencies

Before any field work begins, a meeting shall be conducted with any governmental agency at any level with interest in the project. This is especially important for federal and tribal agencies. In particular, no work may begin on Bureau of Land Management or Forest Service managed lands without a pre-work meeting among federal officials and vegetation management. Multiple projects and multiple agencies may be covered by a single meeting.

The meeting(s) must be organized by the forester and PacifiCorp's environmental services must be notified and invited to attend. The meeting may be held either in person or through a conference call. Work shall not begin until vegetation management receives written notice to proceed from the appropriate agency.

4.2.2.5 Contract Expert to Delineate Sensitive Areas

If environmentally or culturally sensitive areas are identified on governmentally-managed lands, a contractor with appropriate expertise should be retained to delineate subject sites or areas. Target locations should be marked on maps and on site. Care should be taken with field marking to ensure it is sufficiently clear to alert crews, while at the same time being sufficiently discreet to avoid casual detection.

4.2.2.6. Forester Inventories, Compiles, Assembles, Checks Out Maps to Vegetation Contract Supervisor

It is critical for foresters to be gatekeepers over company maps in order to ensure there is only a single master version of each. The forester will check out copies of the master version, which should include sensitive environmental or cultural sites. Effort should be made to work off of digitized maps wherever possible.

4.2.3. Project Plan Developed

The contract supervisor and forest technician are responsible for developing the project plan.

4.2.3.1. Pre-Job Meeting

The contract supervisor and forest tech must have a pre-job meeting to discuss the upcoming project. They should discuss elements of the project plan and focus on solving problem issues that arose during the initial stages of the planning process.

4.2.3.2. Identify Concerned or Dangerous Customers

Forest techs should research the feeder or grid file to identify customers with a history of concerns. Forest techs should be proactive in working with these customers.

4.2.3.3. Identify and Obtain Federal Special Use Permits

PacifiCorp facilities that cross federally-managed lands are in place under the authority of special use permits. Forest techs and supervisors should study and ensure the conditions in the pertinent special use permits are satisfied.

4.2.3.4. Identify and Obtain Federal, State and Local Herbicide Use Permits.

Herbicide or pesticide use permits are required in certain jurisdictions, particularly on federally-managed land. If a permit is required, foresters must ensure that forest techs or supervisors/GFs have obtained it before herbicide application may proceed.

4.2.3.5. Identify and Obtain Other Required Permits.

There are locations where permits may be required for work. Examples may include state road rights-of-way, some communities, county or state forests or riparian areas. All required permits shall be obtained before work may proceed.

4.2.3.6. Identify Outstanding Ticket Work.

From time to time, customers who have called in work requests have been told that their request did not present an immediate threat to safety or electric service, and would wait until we arrived on cycle. Forest techs should research tickets associated with a feeder or grid, ensure contact is made with those customers, assign the work to a tree crew if it is necessary, or if not, explain the reasons to the customer.

4.2.3.7. Identify Flagging Work.

Many areas require flaggers and traffic control. Forest techs should identify areas where flagging support is necessary. Those locations should be identified on both the *Activity Report* and a map.

4.2.7.8. Distribution Configuration

The overwhelming majority of PacifiCorp distribution circuits have wye configuration, which includes a neutral wire. However, delta construction, which does not have a neutral wire, is found in some areas.

The difference is of little consequence on wires attached to cross arms, as all cross arm mounted wires should be cleared to primary specifications (see section 5.5.5). However, there is a difference on lines without cross arms. Wye construction has a low neutral, while the low wire on delta carries primary voltage. This could lead to safety and clearance risks if the low primary is mistakenly identified. In noting that a circuit is delta construction, forest techs should alert tree crew leaders of the potential of a low-mounted primary, so proper safe work practices can be conducted and clearances obtained.

4.2.4 Work Identification

Forest techs are responsible for work identification.

4.2.4.1 Review Special Precautions

Before beginning field work on a project, forest techs should review special precautions. These might include areas where difficulties have arisen in the past, such as a particularly sensitive community or neighborhood, areas where the media has been called to help oppose line clearance work, locations where there is a concentration of people who object to herbicide application, environmentally or culturally sensitive areas, places that present particular challenges to tree crews or other considerations.

4.2.4.2 Follow-up With Items of Concern

Forest techs should follow-up with customers who requested personal contact in the past, note special access (property owners who have requested tree crews not use a gate or drive, for example), or time sensitive instructions. Time sensitive instructions might include advisories not to work prior to hay harvest, not to drive in a field during the raining season in the Pacific Northwest, or some other matter.

4.2.4.3 Verify Facility Point Locations

Forest techs should print outstanding facility points for the feeder, grid or transmission lines on which they are working. They should ensure to inspect outstanding conditions and assign work where necessary.

4.2.4.4 Verify Aerial Waypoint Locations

For transmission projects, forest techs should print outstanding locations from recent aerial patrols and ensure they are inspected and worked if necessary.

4.2.4.5 Review Environmental and Cultural Requirements

For work crossing governmentally managed land, forest techs should review any existing environmental and cultural requirements. These can include threatened and endangered species, riparian areas or areas in which culturally sensitive sites exist.

4.2.4.6 Inspect, Prioritize Work Areas

Forest Techs shall document their contact with property owners or land managers, and organize work for tree crews on an *Activity Report* (Figure 4.3).

The *Activity Report* should identify the district in which work is to be conducted, the project number (the discrete number assigned to the district), the contractor assigned to the job and the feeder or grid number for distribution or plant locality number for transmission.

For each work location, the forest tech should note the date they inspected the site, a detailed location, the identity of the tenant or property owner (if known), the type of contact (door hanger, letter, personal visit, telephone or no contact), the crew type required to perform the work (lift, climb, flagging, mowing or other), a description of the work, and if necessary comments. Comments could include special considerations such as how to access the work, whether or not there is a dog on site, a sensitive area of the yard such as flower beds, cultural or environmental sites, or other matters.

4.2.4.7 Notify Private Landowners and Public Land Managers

Prior to any tree crew work, forest techs should attempt to contact the property owner or tenant on whose property the work will occur. Customer contact shall follow procedures outlined in Section 8.2.

Public land managers should have been consulted before this stage (see section 4.2.2.4). However, during the notification process, forest techs should followup with appropriate land managers to inform them that work is proceeding as planned, and provide an update on when crews are expected to begin work.

4.2.5 Work Assigned to Project Crews

Work assignments are the responsibility of both forest techs and supervisors/GFs.

4.2.5.1 Activity Reports and Other Pertinent Information Issued to Tree Crews.

Forest techs or supervisors/GFs should distribute completed *Activity Reports* to the tree crews.

4.2.5.2 Required Permits Issued to Tree Crews.

Appropriate permits shall be issued to tree crews. Tree crew members should have them available to produce to the appropriate authorities on demand.

4.2.5.3. Work Release and Project Specifics Communicated and Issued to Crews.

Before beginning work on a project, the tree crew should be issued the pertinent work release. Tree crews should be able to produce the work release to foresters during audits.

4.2.5.4 Sensitive Site or Area Review With Crews.

Any sensitive site locations should be communicated to tree crews.

4.2.5.5 Special Instructions

If there are any special instructions, such as working in sensitive areas, forest techs should communicate this to their tree crews in writing and ensure that tree crews have read and understand the special instructions.

Figure 4.3. PacifiCorp Vegetation Management Activity Report.

District : ______	Cycle Maintenance	Interim Maintenance	Ticket Maintenance	Work Order
Project #: ______	Trans. PL#: ______	Trans. PL#: ______	Trans. Ticket ______	W.O. #: ______ &
Inspected By: ______	Dist. F/G#: ______	Dist. F/G#: ______	Dist. Ticket ______	District CC #: ______

Date Inspect.	Detailed Location	Property Owner	Phone Number	Type of *Contact	^TGR s	Crew Type	Description of Work / Comments	Date Comp.	^Cst. Survey	Crew ID No.	Forem. Initials

*Type of Contact Legend: D-Door Hanger, L-Letter, N-None, P-Personal, T-Telephone

^TGRs and Customer Surveys: Check = yes, Blank = no

4.2.6 Project Completion

After completing work, the crew leader shall note the date it was performed and initial the location entry.

4.2.6.1 Post Inspection to Verify Completion.

Supervisors are ultimately responsible for ensuring that all work on a project is completed to PacifiCorp specifications. They should either inspect the work themselves, or delegate that inspection to the forest techs. If the work is delegated to the forest techs, supervisors/GFs still have the responsibility for ensuring the project is completed to specifications. Any exceptions to specifications for any reason must be noted on the work release (see section 4.2.1.1).

4.2.6.2 Inventory and Check in Maps

Supervisors/GFs and forest techs should collect all maps that have been distributed to tree crews and return them to the forester from whom they were initially issued. Foresters shall account for all maps originally issued, and file them appropriately.

4.2.6.3 Maps and Documentation Submitted.

Supervisors should submit maps, completed activity reports and other pertinent documentation to foresters.

4.2.6.4 Concerned Customer and Refusal Information and Dangerous Customer Forms and Information Submitted.

Forest techs and supervisors should gather information on customers that might need follow-up the next time the project is worked. Examples are customers who refuse to allow access or work, customers who express concerns about work or customers or property owners who threaten vegetation management employees. Information should be presented to the forester in writing on the customer refusal form and appropriately filed, preferably digitally.

4.2.6.5 Tree Replacement Voucher Copies Submitted.

Forest techs and supervisors should submit digitized copies of tree replacement coupons to the forester.

4.2.6.6 Hazard Forms Copied, Filed and Submitted to the Utility General Foreman.

Forms documenting facility points (Figure 2.7) that need to be corrected (broken cross arms, broken insulators, leaning or unstable poles, for example) should be submitted to the PacifiCorp district general foreman or operations manager.

4.2.6.7 Daily Logs for Project Submitted to Area Forester.

Supervisors should collect *Daily Logs* from each crew member under their direction. These should be digitized and emailed to the forester, as well as filed by the forester.

4.2.6.8 Sign Work Release.

Once they have determined that all work on a project is completed to specification, GF/supervisor should sign and date the work release. Any locations that have not been worked to specifications should be documented on the work release with an explanation of the circumstances (see section 4.2.1.1)

4.2.7 Project Closure.

Foresters are responsible for closing projects by completing the tasks in 4.2.7.1-4.2.7.3.

4.2.7.1 Verify Receipt of Maps and Other Pertinent Information.

Foresters should inventory maps and collect daily logs, tree replacement vouchers, hazard forms as well as concerned customer, dangerous customer and refusal information from the supervisor. Foresters should file this information digitally so it can be retrieved when work is conducted the next time through.

4.2.7.2 Verify Receipt of Signed Work Release.

Foresters should ensure they have received and filed a copy of the signed work release from the contractor. They should examine the comment section for any work that was not completed to specification, and if necessary, make provisions to correct those outstanding conditions.

4.2.7.3 Close Work Release

The forester should close the work release and inform the lead/senior consultant and director of vegetation management of the closure by electronic mail.

4.3 Reporting Work

After completing work, the crew leader shall document tree work on *Weekly and Daily Reports*. Note the date the work was performed, the crew ID number and the crew leader's initials.

4.3.1 Weekly Vegetation Report

Tree work shall be reported on the *Weekly Time & Vegetation Report* (Figure 4.4). The report is a combination contractor time sheet and PacifiCorp weekly production report. The back of the report provides instructions and definitions for each cell (Figure 4.5).

Most of the items on the *Weekly Report* are self explanatory. A few cells warrant clarification, (reference Figures 4.4 and 4.5).

- Item 23. General Work Location: The general location should be the approximate address. For example, the 4000 block of Dead Elm Memorial Road. Note that for audit purposes, crew leaders will be responsible to find and identify all the trees they worked over the course of a week. Consequently, more detailed information should be kept in the *Daily Report* (covered in Section 4.3.2 [Figure 4.6]).
- Items 31 and 32. Woody plants (including vines) less than 4-inches in diameter at breast height are classified as saplings. The actual square footage occupied by the above ground portion of the plant should be measured and recorded, with a 10 ft^2 maximum per plant for both pruned and removed vegetation. Note that multi-stemmed woody plants where no single stem is over 4-inches in diameter are classified as saplings, with a maximum of 10 ft^2 per plant.
- Item 37. Stump Spraying: Document the time spent treating stumps of trees that have been removed during the day. Use quarter-hour increments.
- Item 39. Side Pruning: Document trees worked that were located 10 feet or more from the center distribution line or that were outside the transmission right-of-way.
- Item 40. Crown Reductions: Document trees worked that were within 10 feet of the center

distribution line, or inside the transmission right-of-way (in the cases where trees in transmission rights-of-way are pruned).

- Item 41. Overhang Pruning: Usually trees that were off to the side of the right-of-way with limbs overhanging the distribution conductors.
- Items 43-45. To obtain the diameters of multi-stemmed trees, add the diameters at breast height of individual stems. For example, if a tree has 3 stems of 8, 4 and 3 inches in diameter, the tree would be 15 inches in diameter and reported as a 12-24 inch removal. An exception would be if no stems on the plant are over 4-inches in diameter at breast height, in which case the plant should be classified as a sapling (see items 31 and 32). If only one stem is over 4-inches in diameter and the remaining stems are less, report the diameter of that specific removal as the diameter of the single largest stem.
- Item 47 and 48. Saplings pruned and removed. Saplings are trees under 4 inches in diameter at breast height (they could also be 6-inches or less in diameter at the stump). Report area covered by the crown of the plant, with a 10 ft^2 maximum for each plant. There must be six inches of soil between stems of the same species for them to count as multiple plants.
- Items 54 and 55. For transmission cycle work, capture the number of acres cleared or sprayed respectively using linear feet.

4.3.2 Daily Report

The *Daily Report* shall be used by crew leaders to keep detailed records on their productivity (Figure 4.6). It is particularly important as a reference for locating trees during audits, and tracking chemical use. Like the *Weekly Report*, the *Daily Report* provides instructions on a cell by cell basis. The *Daily Report* is the property of PacifiCorp, and when completed, supervisors/GFs shall digitize it, and sent to the appropriate forester.

4.4 Tree Crew Audits

The primary purpose of a crew audit is quality control. Furthermore, crew audits offer an opportunity for the forester to provide tree crew leaders and their supervisors/GFs with a clear understanding of PacifiCorp's expectations.

Foresters shall audit one full week of work as many times a year as specified in their goals. All work, including transmission and pole clearing work shall be audited. Each audit should have the forester, the crew's GF/supervisor and the crew leader in the field together reviewing completed work. Audits should begin with the first tree, and progress in order to the last tree worked during the week. Over the course of the audit, the forester, supervisor/GF and crew leader should open a dialog regarding the week's results.

The audits should objectively assess quality, adherence to specifications, tree counts, herbicide and other matters. Moreover, audits should provide the tree crew leader with feedback on production, professionalism, equipment, safety and crew efficiency. Results shall be documented on a *Tree Crew Audit Report* (Figure 4.8).

4.4.1 Objective Components

Objective audit components shall be determined on the straight percentage of trees that meet expectations compared to the total trees worked in each category.

The percent score shall be averaged for the final rating.

4.4.1.1 Quality

The quality component documents crew adherence to natural target pruning as described in Section 3.1.2. Before conducting an audit, the forester and supervisor/GF should agree on a day to examine cut quality. One way would be to roll a die. In this case, 1 would indicate Monday, 2 for Tuesday and so on. Six would represent Saturday, and would require another roll until a different number turns up.

All final cuts made by the crew that day should be counted and examined for proper technique. A minimum of 20 cuts shall be inspected. If a crew did not make 20 cuts on the selected day, another day should be added until a minimum of 20 cuts have been evaluated. Note that if Friday is the selected day and 20 cuts were not made , the crew leader should alert the forester and GF/supervisor before the audit begins so another day can be added for cut quality.

Rip cuts, flush cuts and improper lateral selections violate the principles of natural target pruning, and shall be counted against the category score. Foresters should grant tree crews one grace faulty cut (the "Mulligan"). In addition, each “hanger” left in the tree will count as one improper cut per inch of the hanger’s diameter. For every two hangers under one-inch in diameter, a single cut penalty will be assessed.

4.4.1.2 Specification Adherence

The *Specification* section examines all trees worked over the course of a week, both pruned and removed. It takes a straight percentage of trees that comply with clearances specified in Chapters 5 and 6 against all those worked during the week. Brush feet sprayed may be counted as brush feet removed. In addition, if climbing spurs were used on a tree on which they were unnecessary in the judgment of the forester, the crew will be penalized for a tree out of specification.

4.4.1.3 Tree Count

The tree count section is used to validate numbers in the *Weekly Report* against those actually identified in the field on a straight percentage basis. Reported side pruned, overhang, crown reduction, secondary trees, and brush feet equivalents ($ft^2 \div 10$ of saplings pruned or removed) should be validated for discrepancies in these categories. If overall tree counts are accurate no penalty should be levied. However, the crew should be counseled about the importance of accurately categorizing tree work.

On transmission cycle work, work in the right-of-way should be reported as acres cleared. Hotspotting should also be reported as individual trees in the right-of-way. Trees outside the right-of-way may be reported as individual trees.

4.4.1.4 Herbicide

The herbicide component should compare total treated stumps and brush feet equivalents (total $ft^2 \div 10$) against those that should have been treated. It should also compare stumps and brush feet equivalents treated with herbicide against the total number reported. Deductions for over or under treatment or reporting should be made on a straight percentage basis and added together (Table 4.1). For example, if in an area where herbicide use was acceptable, a tree crew removed five deciduous trees, but only treated four stumps, they would

Figure 4.4. Weekly Time and Vegetation Report

WKLY TIME REPORT & PACIFICORP WKLY VEGETATION REPORT

1 W/E ____________ State ______ Local Union # ______ Crew ______ Contract# ______

Last 4	Employee Name	Code	T	Pay Rate	Sun	Mon	Tue	Wed	Thur	Fri	Sat	ST	OT	DT	Total	HOL	VAC	Other	PAD

Explain Other Hours: PAD- Paid Absent Day

Eq Name	Equipment Number	Mileage	TOTAL	Sun	Mon	Tue	Wed	Thur	Fri	Sat

MAN HOURS	TOTAL	Sun	Mon	Tue	Wed	Thur	Fri	Sat
28 Travel & Misc.								
29 Inspection/Notification								
30 Traffic Flagging								
31 Chip/Cleanup/Dump								
32 Tree Prune								
33 Tree Removal								
34 Saplings Pruned								
35 Saplings Remove								
36 TGR								
37 Pole Clear/Treating								
38 ROW Clearing								
39 ROW Spraying								
40 Stump Spraying								
41 Total Man-Hours								

PRODUCTIVITY	TOTAL	Sun	Mon	Tue	Wed	Thur	Fri	Sat
42 # Side Pruning								
43 # Crown Reductions								
44 Over-hang pruning								
45 # Sec/Serv. Pruning								
46 # Removals 4"-11"								
47 # Removals 12"-23"								
48 # Removals 24"-Up								
49 TOTAL PRUNED/REMOVED								
50 Ft2 Saplings Pruned								
51 Ft2 Saplings Removed								
52 # Stump Appliction								
53 # Stumps Ground								
54 # TGR Application								
55 # Poles Cleared								
56 # Poles Treated								
57 # ROW Ac Cleared								
58 # ROW Ac Sprayed								
59 Ft2 Sprayed								
60 # Loads of Chips								
61 # Survey Cards								

2 District ______

3 Project ______

Crew Information

4 Crew Leader ______

5 Pacificorp # ______

6 Crew Type ______

7 Cert. Appl# ______

8 Supervisor ______

Work Activity

Local Transmission Maintenance

9 Trans Cycle (TRN) TID# ______

10 Trans Ticket (TTK) ☐ ______

11 Trans Hot-Spot (THS) TID# ______

12 Trans Chemical (TCM) TID# ______

13 Trans Inspection (TNT) TID# ______

14 Trans Pole Clear (TPL) TID# ______

Distribution Maintenance

15 Dist Cycle (DST) F/G # ______

16 Dist Ticket (DTK) ☐ ______

17 Dist Hot-Spot (DHS) F/G # ______

18 Dist Chemical (DCM) F/G # ______

19 Dist Pole Clear (DPL) F/G# ______

Main Grid Transmission Maintenance

20 MG Cycle (MGT) TID# ______

21 MG Hot-Spot (MHS) TID # ______

22 MG Chemical (MCM) TID# ______

23 MG Inspection (MGI) TID# ______

24 MG Pole Clear (MPL) TID# ______

25. District Work Order or Storm #s

PM Order # ______

26 Shop Location ______

27. General Work Location

Mon ______

Tue ______

Wed ______

Thrs ______

Fri ______

Sat ______

Sun ______

62 Crew Leader Signature ______

PAGE ______

Changes 3/4/11 Vegetation Weekly Report 3/11

Figure 4.5. PacifiCorp Weekly Time and Vegetation Management Report Instructions and Definitions.

Instruction & Definitions

1. Week Ending: The week ending date (Saturday).
2. District: The PacifiCorp district where the work occurred.
3. Project #: District identification number
4. Cr. Leader: Crew Leader's name.
5. Crew #: Three-digit crew number assigned to crew leader.
6. Crew Type: Two-character crew-type code (2-Lift, 2-Mow, 3-Lift, 3-Climb. 4-Climb, 5-Climb, F. Tech, Others)
7. Certified Appl. #: The certified applicators license number.
8. Supervisor: Crew's Supervisor's name.
9. Local Trans Cycle, TID#: Transmission line six-digit Tech ID number.
10. Local Trans Ticket: Check when working transmission tickets. Tech ID number not required.
11. Local Trans Hot-Spot, TID#: Transmission line six-digit Tech ID number.
12. Local Trans Chemical: Transmission line six digit Tech ID number.
13 Local Trans Inspection: Transmission line six digit Tech ID number.
14. Local Trans Pole Clear: Transmission line six digit Tech ID number California Only
15. Dist. Cycle, F/G#: Feeder or grid number, maximum eight characters.
16. Dist. Ticket: Check when working distribution ticket. Feeder or grid numbers not required.
17. Dist. Hot-Spot, F/G#: Feeder or grid number, maximum eight characters.
18. Dist. Chem. F/G#: Chemical Cycle Maintenance: Enter Feeder/Grid #.
19. Dist. Pole Clear F/G#: Feeder or grid number. maximum eight digits. This activity is only in California.
20. Main Grid Cycle: Transmission line six digit Tech ID number
21. Main Grid Hot-Spot: Transmission line six digit Tech ID number
22. Main Grid Chemical: Transmission line six digit Tech ID number
23. Main Grid Inspection: Transmission line six digit Tech ID number
24. Main Grid Pole Clear: Transmission line six digit Tech ID number California Only
25. District Work Order or Storm Work: Plant Maintenance (PM) Order and Cost Center.
26. Shop Location: Shop location.
27. General Work Location: General work location for the day. Detailed locations are to be kept separately in the "yellow books." For audit purposes, crew leaders are responsible to find and identify all trees they worked.
28. Travel & Misc. Man-hours: Number of travel and miscellaneous (meetings, stand-by, etc.) man-hours a day.
29. Inspection/Notification: Number of inspection and notification man-hours a day. Includes facility inspection property owner notification.
30. Traffic Flagging: Number of traffic flagging man-hours a day.
31. Chip/Cleanup/Dump: Number of chipping, cleanup, and dumping man-hours a day.
32. Tree Prune: Number of man-hours a day spent pruning, including setup.
33. Tree Removal: Number of tree removal man-hours a day, including setup.
34. Saplings Pruned: Man-hours a day spent pruning saplings, including setup. Saplings are woody plants under 4" DBH (diameter at 4.5 feet above the ground) of species which have the potential to reach wire height at maturity. Report no more than 10 ft2 a plant.
35. Sapling Removed: Man-hours a day removing saplings, including setup. Saplings are woody plants under 4" DBH (diameter at 4 .5 feet above the ground) of species which have the potential to reach wire height at maturity. Report no more than 10 ft2 a plant.
36. TGR: Man-hours a day applying TGRs. including setup.
37. Pole Clear/Treating: Pole clearing man-hours a day.
38. ROW Clearing: Transmission ROW clearing man-hours a day.
39. ROW Spraying: Transmission ROW spraying man-hours a day.
40. Stump Spraying: Man-hours a day spent spraying stumps and stubble from removed saplings. Use 1/4 hour increments
41. Total Man-Hours: Total number of man-hours a day and week. Use 1/4 hour increments.
42. Side Pruning: Total trees pruned to the side of the primary conductor each day. Trunks of these trees are usually 10 feet or more off either side of the center distribution line.
43. Crown Reductions: Total trees pruned under the primary conductor(s) daily. Trunks are usually within 10 feet of either side of the center line.
44. Over-hang Pruning: Trees pruned over-hanging the primary conductor. These trees are usually to the side with removed limbs less than 10 feet above the primary.
45. Sec/Serv. Pruning: Total trees pruned each day for secondary, service, or street light where there is no primary.
46. Removals 4"-11": Total trees removed between 4"-11" DBH
47. Removals 12"-23": Total trees removed between 12"-23" DBH
48. Removals 24" and greater: Total trees removed 24" DBH and greater.
49. TOTAL PRUNED/REMOVED: Total trees pruned or removed a day and week.
50. Sq. Ft. Saplings Pruned: Square feet (length x width) of saplings pruned. Saplings are woody plants under 4" DBH (diameter at 4.5 feet above the ground) of species which have the potential to reach wire height at maturity. Report no more than 10 ft2 a plant.
51. Sq. Ft. Saplings Removed: Square feet (length x width) of saplings removed. Saplings are woody plants under 4" DBH (diameter at 4.5 feet above the ground) of species which have the potential to reach wire height at maturity. Report no more than 10 ft2 a plant.
52. Stump Application: Total trees that were stump treated with herbicides.
53. Stumps Ground: Stumps ground out.
54. TGR Application: Trees treated with Tree Growth Regulators (TGRs [(Implants, soil drench, and soil injection]).
55. Poles Cleared: Poles cleared of trees and brush. This activity is only in California.
56. Poles Treated: Poles treated with herbicides.
57. ROW Acres Cleared: Transmission ROW acres cleared of trees and saplings.
58. ROW Acres Sprayed: Transmission ROW acres where trees and saplings were treated with herbicides.
59. Sq. Ft. Sprayed: Report the square feet of undesirable vegetation sprayed.
60. Loads of Chips: Loads of chips dumped.
61. # Survey cards: Total number of survey cards distributed
62. CREW LEADER SIGNATURE: Crew leader signs the report to authenticate its accuracy.

Figure 4.6 Daily Report

PacifiCorp Vegetation Management Daily Report

[1]Crew Leader:

[2]Date	[3]Feeder/Grid #, Ticket Work, Trans. TID#, Work Order #	[4]Detailed Location: Street Address, Pole Number, Structure Number, Mile Marker, Reference Point	[5]# Side Prune	[6]# Crown Reductions	[7]# Over-hang Prune	[8]# Sec/Serv Prune	[9]# Brush Ft² Prune	[10]# Brush Ft² Removed	[11]# Removals 4"-11"	[11]# Removals 12"-23"	[11]# Removals 24" up	[12]# Stump Applications	[13]# Stumps Ground	[14]# TGR Applications	[15]# Poles Cleared	[16]# Poles Treated	[17]# ROW Acres Cleared	[18]# ROW Acres Sprayed	[19]# Brush Ft² Sprayed	[20]Herbicide Product	[21]# Oz. or # Gal. applied	[22]Temperature (F)	[23]Wind Direction	[24]Wind Speed (MPH)	[25]Start Time	[26]Finish Time	[27]Customer Survey

[28]Certified Applicator: ____________ [29]Certified Applicator #: ____________

[30]Forester ____________

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Figure 4.7

PacifiCorp Vegetation Management Daily Report
Instruction and Definitions

1. **Crew Leader:** The name of the crew leader for the day.
2. **Date:** Date work was performed.
3. **Feeder/Grid #, Ticket work, Trans TID #, After Hours Trans or Dist. Storm Work, Worker Order #:**
Identify the work with the appropriate number, or as ticket work.
4. **Detailed Location:** Report a detailed work location for each job site.
5. **Side Pruning:** Report the number of trees pruned to the side of the primary conductors.
6. **Crown Reductions:** Report the number of trees pruned under the primary conductors.
7. **Overhang Pruned:** Report the number of pruned overhanging the primary conductors.
8. **Sec/Service Pruned:** Report the number of trees pruned for secondary, service, or street lights where there is no primary.
9. **# Ft^2 Saplings Pruned:** Report the area of power line right-of-way where saplings were pruned. Report the area occupied by the crown of the plant(s), with no more than 10 ft2 reported for an individual plant. Saplings are defined as woody plants under 4" DBH (diameter at breast height) of species which have the potential to reach wire height at maturity.
10. **# Ft^2 Saplings Removed:** Report the area of power line right-of-way where saplings were removed. Report the area occupied by the crown of the plant(s), with no more than 10 ft2 reported for an individual plant. Saplings are defined as woody plants under 4" DBH (diameter at breast height) of species which have the potential to reach wire height at maturity.
11. **# Removals 4"-11", 12"-23", and 24" and up:** Report the number of trees removed in each size class measured 4½ feet above the ground).
12. **# Stump Applications:** Report the number of trees that were stump treated with herbicides.
13. **# Stumps Ground:** Report the number of stumps that were ground.
14. **# TGR Applications:** Report the number of trees treated with tree growth regulators.
15. **# Poles Cleared:** Report the number of poles cleared of trees and brush to bare ground.
16. **# Poles Treated:** Report the number of poles treated with herbicides.
17. **# ROW Acres Cleared:** Report the number of transmission ROW acres were cleared.
18. **# ROW Acres Spayed:** Report the number of ROW acres sprayed with herbicides.
19. **# Ft^2 Sprayed:** Report the number of square feet of right-of-way sprayed with herbicides.
20. **Loads of chips:** loads of chips dumbed that day.
21. **Herbicide Product:** Report the herbicide product used at the site. Refer to Herbicides A-F.
22. **# Oz., or # Gal. Applied:** Report the number of herbicide ounces or gallons applied at the site.
23. **Temperature (F):** Report the temperature when the herbicide application is made.
24. **Wind Direction:** Report the wind direction at the site when the herbicide application was made.
25. **Wind Speed (MPH):** Report the wind speed in miles per hour at the site when the herbicide application was made.
26. **Start Time:** Report the time when the herbicide application was started.
27. **Finish Time:** Report the time when the herbicide application was completed.
28. **Certified Applicator:** The name of the liscensed applicator.
29. **Certified Applicator #:** The number of the applicator's license.

FRPC000009

Figure 4.8. Tree Crew Audit Form

CREW FOREMAN: ____________ **CREW:** ____________ **DATE:** ____________

CONTRACTOR: ____________ **QUARTER:** ____________ **DISTRICT:** ____________

FEEDER/GRID, Trans PL: ____________

		SCORE	WEIGHT	% FACTOR
QUALITY : # Cuts inspected:	# Proper cuts:	100.0%	0.25	25%
COMMENTS: (Laterals, flush cuts, bark rips, wounds, stubs, hangers)				
CLEARANCE: # Trees Inspected:	# Trees Spec. Clearance:	100%	0.25	25%
# Trees non-spec. clearance: 0				
COMMENTS:				
TREE COUNT: # Trees reported:	# Trees verified:	100%	0.25	25%
COMMENTS:				
HERBICIDE: # Trees reported:	# Trees verified:	100%	0.25	25%
Pesticide Applicators Lic.	Label & MSDS Sheets			
(Proper Material, Application, Tools, & Knowledge):				
AVERAGE RATING: Of all categories (0 to 100% adherence)		**TOTALS:**		**100.0%**

PRODUCTION: ____________

PROFESSIONALISM: ____________

EQUIPMENT: (Appearance, condition, operational) ____________

SAFETY: ***evaluated by contractor supervisor -*** (Work techniques, traffic control, personal protective equip) ____________

CREW EFFICIENCY: (Job planning, multiple tasking idle labor, clean up chip disposal)

SUPERVISOR: ____________ **FORESTER:** ____________

**Crew Personel & Equipment Composition:*

**Week ending date:*

Table 4.1 Herbicide category deductions. Deductions are added together.

Penalty Description	Deduction
Failing to treat stumps or ft^2 of brush requiring treatment	Percentage of stumps or ft^2 of brush missed against the total of those requiring treatment.
Misreported stumps or ft^2 of brush	Percentage of over or under reported stumps, or ft^2 of brush against the total that were actually treated
Crew without a member holding a current applicator's license	100% (crew may be shut down at the forester's discretion).
Crew member has a current applicator's license, but does not have it on site.	10%
Missing herbicide MSDS or Label	10% for each missing document for every chemical on the truck

receive a 20% deduction ((1÷5)×100 = 20%). Moreover, if they reported only three out of the four stumps actually treated, the crew would receive an additional 25% demerit. The total deduction in this example would be 45%, and the crew's herbicide score would be 55% (assuming everything else was in order).

Moreover, foresters should apply penalties for violations of herbicide policy. Penalties include a 100% category deduction for crews without a licensed applicator (the crew may be shut down until they secure a valid license at the forester's discretion), a 10% penalty for a crew that has a valid applicator's license but does not have it on site, and a 10% penalty for each missing, but required pesticide document (MSDS and labels, for example [Table 4.1]).

Failing to report treated trees is a violation of law, in addition to not providing PacifiCorp with accurate information. Examples of trees and brush that do not require treatment include conifers that do not sprout from the stump (pines, firs, spruces, cedars and others), and stumps located in areas where herbicide use is prohibited (certain Federal jurisdictions, most municipal watersheds and private property where the owner objects to herbicide use).

4.4.2 Subjective Components

While not included in the final audit score, subjective factors such as productivity, professionalism, equipment and safety are also critical to program success. The audit process allows the forester to comment on these items.

4.4.2.1 Production

Foresters should provide the tree crew's *Statistics Report* (Figure 4.1) and a *Crew Productivity Report* from PVM for the year to date. On the *Statistics Report,* foresters should review the percentage of removals, the type of removals, the amount of nonproductive time and other factors that affect a tree crew's productivity and quality. The *Crew Productivity Report* compares the subject crew's data with the average productivity of crews working in similar areas. It enables crew members to compare their performance against that of their peers.

While productivity data is objective, valid comparisons involve subjective judgment because specific work types are different from one another. For example, a climb crew's production results will invariably be lower than those of lift crews, ticket work will be worse than cycle work, and one cycle crew working in a vegetation-dense area will have different production from crews working in urban areas. Nevertheless, 70% of PacifiCorp's contractor performance formula is based on productivity; so, audits should stress productivity's importance to program success.

4.4.2.2 Professionalism

Since tree crews have more interaction with PacifiCorp customers than any other department, it is vitally important for tree crews to exhibit professionalism. Foresters should comment on factors such as ISA Certification, and other considerations.

4.4.2.3 Equipment

The condition of equipment relates to professionalism and productivity. Well cared for equipment and organized tool boxes are not only a positive reflection on the crew, but they also make work safer and more efficient. Foresters should comment on the appearance and functionally of equipment and organization of the bins.

4.4.2.4 Safety

Safety should be evaluated by the supervisor/GF. However, if a forester observes unreasonable safety risks or obvious safety violations (such as someone failing to wear personal protective equipment), he/she should relate their concerns to the crew, and inform that crew's GF/supervisor so that he or she may correct the situation. All crew members should know the safety requirements applicable to their positions and take responsibility for following those requirements.

4.4.2.5 Crew Efficiency

Reviewing work systematically from the first to last tree worked allows foresters and supervisors/GF to gain an impression of job planning, which is a reflection of crew efficiency. Foresters should share their impression of crew efficiency and also comment on methodology, clean up and chip disposal. Inefficient work organization may be the responsibility of the forest tech who originally lined-out the work. Trends in disorganization may require forest tech counseling.

4.4.2.6 Crew Composition

Foresters will note the number of crew members and equipment type on the crew being audited. The field notes will be compared to an itemized invoice itemization for accuracy. Foresters should also note the week ending date to help access the proper invoice.

4.5 Herbicide Crew Audit

The primary purpose of the herbicide crew audit is quality control. Audits should evaluate one full week of herbicide crew work. Each audit should have the forester, the crew's GF/supervisor and the crew leader in the field together observing completed work. Audits should begin with the first area treated, and progress in order to the last area worked during the week. Over the course of the audit, the forester, supervisor/GF and crew leader should open a dialog regarding the week's results.

Moreover, audits should provide the herbicide crew leader with feedback on production, professionalism, equipment,

Figure 4.9. Herbicide Audit Form.

Herbicide Crew Audit Form

CREW FOREMAN: ____________ **Crew #** ____________ **DATE:** ____________

CREW/CONTRACTOR: **WEEK OF WORK AUDITED:** ____________

DISTRICT: **QUARTER:**

	SCORE	WEIGHT	%FACTOR
QUALITY: # Stumps reported: ______ #Stumps treated properly: ______	100%	0.33	33%
COUNT: # Trees deciduous stumps: ______ # Deciduous stumps treated verified: ______	100%	0.33	33%
HERBICIDE: Pesticide Applicators Lic. # ______ Label & MSDS Sheets (Y/N) , ______	100%	0.33	33%
AVERAGE RATING: Of all categories (0 to 100% adherence)	TOTALS:		*100%*

QUALITY: # Stumps reported: ______ #Stumps treated properly: ______

Ft² brush/Acres: ______ Ft² brush/Acres treated properly: ______

COMMENTS:

COUNT: # Trees deciduous stumps: ______ # Deciduous stumps treated verified: ______

FT² saplings/Acres recorded: ______ Ft² saplings/Acres treated verified: ______

COMMENTS:

HERBICIDE: Pesticide Applicators Lic. # ______ Label & MSDS Sheets (Y/N) , ______

Stumps/Acres reported ______ # Stumps acres verified ______

Material, Tools & Knowledge: Herbicide appliation looked good

AVERAGE RATING: Of all categories (0 to 100% adherence)

Specification Manual (yes/no) ______

PRODUCTION:

PROFESSIONALISM:

safety and crew efficiency. Results shall be documented on an *Herbicide Crew Audit Report* (Figure 4.9).

4.5.1 Objective Components

Objective audit components shall be determined on the straight percentage of trees that meet expectations compared to the total trees worked in each category. The percent score shall be averaged for the final rating.

4.5.1.1 Quality

The quality section examines proper brush ft^2 treatment following specifications described in Chapter 7. Calculate the score by using percentages of proper brush or acres treated against the total number treated.

4.5.1.2 Count

To complete the *Count* section, check the number brush ft^2 or acres treated against which should have been sprayed.

4.5.1.3 Herbicide

The herbicide section is mainly for evaluating documentation. Foresters should apply penalties for violations of herbicide policy. Penalties include a 100% category deduction for crews without a licensed applicator (the crew may be shut down at the forester's discretion), a 10% penalty for a crew that has a valid applicator's license but does not have it on site, and a 10% penalty for each missing pesticide document required for chemical use (MSDS and labels, for example).

Foresters should also comment on material, proper tools and crew knowledge.

4.5.2 Subjective Components

While not included in the final audit score, subjective factors such as productivity, professionalism, equipment and safety are also critical to program success. The audit process allows the forester to comment on these items.
Failing to report herbicide treatment or not having a licensed applicator on the crew is a violation of the law.

4.5.2.1 Professionalism

Same instructions as 4.4.2.2

4.5.2.2 Equipment

Same instructions as 4.4.2.3

4.5.2.3 Safety

Same instructions as 4.4.2.4

4.5.2.4 Crew Efficiency

Same instructions as 4.4.2.5

4.5.2.5 Crew Composition

Same instructions as 4.4.2.6

4.6 Worksite Inspection

PacifiCorp has a *Worksite Inspection Form* (Figure 4.10), which is designed to check tree crew safety. Foresters are required to perform a number of worksite inspections as specified in their annual goals. Foresters may use the form during crew visits. The form provides a general review, as well as tailboard, bucket or climb setup, vehicle, herbicide and other safety provisions.

Figure 4.10. Vegetation Management Worksite Inspection Form.

PACIFICORP
A MIDAMERICAN ENERGY HOLDINGS COMPANY

VEG. MANAGEMENT WORKSITE INSPECTION FORM

Employee Name(s)

Feeder/Grid #

District

Inspection Date

0
Crew Leader

Work Location (Address or GPS)

Required? Yes	Required? No	General	In Use? Yes	In Use? No
☐	☐	Hard Hat	☐	☐
☐	☐	Safety Glasses/Face Shield	☐	☐
☐	☐	Hearing Protection	☐	☐
☐	☐	Hand Protection	☐	☐
☐	☐	Chaps	☐	☐
☐	☐	Appropriate Footwear	☐	☐
☐	☐	Safety Vest	☐	☐
☐	☐	Job-site Housekeeping	☐	☐
☐	☐	Proper Clothing	☐	☐
☐	☐	Whistle	☐	☐
☐	☐	Communication	☐	☐
☐	☐	First Aid Kit	☐	☐
☐	☐	Fire Extinguisher	☐	☐
☐	☐	Backpack Water Fire Sprayer	☐	☐
☐	☐	Shovel and Pulaski	☐	☐
☐	☐	Fire Wagon	☐	☐
☐	☐	Dispatch Notified	☐	☐
☐	☐	Seasonal Tools	☐	☐

Required? Yes	Required? No	Bucket Work	In Use? Yes	In Use? No
☐	☐	Bucket Lanyard/Harness	☐	☐
☐	☐	Minimum Separation	☐	☐
☐	☐	Wheel Chocks in Place	☐	☐
☐	☐	Clearance Over Roadway	☐	☐
☐	☐	Outrigger Placement	☐	☐
☐	☐	Hydraulic Saw Use/Storage	☐	☐
☐	☐	Chain Saw Use/Storage	☐	☐

Required? Yes	Required? No	Climb Work	In Use? Yes	In Use? No
☐	☐	Pre-Climb Inspection	☐	☐
☐	☐	Saddle	☐	☐
☐	☐	Rope	☐	☐
☐	☐	Lanyard	☐	☐
☐	☐	2-point Attachment	☐	☐
☐	☐	Proper Tie-in Position	☐	☐
☐	☐	Figure 8 knot	☐	☐
☐	☐	Carabineers/Snaps	☐	☐
☐	☐	Minimum Separation	☐	☐
☐	☐	Ladder Use/Placement	☐	☐
☐	☐	Pole Pruners Hung Safely?	☐	☐

Required? Yes	Required? No	Tailboard	In Use? Yes	In Use? No
☐	☐	Electric Hazard	☐	☐
☐	☐	Traffic	☐	☐
☐	☐	Parked Vehicles	☐	☐
☐	☐	Structures	☐	☐
☐	☐	Fences	☐	☐
☐	☐	Pets/Livestock	☐	☐
☐	☐	Trip Hazards	☐	☐
☐	☐	Slope	☐	☐
☐	☐	Public/Property Owner Access	☐	☐
☐	☐	Yard Ornaments	☐	☐
☐	☐	Other	☐	☐

Required? Yes	Required? No	Vehicle	In Use? Yes	In Use? No
☐	☐	Wheels Chocked	☐	☐
☐	☐	Positioning and Set-up	☐	☐
☐	☐	Loads Secure	☐	☐
☐	☐	Emergency Brake	☐	☐
☐	☐	Conned off	☐	☐
☐	☐	Signage	☐	☐
☐	☐	Chipper Use	☐	☐
☐	☐	Seatbelt Use	☐	☐

Herbicide

Required? Yes	Required? No		In Use? Yes	In Use? No
☐	☐	Labels	☐	☐
☐	☐	MSDS	☐	☐
☐	☐	Containers Labeled	☐	☐
☐	☐	Sprayers Labeled	☐	☐

Required? Yes	Required? No		In Use? Yes	In Use? No
☐	☐	Rubber Gloves	☐	☐
☐	☐	Proper Application	☐	☐
☐	☐	Wetland Product	☐	☐
☐	☐	Current Applicator's Lisc.	☐	☐

COMMENTS: ______________________________

CREW LEADER:

FORESTER: ______________________________

4.7 PVM

PacifiCorp Vegetation Management (PVM) is a PacifiCorp intranet-based program available at: http://pdxus033.pacificorp.com/cognos7/cgi-bin/upfcgi.exe, which organizes data downloaded from the *Weekly Report* (Figure 4.4). PVM offers a variety of reports, such as the *Statistics Report* (Figure 4.11), which enable program analysis.

The statistics reports are designed to be flexible. They allow data examination on a program level (it contains data since 1996 for Pacific Power, for example), down to a crew level for a specific week of work. They also provide cost and man-hours per tree, the percentage of various work types (tree removals, the size of trees removed, the number of side pruned trees, crown reduction and others), the percentage of time spent on travel, flagging, cleanup and other activities.

Other PVM reports compare the productivity of individual crews, or breakdown production by district, state, and work code. The reports provide objective information upon which foresters and supervisors/GFs can make sound management decisions based on objective information.

4.8 Monthly Reports

Vegetation management has monthly reports tracking distribution cycle and interim progress, distribution spray progress, tree crew deployment, cycle progress, California Pole Clearing and transmission progress reports. These reports can be found at the PacifiCorp T&D Support Services Website: http://idoc.pacificorp.us/pacificorp_organization/rmp/rmpto/rtss/vm.html. A description of three prominent reports follows.

4.8.1 Distribution Progress Report

The distribution progress report (Figure 4.12) accounts for line miles achieved on systematic distribution work compared to goals for a given year. Systematic distribution work is cycle work throughout the six state service territory, as well as interim work in the Pacific Power service territory. The goal is the recommended cycle (three or four years depending on the state) prorated by the week of the year.

The report provides a summary of line miles achieved, breaks down progress by Pacific Power and Rocky Mountain Power's service territory, includes monthly miles ahead or behind goals, a chart depicting monthly line mile progress, and progress in each state by district and where appropriate, by forester.

4.8.2 Distribution Cycle Progress Report.

The distribution cycle report records line miles achieved over the course of the current recommended cycle compared to goals (Figure 4.13). Goals are prorated monthly and compared to actual progress.

4.8.3 Tree Crew Deployment Report

The tree crew deployment report (Figure 4.14) lists tree crews, forest techs and supervisors/general foremen by forester and district as of the first of each month. In addition to providing information on tree crew locations, the tree crew deployment is used for budget projections.

Figure 4.11. A sample PVM *Statistics Report* showing distribution cycle data for Oregon 2010.

PacifiCorp Vegetation Management

Data Updated on 6/13/11 15:10:25 PM

Statistics Report

FISCAL YEAR: 2011

WORK ENDING: 01/03/2010 TO 01/01/2011 INVOICE

COMPANY NAME CREW CODE

STATE OR CREW TYPE

DISTRICT CODE DST

PROJECT WORK ID

SUPERVISOR FOREMAN

FORESTER

TRIM TOTAL	% SIDE TRIMS	%CROWN REDUCTION TRIMS	%OVERHANG TRIMS	SEC/SERV TRIMS	# BRUSH TRIMS	
103,658	44.99	41.95	1.90	4,563.00	70,109	
REMOVALS TOTALS	**%TREE REMOVALS**	**#BRUSH FT REMOVED**	**% BRUSH FEET REMOVED**	**% 4 - 11 REMOVED**	**% 12 - 23 REMOVED**	**% 24+ REMOVED**
90,956	46.74	772,283	84.91	12.56	2.02	0.51
TOTAL TREESBRUSH	**#STUMP APPLICATIONS**	**#ACRES SPRAYED**	**#ACRES CLEARED**	**#TGR APPLICATIONS**		
194,614	6,098	0	0	668		
	#STUMP GROUND	**#POLES CLEARED**	**#POLES TREATED**			
	6	15	0			
TOTAL MANHOURS	**%TRAVEL./ MISC MANHOURS**	**%INSPECT/ NOTIFY MANHOURS**	**%TRAFFIC/ FLAGGING MANHOURS**	**%CHIP/ CLEANUP MANHOURS**		
147,737	7.66	13.09	9.73	41.35		
%TRIM MANHOURS	**%REMOVAL MANHOURS**	**%TGR MANHOURS**	**%POLE CLEARING MANHOURS**	**%ROW CLEARING MANHOURS**	**% SPRAYING MANHOURS**	**%STUMP TREAT MANHOURS**
22.42	3.64	0.17	0.00	0.00	0.00	0.28
TOTAL COST	**TOTAL $/TREE**	**TRIMMING $/TRIM**	**REMOVAL $/REMV**			
$7,797,560	$40.07	$63.34	$11.73			
TOTAL MH/TREE	**TRIMMING MH/TRIM**	**REMOVAL MH/REMV**	**TRIM MH/10FT2 SAPPRUN**	**REMV MH/ 10FT2 SAPREM**		
0.76	1.20	0.22	0.06	0.03		

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Figure 4.12 Monthly Distribution Progress Report

PACIFICORP VEGETATION MANAGEMENT 2011 DISTRIBUTION PROGRESS REPORT

Summary

Through Dec 3, 2011

		CYCLE WORK				INTERIM WORK			
	Total Line Miles	Total Miles Scheduled	Line Miles Completed	Line Mile Completed Goal	Miles Ahead(Behind)	Total Miles Scheduled	Line Miles Completed	Line Mile Completed Goal	Miles Ahead(Behind)
	43,047	**12,182**	**10,058**	**11,244**	**-1,186**	**4,908**	**4,001**	**4,530**	**-529**
State									
California	2,323	581	569	536	33	581	457	536	-79
Idaho	4,358	1,453	1,135	1,341	-206	0	0	0	0
Oregon	14,184	3,655	2,111	3,373	-1,263	3,438	2,675	3,173	-498
Utah	11,377	3,792	3,528	3,501	27	0	0	0	0
Washington	3,557	889	591	821	-230	889	870	821	49
Wyoming	7,248	1,812	2,125	1,673	452	0	0	0	0
Total	43,047	12,182	10,058	11,244	-1,186	4,908	4,001	4,530	-529

SUMMARY OF SYSTEMATIC WORK* BY FORESTER					
	Total Line Miles	Total Miles Scheduled	*Line Miles Completed	*Line Mile Completed Goal	Miles Ahead/(Behind)
	43,047	**16,200**	**14,059**	**15,774**	**-1,715**
Forester		*	*	*	*
Hooley	2,830	1,415	868	1,306	-438
Evans	6,030	2,010	1,690	1,855	-166
Jones	2,351	784	931	723	208
Partridge	3,919	1,960	1,135	1,809	-674
Phillips	5,823	2,912	2,368	2,688	-320
Vanderhoof	14,602	4,263	4,167	3,935	232
Armstrong	7,492	2,857	2,900	3,458	-558
Total	43,047	16,200	14,059	15,774	-1,715

*Combines cycle and interim work.

Weeks 48

Figure 4.13. Cycle Progress Report.

PACIFICORP VEGETATION MANAGEMENT 2011 CYCLE DISTRIBUTION PROGRESS REPORT

Pacific Power - Rocky Mountain Power

Through December 3, 2011

	CYCLE WORK				INTERIM WORK			COMBINED		
	Total Line Miles	Line Miles Completed	Line Mile Completed Goal	Miles Ahead(Behind)	Line Miles Completed	Line Mile Completed Goal	Miles Ahead(Behind)	Line Miles Completed	Line Mile Completed Goal	Miles Ahead(Behind)
	43,047	**20,653**	**23,826**	**-3,173**	**14,840**	**16,887**	**-2,047**	**35,493**	**40,713**	**-5,220**
Pacific										0
California	2,323	1,529	1,698	-169	1,602	1,698	-96	3,131	3,395	-264
Oregon	14,184	11,043	13,905	-2,862	11,661	13,480	-1,819	22,704	27,385	-4,681
Washington	3,557	1,293	1,710	-417	1,577	1,710	-133	2,870	3,420	-550
Total	**20,064**	**13,865**	**17,312**	**-3,447**	**14,840**	**16,887**	**-2,047**	**28,705**	**34,200**	**-5,494**
Rocky Mt										
Idaho	4,358	1,135	1,341	-206			0	1,135	1,341	-206
Utah	11,377	3,528	3,500	28			0	3,528	3,500	28
Wyoming	7,248	2,125	1,672	453			0	2,125	1,672	453
Total	**22,983**	**6,788**	**6,514**	**274**	**0**	**0**	**0**	**6,788**	**6,514**	**274**

	SUMMARY OF SYSTEMATIC WORK* BY FORESTER				INTERIM WORK			COMBINED		
	Total Line Miles	Line Miles Completed	Line Mile Completed Goal	Miles Ahead(Behind)	Line Miles Completed	Line Mile Completed Goal	Miles Ahead(Behind)	Line Miles Completed	Line Mile Completed Goal	Miles Ahead(Behind)
	43,047	**20,653**	**23,826**	**-3,173**	**14,840**	**16,887**	**-2,047**	**35,493**	**40,713**	**-5,220**
Forester/Pacific		*	*	*						
Hooley	2,830	1,578	2,776	-1,197	2,362	2,776	-414	3,940	5,551	-1,611
Partridge	3,919	2,861	3,770	-909	2808	3770	-962	5,669	7,541	-1,871
Phillips	5,823	4,655	5,203	-548	4,742	5,203	-461	9,397	10,407	-1,010
Armstrong	7,492	4,771	5,563	-792	4,928	5,138	-210	9,699	10,701	-1,002
Total	**20,064**	**13,865**	**17,312**	**-3,447**	**14,840**	**16,887**	**-2,047**	**28,705**	**34,200**	**-5,494**
Forester/Rocky Mt										
Evans	6,030	1,690	1,855	-166			0			0
Jones	2,351	931	723	208			0			0
Vanderhoof	14,602	4,167	3,935	232			0			0
Total	**22,983**	**6,788**	**6,514**	**274**	**0**	**0**	**0**	**0**		**0**

Figure 4.14. Monthly Tree Crew Deployment Report.

PacifiCorp Vegetation Management

Monthly Crew Report: Summary

Date: 12/1/2011

State	Distribution & Local Trans													Main Grid Trans							
	2 Man Lift	3 Man Lift	3 Man Climb	4 Man Climb	3 Man Skidder	2 Man Mow	2 Man Slash	2 Man Pole Clear	1 Man Chem	2 Man Flagger	For. Tech	Billed Super	Sub Total	3 Man Climb	3 Man Skidder	2 Man Slash	2 Man Pole Clear	1 Man Chem	Forest Tech	Sub Total	**Total Crews**
California	5.0	1.0	3.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	3.0	2.75	15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0
Idaho	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	1.00	5.0	1.0	0.0	0.0	0.0	0.0	0.3	1.0	6.0
Oregon	30.0	12.0	6.0	0.0	0.0	0.0	0.0	0.0	0.5	6.5	12.5	8.25	55.0	2.0	0.0	0.0	0.0	0.0	0.0	2.0	57.0
Utah	27.0	2.0	38.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	13.0	10.50	73.0	4.0	0.0	0.0	0.0	0.0	2.0	4.0	77.0
Washington	5.0	1.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	2.0	1.5	2.00	10.0	2.0	0.0	0.0	0.0	0.0	0.5	2.0	12.0
Wyoming	5.0	1.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	1.50	8.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	8.0
TOTAL	77	17.0	49.0	0.0	0	0	0	2	13	8.5	32.3	26.00	166.0	9.0	0.0	0.0	0.0	0.0	3.3	9.0	175.0

Forester	Distribution & Local Trans													Main Grid Trans							
	2 Man Lift	3 Man Lift	3 Man Climb	4 Man Climb	3 Man Skidder	2 Man Mow	2 Man Slash	2 Man Pole Clear	1 Man Chem	2 Man Flagger	For. Tech.	Billed Super	Crew Sub-Total	3 Man Climb	3 Man Skidder	2 Man Slash	2 Man Pole Clear	1 Man Chem	Forest Tech	Sub Total	**Total Crews**
Hooley	5.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	2.0	2.00	11.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.5
Evans	9.0	1.0	8.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	6.0	3.00	20.0	2.0	0.0	0.0	0.0	0.0	0.0	2.0	22.0
Jones	11.0	1.0	20.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	5.0	4.00	35.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	35.0
Partridge	12.0	7.0	5.0	0.0	0.0	0.0	0.0	0.0	2.5	3.0	5.5	3.50	29.5	2.0	0.0	0.0	0.0	0.0	0.0	2.0	31.5
Phillips	15.0	1.0	4.0	0.0	0.0	0.0	0.0	0.0	4.0	1.0	7.0	5.00	25.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	25.0
Vanderhoof	17.0	1.0	12.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	4.3	6.00	31.0	3.0	0.0	0.0	0.0	0.0	1.8	3.0	34.0
Armstrong	8.0	1.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	3.0	2.5	2.50	14.0	2.0	0.0	0.0	0.0	0.0	0.5	2.0	16.0
TOTAL	77.0	17.0	49.0	0.0	0.0	0.0	0.0	2.0	12.5	8.5	32.3	26.00	166.0	9.0	0.0	0.0	0.0	0.0	4.3	9.0	175.0

5 DISTRIBUTION SPECIFICATIONS

Distribution lines are overhead facilities that are energized less than 46 kV. Distribution primary voltage ranges from 600 to 45,000 volts, while lines energized below 600 volts are secondary.

5.1 Distribution New Construction Clearing

Every effort should be made by the Company not to build new line over or through trees that will need to be cleared from the facilities in the future. New distribution rights-of-way should be cleared to specification before the lines are energized. Initial clearing is very important because it sets a pattern for future work.

5.2 Distribution Cycle Maintenance

Trees and vegetation should be cleared from distribution facilities on scheduled cycles. Cycle work is methodical, and facilities shall be worked systematically, either by feeder or grid map. Cycles should be based on considerations such as the time elapsed since the last scheduled work, the type of facilities, tree conditions, the number of customer complaints, the growth rate and density of predominant tree species, geography, the frequency of tree-caused outages, customer count, the existence of important accounts (hospitals, factories, mines or other facilities) whether the area is rural or urban, single or multiple phase wires and other factors. Trees and vegetation should be cleared from distribution facilities to last until the next scheduled cycle work.

The intent of the cycle program is to:

- Systematically obtain specification clearance and maintain compliance with state regulatory rules, laws or regulations.
- Remove trees to reduce inventories, provide clearance, or improve access to facilities. This includes removing non-landscape trees 6-inch DBH or less, after providing the property owner notification (following Section 8.2).
- Identify and correct readily climbable trees.
- Identify and remove tree houses built inside of criteria specified in Table 2.1.
- On insulated secondaries or services, prune stems that are causing strain to the point of deflection (Figure 5.4) or that are abrading the insulation to the extent they could cause an outage before the next scheduled cycle. If pruning or removal is not practical, arrangements should be made with operations to re-route facilities or have suitable material or devices installed to avoid insulation damage by abrasion.
- Identifying and removing hazard trees that could fall through facilities.
- Apply herbicide to saplings (< 4” DBH) of tall-growing species after property owner notification (presuming the property owner has not expressed objection to herbicide application).
- Apply tree growth regulators (TGR’s) to fast-growing tree species after providing property owner notification.

5.3 Distribution Interim Maintenance

In some cases, fast-growing trees will not hold for an entire scheduled cycle. On the Pacific Power system, resulting tree conditions on a feeder or grid should be corrected systematically in the interim half way through the scheduled cycle.

Interim work should be restricted to critical conditions, including:

- Hazard trees.
- Trees interfering with primary or open-wire secondary conductors, or trees violating specific state regulatory agency regulations.
- Trees with clearances that will violate specific regulatory or other governmental agency tree regulations before the next scheduled work.
- Readily climbable trees.
- Identifying and removing tree houses built inside of criteria specified in Table 2.1.
- On insulated secondaries or services, prune stems that are causing strain to the point of deflection (Figure 5.4) or that are abrading the insulation to the extent they could cause an outage before the next scheduled cycle. If pruning or removal is not practical, arrange with operations to have suitable material or devices to avoid insulation damage by abrasion.
- All work should be completed to company specifications. Non-critical conditions should be monitored until the next scheduled maintenance cycle work.

5.4 Distribution Ticket Maintenance

Customers, district operations staff, governmental bodies, regulatory agencies or others often alert vegetation management to real or perceived conflicts between trees and power lines. The intent of ticket maintenance is to determine whether or not the reported conditions present unreasonable safety or electrical service risks, and if they do, correct them.

Emergency situations should be corrected within 24 hours. Critical conditions reported by regulatory agencies and other urgent situations should be inspected within 48 hours and corrected within 7 days. Other tickets should be inspected within 10 business days from the date of request, and a determination made regarding whether or not the reported condition warrants work.

The concerned party shall be contacted regarding the inspection determination. This contact may be face to face if the customer is present, or by door hanger, letter, or telephone if they are not present.

Ticket work should be limited to critical conditions, including:

- Trees representing an unreasonable safety risk as determined by the responsible forest tech.
- Trees that have caused an outage.
- Trees violating specific state regulatory regulations.
- Limbs that are deflecting secondary conductors to the extent they present a high probability of tearing down the wire before the next scheduled work.
- Trees that are likely to start a fire.
- Readily climbable trees.
- Trees where the property owner requires clearance so non-utility line clearance workers may work the tree. This work complies with various state line safety acts.

All work should be completed to Company specifications. Non-critical conditions should be monitored when the next scheduled maintenance cycle work is lined out, and worked if necessary.

5.5 Distribution Clearance Specifications

Removals are encouraged. When trees are pruned, branches should be cut to natural targets rather than predetermined clearance limits (following section 3.3). Consequently, the clearances in this specification should not be used as strict boundaries requiring cuts at the precise distances indicated. Rather, they are guidelines to use in obtaining proper clearances. Accurate natural target pruning is the overriding principal, with tree structure dictating appropriate cut locations. In many cases, the best targets are outside established clearance limits. So, many properly pruned trees will have more than specified clearance from conductors.

The type of facility and tree growth rate determine distribution clearance. Trees should be removed or pruned to provide for specification clearances as described in Figures 5.1, 5.2 and 5.3 and Table 5.1. The figures and table provide work thresholds and specification clearances for slow, medium and fast-growing trees. Trees that exceed work threshold distances should hold until the next scheduled work and not be pruned. However, these trees should still be considered to be removal candidates. <u>If trees violate pruning thresholds, they shall be removed or pruned to provide specification clearances</u>.

5.5.1 Growth Rate Definitions

Slow-growing trees grow less than one-foot a year. Moderate growing trees grow between one and three feet a year and fast-growing trees grow more than three feet a year.

5.5.2 Side Clearance

Side clearances work thresholds and side clearances can be found in Table 5.1. Work thresholds for trees growing adjacent to primary conductors are four feet for slow (Figure 5.1), six feet for moderate (Figure 5.2) and eight feet for fast-growing trees (Figure 5.3).

Specification side clearance is at least eight feet for slow (Figure 5.1), ten feet for moderate (Figure 5.2) and twelve feet for fast-growing trees (Figure 5.3).

Side clearances may be reduced to three feet for structurally sound limbs greater than 6 inches in diameter at wire height, provided the tree is not readily climbable. Hazard trees should be removed or pruned to reduce the safety risk.

5.5.3 Under Clearance

Under clearances work thresholds and side clearances can be found in Table 5.1. On trees growing under conductors, work thresholds are six feet for slow (Figure 5.1), eight feet for moderate (Figure 5.2) and ten feet for fast-growing trees (Figure 5.3). Specification clearance is at least ten feet for slow-growing trees (Figure 5.1), twelve feet for moderate growing trees (Figure 5.2) and fourteen feet for fast-growing trees (Figure 5.3).

5.5.4 Overhang Clearance

Trees overhanging primary conductors should be removed or pruned to provide at least ten feet of clearance (Figures 5.1, 5.2 and 5.3). Increased or even complete overhang clearance should be considered by the forester or GF/supervisor under the following types of circumstances: three-phase lines, rural or difficult to access areas, weak wooded or fast-growing tree species, weak structure and foreseeable weather conditions such as high wind, heavy rains, ice and snow. Dead wood that could fall or be blown into the primary conductors shall be removed. In some cases, such as three phase lines or remote areas, all overhanging branches may be removed.

Figure 5.1. PacifiCorp Vegetation Management
Distribution Primary Clearances

Slow Growing Trees

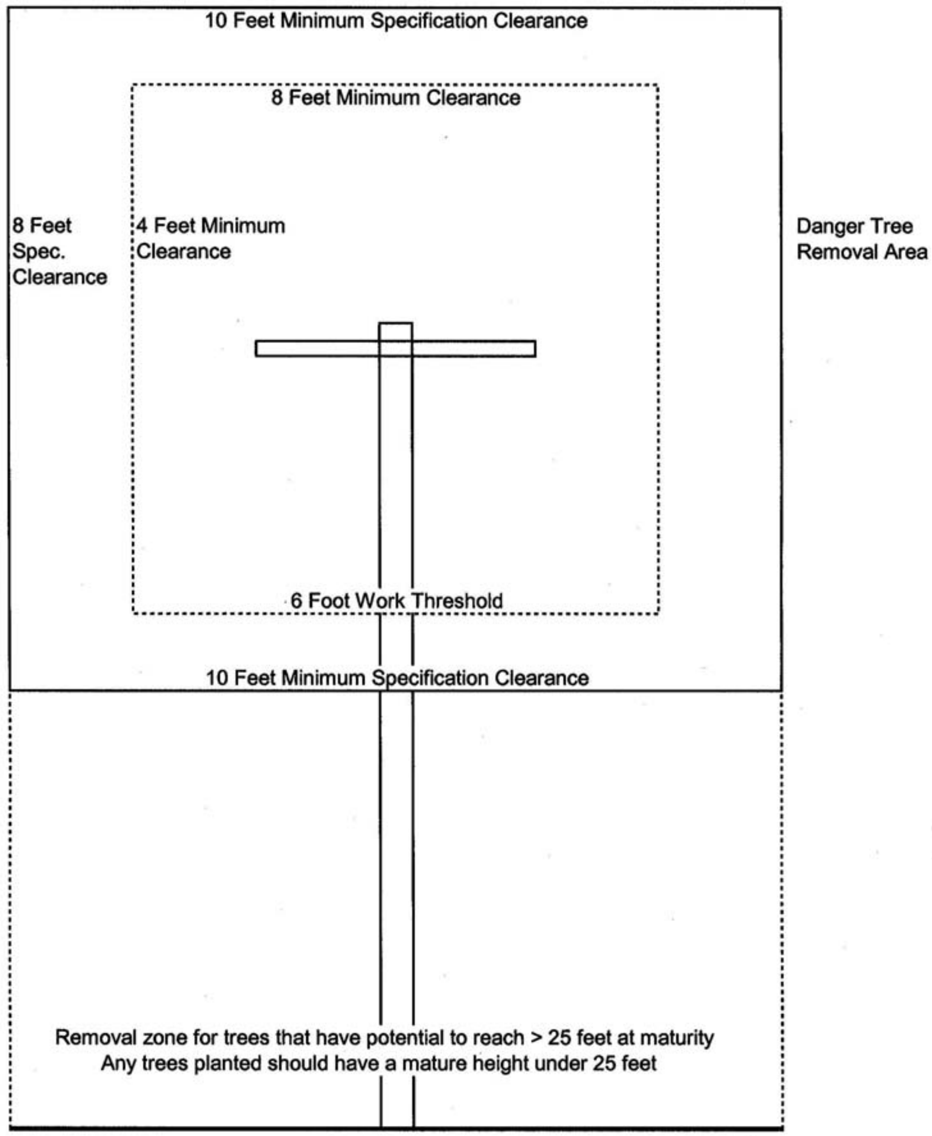
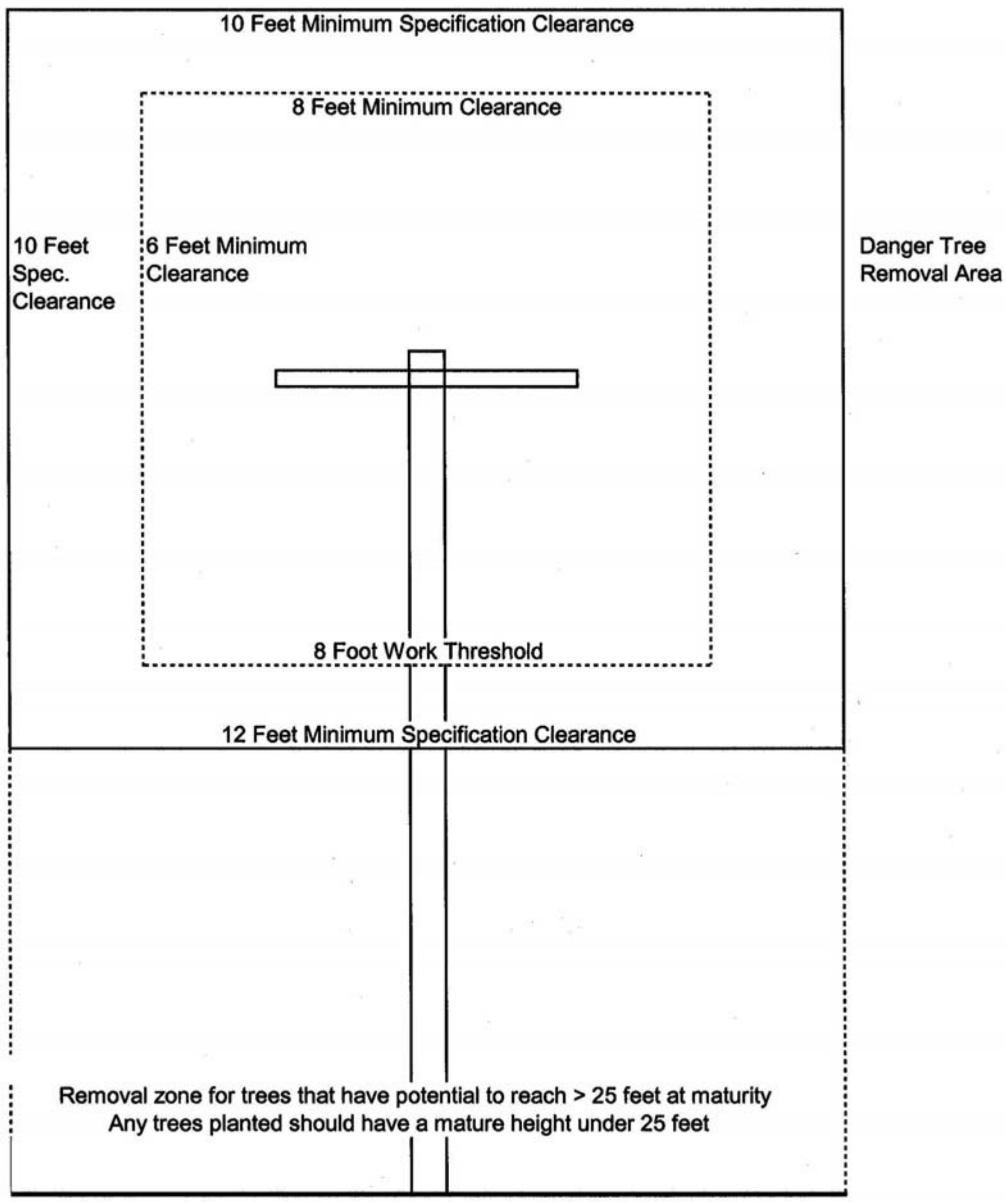


Figure 5.2: PacifiCorp Vegetation Management
Distribution Primary Clearances

Moderate Growing Trees



Fgure 5.3: PacifiCorp Vegetation Management
Distribution Primary Clearances

Fast Growing Trees

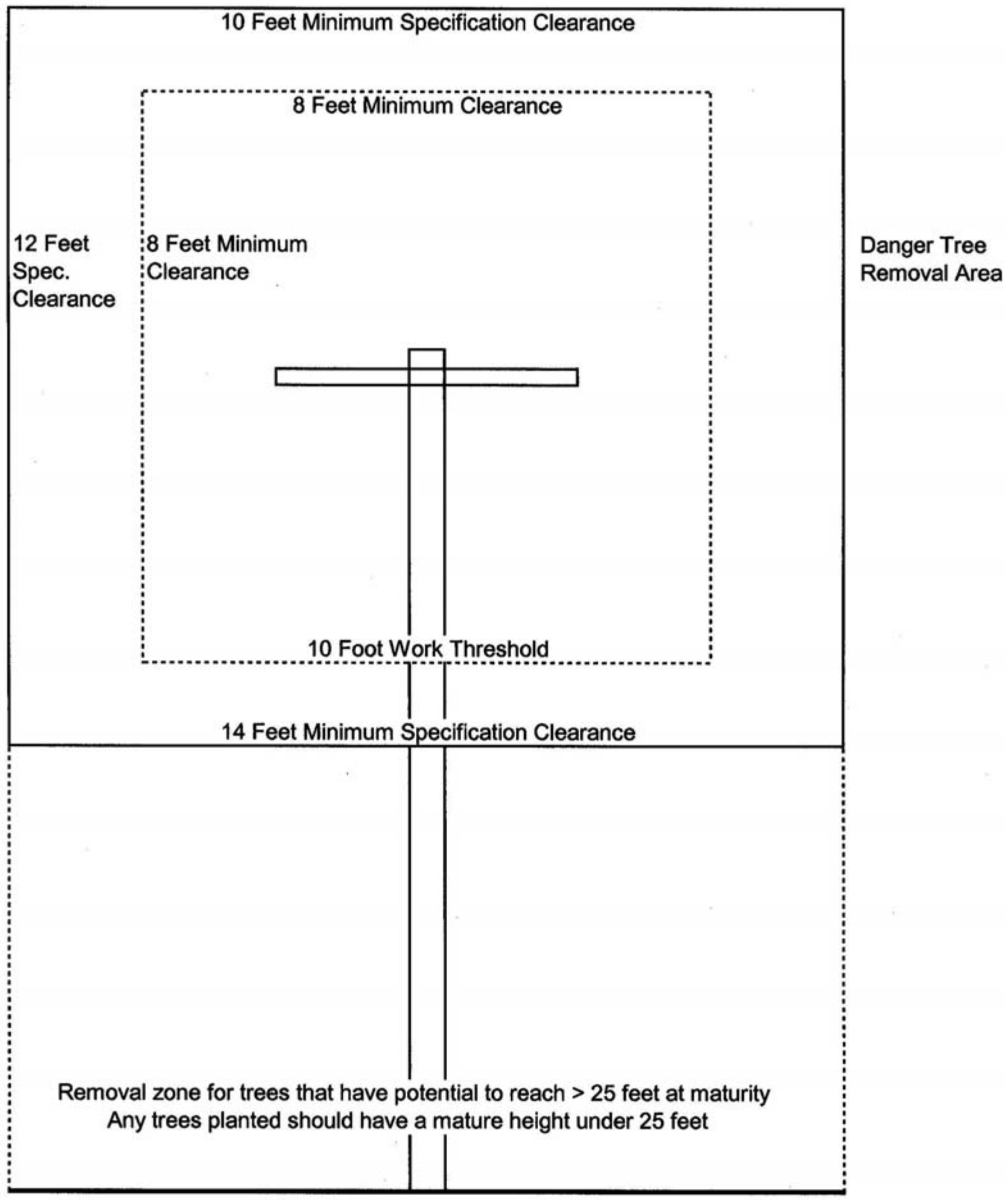


TABLE 5.1: DISTRIBUTION PRIMARY CLEARANCES

Slow-growing Trees (< 1 ft/yr)	Work Threshold	Specification Clearance
Side Clearance	4 feet	8 feet
Under Clearance	6 feet	10 feet
Overhang Clearance	8 feet	10 feet
Moderate Growing Trees (1-3 ft/yr)		
Side Clearance	6 feet	10 feet
Under Clearance	8 feet	12 feet
Overhang Clearance	8 feet	10 feet
Fast-growing Trees (> 3 ft/yr)		
Side Clearance	8 feet	12 feet
Under Clearance	10 feet	14 feet
Overhang Clearance	8 feet	10 feet

*Note: Trees with clearances that exceed the pruning threshold should not require cutting, provided they will not interfere with the primary conductors or violate state tree clearance requirements before the next scheduled work.

Table 5.2. Non-primary wire clearances.

Line Type	Work Threshold	Specification Clearance
Triplex service	Deflection/abrasion	Relieve pressure
Triplex pole-to-pole secondary/streetlight wire	Deflection/abrasion	2-feet
Non-insulated wire service/street light wire	Contact	1-foot
Non-insulated wire pole-to-pole secondary	Contact	3-feet
Neutral low condition	Contact	2-feet
Neutral on cross arm	Primary as in Table 5.1	Primary as in Table 5.1
Guy wire	2-inch or greater diameter limb applying pressure, threatened by hazard tree	Relieve pressure or remove hazard tree

5.5.5 Neutral and Insulated Pole-to-Pole Secondary Clearance

During cycle work, trees should be maintained to provide at least two feet of clearance around insulated pole-to-pole secondary and neutral conductors (Table 5.2). Tree limbs should not be allowed to remain between primary and neutral or insulated secondary conductors. Neutral conductors in a raised (primary) position should be provided secondary clearance distances during ticket or interim work, and primary specification clearance distances during cycle work.

5.5.6 Non-Insulated Open/Spaced Secondary Clearances

Trees growing around non-insulated open/spaced secondary conductors shall be pruned on cycle to provide a minimum of three-feet of clearance (Table 5.2). During cycle work, trees shall be cleared from the space between primary and non-insulated open/spaced secondary conductors. Side clearances may be reduced to one foot for structurally sound limbs greater than 6-inches in diameter at wire height.

5.5.7 Insulated Service and Insulated Street Light Line Clearances

Stems that are causing strain to the point of deflection (Figure 5.4) or that are abrading the insulation to the extent they could cause an outage before the next scheduled cycle should be pruned to relieve the pressure (Table 5.2). If pruning or removal is not practical, arrange with operations to have the facility re-routed or have suitable material or devices installed to avoid insulation damage by abrasion.

If the customer desires to remove other limbs or trees around these lines, they must arrange for a temporary disconnection to allow the desired work to be done safely. PacifiCorp does not clear trees for street light illumination, unless required to by specific language in a franchise agreements.

5.5.8 Non-insulated Service Line and Non-Insulated Street Light Line Clearances

Trees should be pruned to provide at least one-foot of clearance around non-insulated service and street light lines (Table 5.2). If the customer desires to remove other limbs or trees around these lines, forest techs or crew leaders should inform the customer to call the customer service line to arrange for a temporary disconnection of the facilities to allow safe completion the desired tree work, as required by law.

5.5.9 Other Facility Clearances

5.5.9.1 Guy Wires.

Trees or branches two-inches or more in diameter applying direct pressure to or threatening to fall on or through poles or guy wires shall be removed or pruned (Table 5.2).

5.5.9.2 Poles.

One-third of the circumference around poles shall be cleared of vegetation to a distance of 5-feet to allow linemen a clear climbing path.

5.5.9.2.1 Vines

Vines shall be removed from poles and guys, cut at ground level, and treated with an approved herbicide (see Section 7.3). They shall be reported as brush or tree removed (depending on stem diameter). Vines clearly part of a landscape and rooted well away from the pole may be pruned and reported as

Figure 5.4. Trees with branches applying sufficient pressure to cause damage to insulated service and street light lines should be pruned on cycle to relieve the pressure.

crown reductions. Vines shall be pulled off the bottom 5-feet of poles after they have been cut. The facility point shall be documented by the tree crew and given to their supervisor/GF, who shall report it to operations to clear the remainder of the pole, and arrangements made with PacifiCorp journeymen linemen for the job.

5.5.9.3 Telecom and Private Electrical Lines

Trees should not be pruned or removed expressly to provide clearance for television cable, telephone lines or private electrical facilities unless authorized by the area forester.

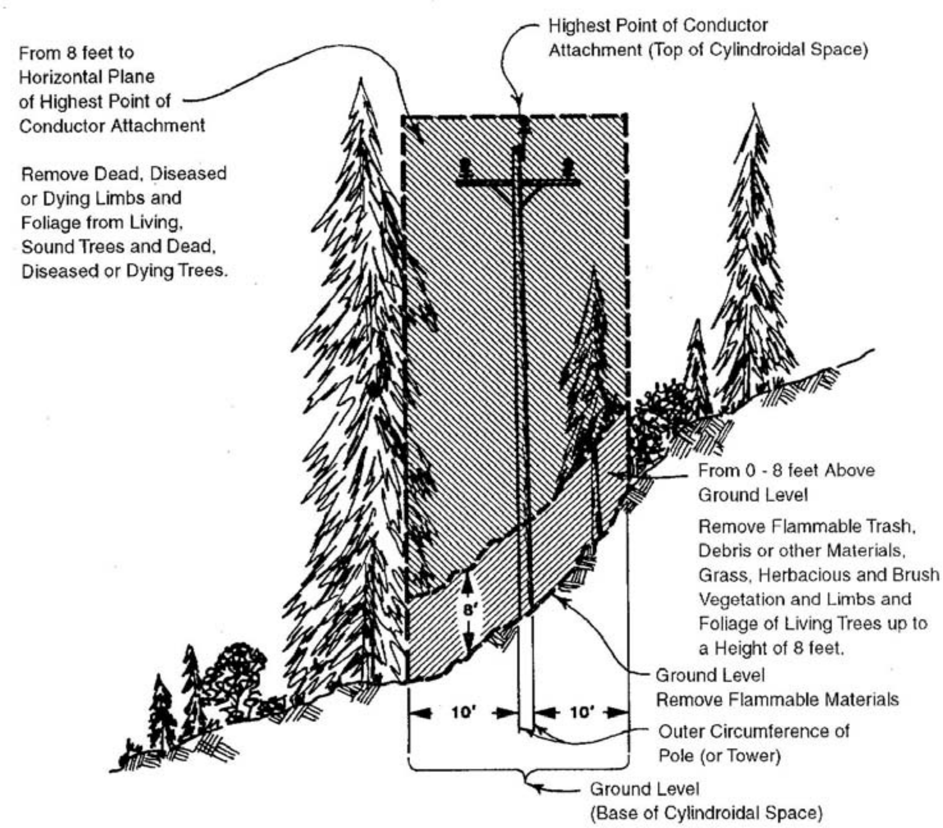
5.5.9.4 Street Light Illumination

Moreover, trees shall not be pruned to improve streetlight illumination, unless required by specific language in a franchise agreement.

5.6 Pole Clearing.

California Resource Code 4292, requires a ten-foot radius cylinder of clear space from pole top to bare ground around "subject" poles in delineated resource areas during designated fire

Figure 5.5. California pole clearing requirements (from Nichols et al. 1995).



season. Trees or saplings with trunks within clearance zone should have eight feet of vertical clearance from the ground to the highest limb (Figure 5.5).

Subject poles have fuses, air switches, clamps or other devices that could create sparks and start fires (Nichols et al. 1995). This cleared space should be established and maintained by pruning and removing above ground branches and plant parts. After removing vegetation to bare ground for a 10-foot radius around subject poles, herbicides, including soil sterilants, should be applied.

6. TRANSMISSION VEGETATION MANAGEMENT PLAN (SPECIFICATIONS)

Transmission facilities are overhead lines energized to greater than 45 kV. Typical transmission voltages on PacifiCorp's system are 46 kV, 69 kV, 115 kV, 138 kV, 161 kV, 230 kV, 345 kV and 500 kV. Facility voltage and type determine the amount of transmission clearance needed. Table 6.1 provides specification clearances for transmission rights-of-way.

Transmission work shall comply with the ANSI A300 Part 7: *American National Standard for Tree Care Operations (Integrated Vegetation Management a Electric Utility Rights-of-way* [ANSI 2006]) and the ISA *Best Management Practice: Integrated Vegetation Management for Electric Utility Rights-of-way* (Miller 2007).

Transmission work on lines at or above 200 kV and those designated by the Western Electricity Coordinating Council as an element of the major transfer path in the bulk electric system shall also conform to the North American Electric Reliability Corporation's (NERC) Reliability Standard FAC-003-01 (Effective 2006) along with other chapters in this manual.

6.1 Work Objective

The objective of systematic transmission work is to improve the reliability of PacifiCorp's transmission system by preventing outages from vegetation located on transmission rights-of-way and minimizing outages from vegetation located adjacent to the right-of-way.

6.2 Philosophy

PacifiCorp's vegetation management philosophy for transmission lines is to utilize integrated vegetation management best practices to conduct cover type conversion and to cultivate stable, low-growing plant communities comprised of plants that will never interfere with transmission lines in their lifetime.

Reliability and safety are most effectively protected through establishing and maintaining a right-of-way consistent with the wire-border zone concept (Figures 6.4a and 6.4b). When the line is less than 50 feet off the ground, the wire-border zone should be cleared of all incompatible vegetation unless an easement fails to provide authority or there are legal impediments from doing so.

6.3 Initial Clearing and Construction

Newly constructed transmission lines should be cleared to this specification prior to being energized.

6.4 Inspection

Transmission lines falling under the auspices of FAC-003-01 should be inspected at least once a year by ground or air, depending on the anticipated growth of vegetation and any other environmental or operational factors that could affect the relationship of vegetation to the transmission lines.

Line Patrolmen have responsibility for inspecting transmission lines subject to FAC-003-01 and reporting conditions to vegetation management. In addition, each area forester shall meet twice each year to discuss vegetation conditions with the line patrolman with mutual geographic responsibilities.

Line Patrolmen encountering a tree that poses an imminent threat of a transmission outage shall follow procedures in PacifiCorp Operating Procedure PCC-215, in order to comply with Requirement R1.5 of NERC Standard FAC-003-01 (*Transmission Vegetation Management Program.* Line patrolmen must:

- Immediately notify the grid operator by phone and describe the nature and extent of the threat.
- Complete and process the Emergency Tree Action Form.
- Communicate the vegetation conditions to vegetation management for urgent attention.

Examples of an imminent threat include (but are not limited to) trees that violate or are pose a risk within 72 hours of violating NERC Clearance 2, uprooted trees that are leaning toward the line and pose a risk of immediate failure and trees that structural failures so they may break in part or whole onto the transmission facilities.

6.4.1 Additional Inspection

Foresters should annually select lines among those over 200 kV and those designated by the Western Electricity Coordinating Council as elements of the major transfer path in the bulk electric system for annual inspection in addition to that performed by line patrolmen. These inspections are to supplement, rather than substitute for, those conducted by line patrolmen. Foresters should assign representatives to complete these inspections.

Such inspection should identify trees that pose an imminent hazard, and trees that will violate NERC Clearance 2 distances within the next year. Locations should be noted on an activity report, and assigned to a tree crew for work, with the appropriate forester's approval. If the inspections discover an imminent threat, forest techs shall contact the appropriate forester within three hours. Foresters shall immediately request the appropriate line patrolman to inspect the line according to the imminent threat procedure described in section 6.4.

6.5 Work Plan

The Vegetation Management A300 standard (ANSI 2006) and the ISA integrated vegetation management best management practice (Miller 2007) recommends against cycle-based transmission work thresholds. Rather, work should be scheduled depending on line voltage, line importance, vegetation conditions that violate the action thresholds in Table 6.1, location, predominant species' growth rates, threatened and endangered species, archeological sites, topography and other factors.

A comprehensive approach that exercises the full extent of legal rights is superior to incremental management in the long term because it reduces overall encroachments, and it ensures that future planned work is sufficient at all locations on the right-of-way Removal is superior to pruning. Removal minimizes the possibility of conflicts between energized conductors and vegetation.

6.5.1 Annual Work Plan

PacifiCorp performs vegetation management work in accordance with annual work plans that details the circuits and facilities to be managed during a calendar year. Plans should include:

- A list of facilities subject to scheduled work.

- If only a portion of a line is scheduled, the line segment must be identified.
- Dates when work is anticipated to start and end on each project (Gantt charts are recommended).
- A description of the type of control methods, (cycle, herbicide, mowing, aerial etc.)

6.5.1.2 Annual Work Plan Adjustments

The annual work plan may be adjusted during the year to account for changes in conditions that require a circuit, line segment or project to be moved into or out of the work plan. Examples of reasons for adjustments include, but are not limited to, vegetation growth in excess of anticipated levels, vegetation inspection results, new construction projects or removal of existing facilities. Adjustments to the annual work plan shall be documented as they occur.

6.6 Clearances

6.6.1 NERC Clearances

The NERC Vegetation Management Standard FAC-003-01 has two clearance requirements: Clearance 1 and Clearance 2.

6.6.1.1 NERC Clearance 1

NERC Clearance 1 represents minimum clearances to be achieved at the time of work (Table 6.1). These distances should be increased, depending upon local conditions and the expected time frame to return for future vegetation management work. Local conditions may include appropriate vegetation management techniques, fire risk, reasonably anticipated tree and conductor movement, species types and growth rates, species failure characteristics, local climate and rainfall patterns, line terrain and elevation, location of the vegetation within the span, worker approach distance requirements and other factors.

6.6.1.2 Clearance 2

NERC Clearance 2 represents radial distances from the lines inside of which trees should not encroach (Table 6.1) Trees that violate NERC Clearance 2 shall be corrected within 24 hours of their identification following PacifiCorp SOP-013, *Transmission Grid Operations Operating Procedure PCC-215.*

6.6.1.3 Action Thresholds

The action thresholds in Table 6.1 provide roughly ten-foot buffers from NERC Clearance 2. Trees identified within the action thresholds should be scheduled for work within twelve months.

6.6.2 Side Clearance in Transmission Rights-of-Way

Specification side clearances are presented in Table 6.1. Consider potential sway of conductors in foreseeable high wind, particularly mid span, where clearances could need to be increased at mid span to accommodate conductor sag and swing in high temperature and winds.

6.6.3 Structure Clearances

Trees and brush should be cleared within a twenty-five foot radius of transmission "H" or metal structures, a ten-foot radius of single pole construction and a five-foot radius of guy anchors. Clearing activities shall not damage poles, structures, guys or anchors.

6.7 Integrated Vegetation Management

The purpose of vegetation management on utility rights-of-way is to

Table 6.1. Transmission clearance requirements (in feet).

	500 kV	345 kV	230 kV	161 kV	138 kV	115 kV	69 kV	45 kV
Maximum Flash Distances (NERC Clearance 2)	14.8	9.5	5.2	3.5	3.0	2.5	1.3	N/A
Action thresholds	25	20	15	13.5	13	12.5	11.5	5
*Minimum under & side clearances following work (NERC Clearance 1)	50	40	30	25	25	25	25	20

Clearance 2 represents minimum clearances that should be maintained at all times, considering the effects of ambient temperature on conductor sag under maximum design loading, and the effects of wind velocities on conductor sway. They follow table 5 in IEEE 516-2003 as specified in FAC-003-01

Action thresholds indicate work should be scheduled within the next year. They are roughly IEE

Clearance 1 represents minimum clearance following work.

establish sustainable plant communities that are compatible with the electric facilities. Stable, low-growing plant ecotypes are compatible with conductors encourage and promote diversity, and the establishment of a sustainable supply of forage, escape and nesting cover, movement corridors for wildlife, reduced fire risk, and more open access to the line (Yanner and Hutnik 2004). Establishing native vegetation will also reduce the invasion of noxious weeds into the corridor (BPA 2000).

6.7.1 IVM Control Methods

Control methods are the processes used to achieve objectives. Many cases call for a combination of methods. There are a variety of controls from which to choose, including manual, mechanical, chemical, biological, and cultural options (Miller 2007). Ground disturbance shall be minimized on all rights-of-way.

6.7.1.1 Manual Control Methods

Manual methods involve workers using hand-carried tools, including chainsaws, handsaws, pruning shears and other devices to control incompatible vegetation. Manual techniques are selective and can be used where others may not be appropriate, including urban or developed areas, environmentally sensitive locations (such as wetlands or places inhabited by sensitive species), in the vicinity of archeological sites and on steep terrain.

6.7.1.2 Mechanical Control Methods

Machines are used for mechanical control. They are efficient and cost effective, particularly for clearing dense vegetation during initial establishment, or reclaiming neglected or overgrown rights-of-way. On the other hand, mechanical control methods can be non-selective and disturb sensitive sites, such as wetlands, archeologically rich localities or developed areas. At times, machines leave behind petroleum products, leaks and spills from normal operation. Furthermore, heavy equipment can be risky to use on steep terrain, where they may be unstable.

6.7.1.3 Chemical Control Methods

Tree growth regulators and herbicides must be used according to directives on their labels. Applicators are not only required to comply with label instructions, but also all other laws and regulations pertaining to tree growth regulator and herbicide use (see Chapter 7).

6.7.1.3.1 Tree Growth Regulators

Tree growth regulators (TGRs) are designed to reduce growth rates by interfering with natural plant processes. TGRs can be used to slow fast-growing trees, and be helpful where removals are prohibited or impractical.

6.7.1.3.2 Herbicides

Herbicides control plants by interfering with specific botanical biochemical pathways. There are a variety of herbicides, each of which behaves differently in the environment and in their affects on plants, depending on the formulation and characteristics of the active ingredient. While appropriate herbicide use reduces the need for future intervention, if misused they can cause unintended environmental harm due to drift, leaching and volatilization.

6.7.1.4 Biological Control Methods

Biological control uses natural processes to control undesirable vegetation. For example, some plants, including certain grasses, release chemicals that suppress other plant species growing around them. Known as allelopathy, this characteristic can serve as a type of biological control against incompatible species. Promoting wildlife populations is also a form of biological control. Birds, rodents and other animals can encourage compatible plant communities by eating seeds or shoots of undesirable plants.

6.5.1.5 Cultural Control Methods

Cultural methods modify habitat to discourage incompatible vegetation. Cultivated landscapes of compatible plants and agricultural crops are examples of cultural control.

A cultural control known as cover-type conversion provides a competitive advantage to short-growing, early successional plants, allowing them to thrive and eventually out-compete unwanted tree species for sunlight, essential elements and water. Cultural methods also take advantage of seed banks of native, compatible species lying dormant on site. In the long run, cultural control is the most desirable method where it is applicable.

The early successional plant community is relatively stable, tree-resistant and reduces the amount of work, including herbicide application, with each successive treatment.

While it is a type of cultural control, cover-type conversion employs a combination of manual, mechanical, herbicide and biological methods. For example, although encouraging allelopathic plants and increasing wildlife populations by improving habitat are types of biological controls, they are also forms of cultural control.

Tree-resistant communities are created in two stages. The first involves non-selectively clearing the right-of-way of undesirable trees using the best applicable control method or methods. The second develops a tree-resistant plant community using selective techniques, including herbicide applications and releasing the seed bank of native, compatible species for germination.

Cover type conversion, uses herbicides to remove incompatible tall-growing trees and other vegetation from the right-of-way in order to establish a stable, low-growing plant community. The specific IVM technique selected for a particular site is based upon various conditions, which include terrain, accessibility, environmental considerations (wetlands, streams, etc.) cultural factors, worker and public health, economics and other factors.

6.7.1.5.1 Wire-Border Zone

Over roughly sixty years of research on transmission rights-of-way has demonstrated that integrated vegetation management applied to creating distinct, compatible plant communities not only effectively manages vegetation on rights-of-way, but also enhances wildlife habitat, at least in forested areas (Yanner and Hutnik 2004). The wire zone-border zone concept was developed by W.C. Bramble and W.R. Byrnes (Bramble et al 1991).

On flat terrain, the wire zone is the right-of-way portion directly under the wires and 10-feet to the field side of the outside phases. The border zone ranges from ten-feet outside the outer phases to the right-of-way edge (Figure 6.4a). The border zone may be reduced or eliminated on the up-slopes slope where wire sag and sway may preclude leaving trees of any type. It may also extended on down-slopes (Figure 6.4b).

Properly managed, wire zone-border zone linear corridors not only effectively protect the electric facilities, but also can become an asset for forest ecology and forest management (Bramble et al 1991, Yanner, Bramble and Byrnes 2001, Yanner and Hutnik 2004).

6.7.1.5.1.1 Region A

Region A is the area where lines are less than 50 feet off the ground (Figure 6.5). The 50 foot height should be from maximum engineered sag mid-span, with attention to side slope and potential sway of conductors in high wind. The right-of-way in Region A should be cleared following the wire zone - border zone recommendations of Bramble and Byrnes (Bramble et. al. 1991 [Figure 6.2]).

After clearing, the Region A wire zone should consist of grasses, legumes, herbs, ferns and low-growing shrubs (under 5-feet at maturity). The border zone should consist of tall shrubs or short trees (up to 25 feet in height at maturity), grasses and forbs. These cover types benefit the right-of-way by competing with and excluding undesirable plants.

6.7.1.5.1.2 Region B

Region B occurs where the lines are between 50 and 100 feet off the ground from maximum engineered sag (Figure 6.5). In Region B, a border zone regime should be established throughout the right-of-way.

Note that many transmission structures are over 50 feet high. So, in many cases, a border zone community can be maintained near structures. Care should be taken to maintain access to the structure.

6.7.1.1.3 Region C

Region C is where the lines are 100 feet or more off the ground (Figure 6.5). Tall-growing trees may be allowed in Region C provided they have at least 50 feet of clearance. Trees with less than 50 feet of clearance can be selectively removed.

6.8 Transmission Rights-of-Way Widths

Right-of-way clearing should conform to the greater of the NERC clearances or the width indicated on the easement or permit. Removals are always desirable under transmission lines.

Transmission lines may be constructed on the edge of dedicated road right-of-way where that may or may not be an easement or permit on the adjoining property allowing encroaching vegetation to be cleared. In these cases or others where the easement or permit does not specify a width, right-of-way dimensions in Table 6.2 apply. However, if no authority exists to remove trees, at minimum work should conform to Tables 6.1 and 6.2.

Easements should be researched through PacifiCorp Right-of-Way Services referencing the *Plan and Profile.* The *Plan and Profile* may also be useful in determining if the age of the line qualifies it for a prescriptive easement (see Section 8.3.1.1 and Table 8.1). Ground disturbance shall be minimized on all rights-of-way.

6.9 Post Work Assessment

Foresters should audit transmission work following procedures outlined in Section 4.3. The audits should objectively assess quality, adherence to specifications, production, herbicide and other matters. Moreover, audits should provide the tree crew leader with feedback on production, professionalism, equipment, safety and crew efficiency. Results shall be documented on an *Audit Report* (Figure 4.7). Following systematic work, the entire length of completed line shall be inspected by the contractor to verify work complies with PacifiCorp specifications.

6.10 Mitigation Measures

NERC Requirement R1.4, directs transmission owners to develop mitigation measures to achieve sufficient clearances for protection of the transmission facilities when it identifies locations on the right-of-way where the transmission owner is restricted from attaining Clearance 1.

Whenever the restriction is caused by a landowner, the refusal process in Chapter 8 shall be followed. If the refusal process has been completed without attaining Clearance 1 distances, such locations should be documented on the *Work Release* (Figure 4.2). These sites should be reported in writing to the appropriate line patrolmen within 30 days. The line patrolmen should report annually on these site’s status. Moreover, foresters or their contract designee should inspect the site biannually.

6.11 Hazard Trees

Hazard trees are structurally unsound and could strike a target (such as electric facilities) when they fail. Off right-of-way hazard trees shall be identified bearing prevailing winds and soil depth in mind. Trees on the uphill and windward sides of rights-of-way should receive particular scrutiny. Hazard trees should be either removed or pruned to reduce the exposure. Work shall be performed in a manner that neither damages trunks nor disturbs root

Figure 6.1. Right-of-way reclamation using mechanical control. In this case, a slashbuster.

TABLE 6.2. Active transmission right-of-way widths.

Facility	Distance from Center	Urban Width	Rural Width
46 kV Single pole	25 feet	50 feet	50 feet
69 kV Single pole	25 feet	50 feet	50 feet
115 kV Single pole	30 feet	60 feet	60 feet
138 kV Single pole	30 feet	60 feet	60 feet
161 kV Single pole	40 feet	80 feet	80 feet
230 kV Single pole	40 feet	80 feet	80 feet
69 kV H frame	40/50 feet	80 feet	100 feet
115 kV H frame	40/50 feet	80 feet	100 feet
138 kV H frame	40/50 feet	80 feet	100 feet
161 kV H frame	40/50 feet	80 feet	100 feet
230 kV H frame	62½ feet	125 feet	125 feet
345 kV H frame	75 feet	150 feet	150 feet
345 kV Steel tower	75 feet	150 feet	150 feet
500 kV Steel tower	87½ feet	175 feet	175 feet

Note rights-of-way should be cleared to those specified in the easement. If no easement exists, rights-of-way in this table apply. Widths conform to those in PacifiCorp Transmission Construction Standard TA 181.

Figure 6.2 In densely vegetated areas, rights-of-way usually have to be completely cleared as the initial stage of establishing a wire-border zone.

Figure 6.3. Line 4 in California following work (note the trees midspan where the line is more than 110-feet off the ground).

Lorelei Phillips photo

Figure 6.4a. Bramble and Byrnes Wire Zone - Border Zone (adapted from Yahner, Bramble and Byrnes, 2001).

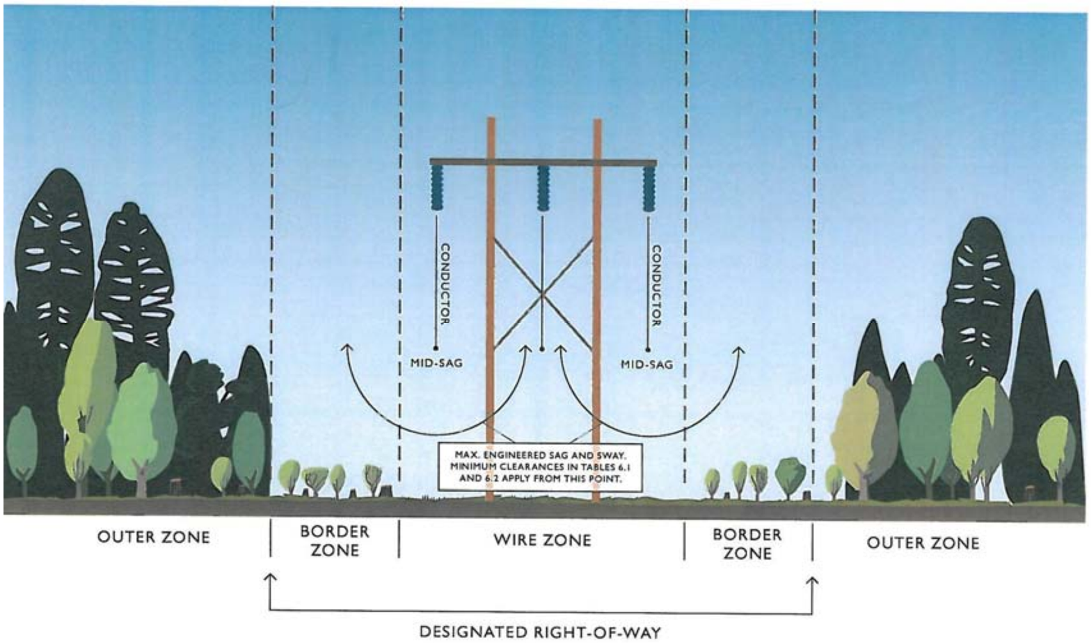
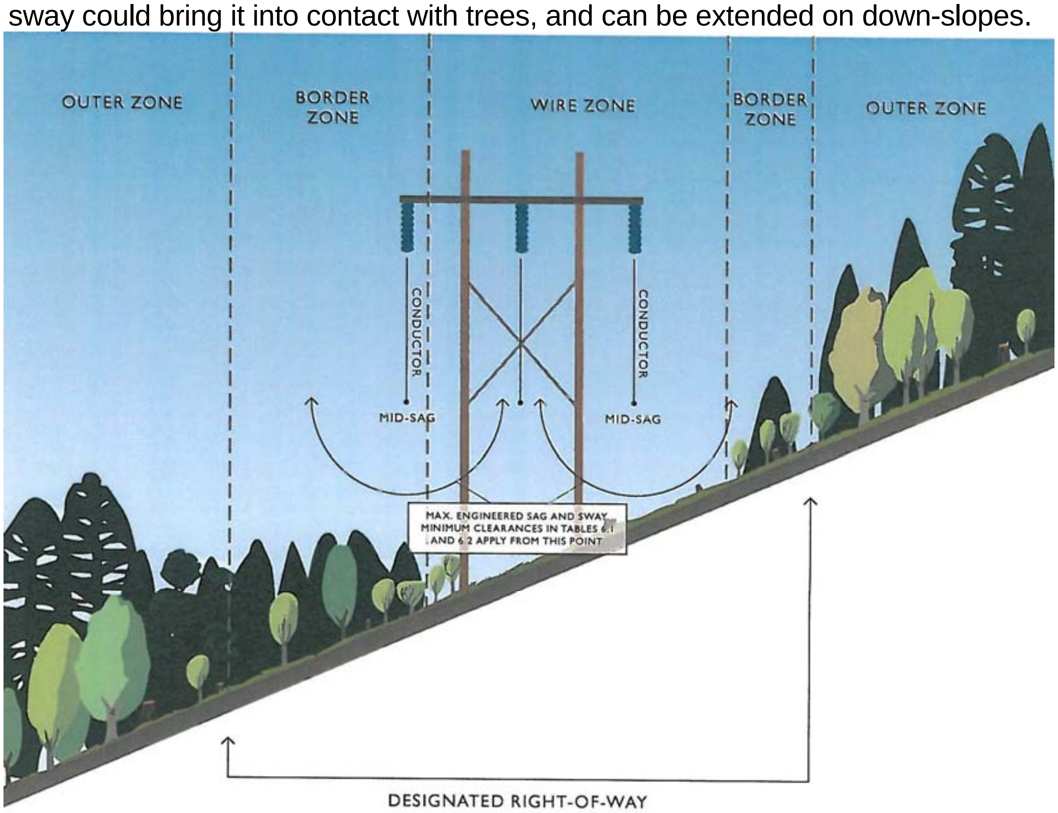
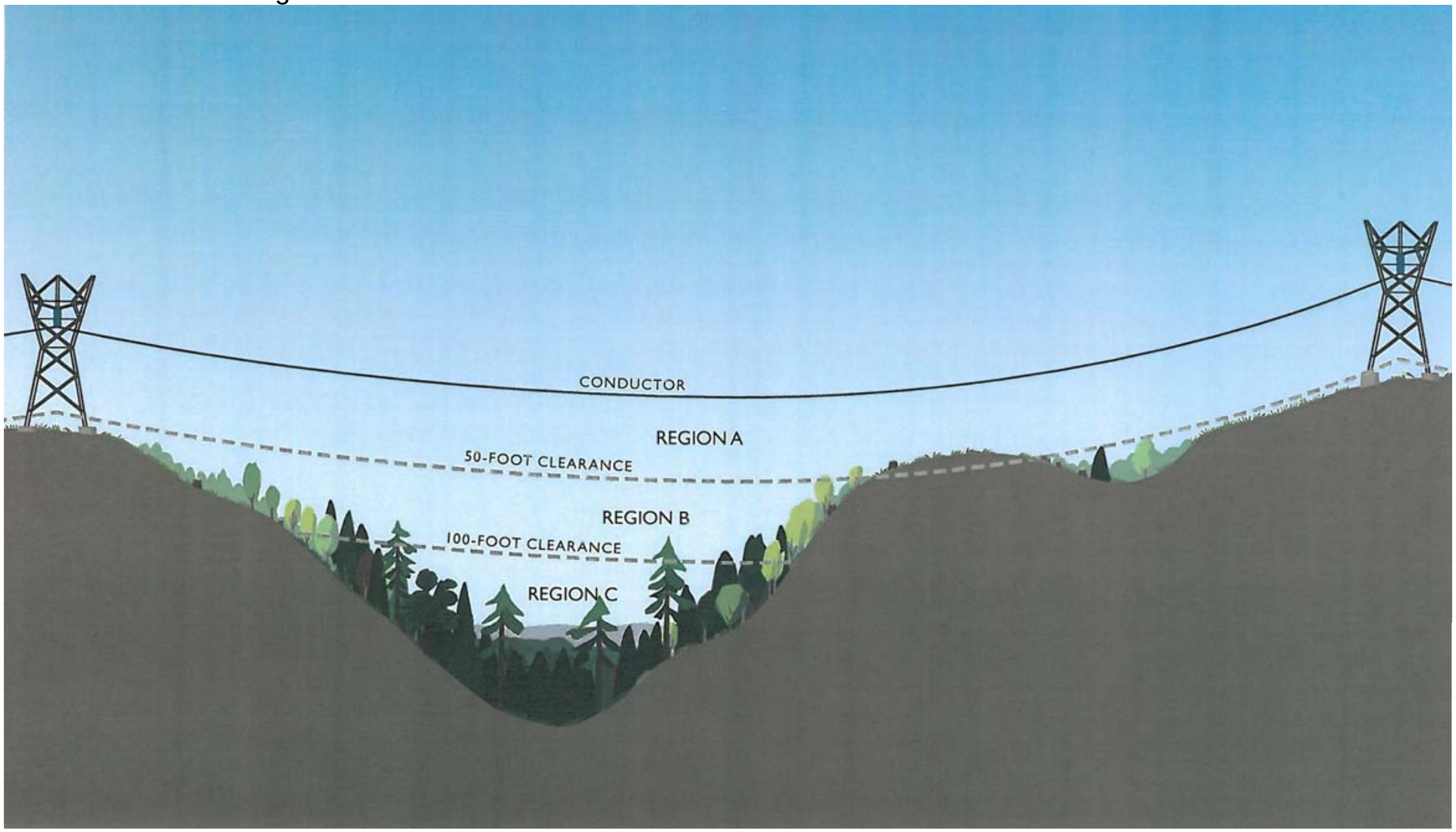


Figure 6.4b. The border zone may be reduced or eliminated on up-slopes where wire sag and sway could bring it into contact with trees, and can be extended on down-slopes.



Brad Gouch drawings (Figures 6.4 and 6.5).

Figure 6.5. Under clearance regions.



Region Definitions:
Region A: Where conductor to ground clearance is less than 50 feet (from maximum engineered sag and sway.
Region B: Where the conductor to ground clearance is 51-100 feet (from maximum engineered sag and sway.
Region C: Where the conductor to ground clearance is over 100 feet (from maximum engineered sag and sway.

Appropriate Region Plant Species:
Region A: Grasses, legumes, ferns and low-growing shrubs (<5' at maturity).

Region B: Region A species as well as large shrubs and short-growing trees (<25' at maturity).
Region C: All tree and shrub species.

systems of adjacent trees. Damaged trees could decline, decay or die, threatening the conductors if they fall.

Federal and state agencies could request hazard trees to be topped to create "wildlife trees". PacifiCorp may honor such requests provided the safety of the tree workers or facilities are not compromised, and the trees are topped below a height that would allow them to contact Company facilities should they fall.

PacifiCorp manages millions of trees across its 15,000 mile transmission system. That means in every mile of line, the Company potentially has hundreds or thousands of trees, any one of which could compromise public safety and electrical service reliability. It is impossible to completely secure an electrical system from that level of exposure. Nevertheless, PacifiCorp has a responsibility to make a reasonable effort to maintain vegetation to reduce risks to both the public and power supply.

6.12 Vegetation Screens

Vegetation screens may be required by federal or local authorities in some locations at high visibility areas such as major road crossings. Where such mandates exist, vegetation screens should consist of border zone communities and be located near structures (where the line is unlikely to sag), if possible. If no border zone species are present, tall-growing trees may be left provided they have at least the minimum clearances in Table 6.1 following scheduled work.

Leaving tall-growing trees in transmission rights-of-way should be discouraged because they impede cover type conversion. So, trees should be removed, rather than be pruned to obtain proper clearances, if at all possible. Vegetation screens should be no more than twenty-five feet from frequented vantage points into the right-of-way. Areas where tall-growing species are retained as screens shall be documented and monitored annually by line patrolmen. If remaining trees violate work thresholds specified in Table 6.1, line patrolmen should report them to Vegetation Management for correction within 30 days.

6.13 Merchantable Timber

Rights-of-way could contain merchantable timber. Merchantable timber is defined as trees with at least six-inch diameter at breast height (DBH), that is recoverable and has a market in the local area. Merchantable timber belongs to the property owner unless the easement or permit states otherwise. If merchantable timber needs to be felled, the property owner should be contacted regarding timber recovery.

After the merchantable timber is felled, it should be de-limbed and left in total tree length on the right-of-way for recovery by the owner. In limited cases, PacifiCorp may decide to purchase merchantable timber from the property owner and retain or transfer ownership to another party. A forest practice permit from the appropriate state department of forestry is required for timber recovery.

6.14 Transmission Safety Procedures

The following safety procedures shall be followed by all tree crews on PacifiCorp transmission facilities.

6.14.1 Pre-work Communication with Dispatch

Communication with dispatch is critical for tree crew safety. Every morning before starting transmission work, tree crews shall call the dispatcher from the right-of-way by radio or telephone and provide the following information to comply with *Power Delivery System Operations System policy SOP-POL-013* (Figure 6.6):

- Name of crew leader
- Name of company
- Name of transmission line
- Line section (substation names between which work is to occur, such as "Alvey to Dixonville," or "Ben Lomond to Terminal")
- Location of work (structure number, address or both)
- How long the crew will be working at that location
- Radio or cellular telephone number of the crew
- Name of GF/supervisor and their cellular telephone number

If radio or telephone contact cannot be made with the dispatcher from the right-of-way, non-emergency work shall not be performed at that site. The crew should relocate to work where they can communicate with the dispatcher. Operative communication capability is mandatory at all times on transmission rights-of-way. Satellite phones could be necessary in remote locations to provide the required communication.

6.14.2 Post-Work Communication with Dispatch

Each afternoon after completing transmission work for the day, tree crews shall call the dispatcher and provide the following information (Figure 6.6):

- Name of crew foreman and company.
- Name of transmission line
- Line section (substation names between which work occurred, such as "Alvey to Dixonville," or Ben Lomond to Terminal").
- Location where work was performed

Crew members and equipment are off the right-of-way or in the clear.

6.14.3 Safe Working Procedure

Do not take chances. If a tree cannot be felled or pruned safely, do not proceed. If a tree or limb falls into the conductors, stop work and immediately and follow the emergency procedure in Figure 2.1. Minimum approach distances (Table 2.1) shall not be violated. Remember, transmission conductors can sag considerably at mid-span during hot weather, ice buildup and heavy loads. Trees that have safe clearance in the morning may not have safe clearance in the afternoon. Conditions could require a hold or clearance. Clearances on some transmission lines can take weeks or months to schedule. Conditions could require a hold or a clearance. See Section 2.1.1 for hold and clearance instructions.

6.15 Monthly Progress Tracking

Progress on the annual work plan for NERC Transmission Lines shall be tracked on the *PacifiCorp Main Grid Transmission 2008 MASTER* for lines under the auspices of NERC Standard FAC-003-01. Progress on the annual work plan for other transmission lines shall be tracked on the monthly *Local Transmission Progress Report.* Both reports track miles achieved against plan on a monthly basis (Figure 6.7).

Figure 6.6. Transmission communication procedure with Dispatch (operative communication is mandatory at all times on transmission rights-of-way. Satellite phones could be necessary in remote locations).

Before beginning work on transmission lines.

Call System Dispatch to Report location by radio or phone.
Radio:
Pacific Power: 3 and key the mic. or 113 and key the mic.
(depending on the type of radio)
Utah Power: Direct radio call
Phone:
Grid Operations:
CA, OR, WA, WY 503.251.5230
ID, UT: 503.251.5250

Provide:
1). Name of crew leader
2). Name of contractor
3). Name of transmission line
4). Line section (names of substation between which work is to occur -- such as "Alvey-Dixonville" or Ben Lomand-Terminal
5). Location of work (structure number or address)
6). How long crew s will be working at that location.
7). Radio and cellular number of the crew.
8). The name of the Supervisor/GF and their cellular number

On Pacific Power lines, call local District and provide the same information as already provided to System Dispatch

Following Work

Call System Dispatch (same numbers as listed above)

Provide:
1). Name of crew leader
2). Name of contractor
3). Name of transmission line
4). Line section (names of substations between which work is to occur)
5). Location of work (structure number or address)
6).Notice that crews and equipment are off the right-of-way and clear.

Figure 6.7. Summary pages of main grid and local transmission monthly reports.

PACIFICORP VEGETATION MANAGEMENT 2011 MAIN GRID TRANSMISSION PROGRESS REPORT

Through Dec 31, 2011

STATE SUMMARY

	TOTAL Line Miles	Line Miles Scheduled	Line Miles Completed	Line Miles Goal	Line Miles Ahead/Behind
	7,160	795	803	795	8
State					
California	129	23	11	23	-11
Idaho	1,206	99	99	99	0
Misc States	66	0	0	0	0
Montana	137	46	30	46	-16
Oregon	1,131	224	224	224	0
Utah	2,329	207	230	207	23
Washington	284	160	168	160	8
Wyoming	1,877	37	41	37	4
TOTAL	7,160	795	803	795	8

FORESTER SUMMARY

	TOTAL Line Miles	Line Miles Scheduled	Line Miles Completed	Line Miles Goal	Line Miles Ahead/Behind
	7160	795	803	795	8
Forester					
Armstrong	609	306	311	306	5
Evans	1865	127	142	127	14
Jones	64	21	21	21	0
Partridge	284	35	42	35	8
Phillips	734	58	46	58	-12
Vanderhoof	3,534	239	237	239	-2
Hooley	71	9	4	9	-5
Total	7,160	795	803	795	8

PACIFICORP VEGETATION MANAGEMENT 2011 LOCAL TRANSMISSION PROGRESS REPORT

Summary

Through Dec 31, 2011

LOCAL TRANSMISSION WORK

	Total Line Miles	Total Miles Scheduled	Line Miles Completed	Line Mile Completed Goal	Miles Ahead(Behind)
	7,936	2,136	2,316	2,136	180
State					
California	572	106	116	106	10
Idaho	797	38	46	38	8
Oregon	1,836	279	340	279	61
Utah	3,747	1,445	1,587	1,445	142
Washington	324	131	89	131	-42
Wyoming	660	137	138	137	1
Total	7,936	2,136	2,316	2,136	180

SUMMARY OF WORK BY FORESTER

	Total Line Miles	Total Miles Scheduled	Line Miles Completed	Line Mile Completed Goal	Miles Ahead(Behind)
	7,936	2,136	2,316	2,136	180
Forester		*	*	*	*
Hooley	356	9	41	9	32
Evans	2,304	977	1,035	977	58
Jones	766	330	413	330	83
Partridge	594	259	191	259	-68
Phillips	1,038	90	138	90	48
Vanderhoof	2,134	313	323	313	10
Armstrong	744	158	176	158	18
Total	7,936	2,136	2,316	2,136	180
Weeks					
52					

7. CHEMICAL SPECIFICATIONS

Herbicides and tree growth regulators (TGRs) are an integral part of PacifiCorp's Vegetation Management program. Chemical applications shall be performed according to federal, state and local regulations. Labels are the law, and chemical use must comply with labeling. PacifiCorp's director of vegetation management shall approve all products and mixes. Property owners shall be notified at least five days, but no more than six weeks in advance, whenever chemicals are to be used on their property. Property owner objection to herbicide use shall be honored.

The company making the application is responsible for chemical purchase and storage, record keeping as well as container disposal. All vegetation management crews shall have at least one individual who holds a valid applicator's license. Applicators shall either hold that license, or work under the direct supervision of a certified applicator. Tree crews found working without a valid applicators license for the state in which they are working may be shut down at the forester's discretion. Supervisors/GFs of qualified applicators shall hold a certified applicator's license in the state or states in which they supervise crews.

7.1 Chemical Reports

All chemical applications shall be documented in the *Daily Report* (Figure 4.6). The company making the application shall be responsible for maintaining reports for review by the state departments of agriculture.

When chemical work is done on or adjacent to PacifiCorp Hydro properties, copies of chemical reports shall be provided to the plant manager weekly.

7.2 Herbicide Applications

Herbicide applications shall be pursued wherever possible as a vegetation management tool. Herbicides prevent sprouting from stumps of deciduous trees and should be used on saplings of tall-growing species to reduce future inventories (Figure 7.2). Herbicides are essential in establishing the wire zone-border zone method on transmission lines.

When properly used, herbicides are effective and efficient, minimize soil disturbance, and enhance plant and wildlife diversity. Herbicide application can benefit wildlife by improving forage as well as escape and nesting cover. In some instances, noxious weed control is a desirable objective on utility rights-of-way that can be satisfied through herbicide treatment.

Herbicide use can control individual plants that are prone to re-sprout or sucker after removal. When trees that re-sprout or sucker are removed without herbicide treatment, dense thickets develop, impeding access, swelling workloads, increasing costs, blocking lines-of-site, and deteriorating wildlife habitat (Yanner and Hutnik 2004 [Figure 7.1]).

Treating suckering plants allows early successional, compatible species to dominate the right-of-way and out-compete incompatible species, ultimately reducing work.

7.2.1 Selectivity

Herbicides can be selective or non-selective depending on their type. Selective herbicides only control specific kinds of plants, when applied according to the label. For example, synthetic auxins are a class of selective herbicides that control broadleaved plants, but do not harm grass species when applied according to the label. By contrast, non-selective herbicides work against both broadleaved plants and grasses. Non-selective herbicides can be effective where a wide variety of target plant species are present, like that often found during initial clearing or reclaiming dense stands of invasive or other undesirable vegetation.

Application techniques can also be either selective or non-selective. Selective applications are used against specific plants or pockets of plants. Non-selective techniques target areas rather than individual plants (see *Application Methods*). Non-selective use of non-selective herbicides eliminate all plants in the application area. Non-selective use of a selective herbicide controls treated plants that are sensitive to the herbicide, without differentiating between compatible or incompatible species. Selective use of either would only control targeted vegetation. Selective use is preferable unless target vegetation density is high.

7.2.2 Herbicide Best Management Practices

PacifiCorp is dedicated to ensuring proper application of approved herbicides to minimize the effects on non-target vegetation, human health, fish and wildlife species and water quality (Childs 2005).

Herbicide applications shall (Childs 2005):

- Follow all product label mandatory provisions such as registered uses, maximum use rates, application restrictions, worker safety standards, restricted entry levels, environmental hazards, weather restrictions, and equipment cleansing.
- Follow all product label advisory provisions such as mixing instructions, protective clothing and others matters.
- Have on site a copy of the label and MSDS sheets.
- Be made in the presence of a licensed applicator valid for the state in which work is performed.

7.2.3 Wetlands and Water Bodies

The affects of herbicides on wetland and water resources should be minimized by utilizing buffer zones. Such zones reduce the movement of herbicides into from the application site into adjoining water bodies. Buffer zones in Table 7.1 must be followed unless instructed otherwise by competent authorities. Climate, geology and soil types should be considered when selecting the herbicide mix with the lowest relative risk of migrating to water resources (Childs 2005).

7.2.4 Spills

Mixing, loading and cleaning equipment are critical activities that present the greatest exposure to accidents or spills (Miller 1993). To prepare for accidental spills, some kind of absorptive material shall be available.

Figure 7.1. Untreated rights-of-way quickly fill in with thickets of sprouts following mowing

Jay Neil photo

Figure 7.2. Incompatible species treated in the Line 72 right-of-way in, Oregon two years after reclamation. Herbicide treatments help maintain the right-of-way and are used to convert it to a wire zone-border zone prescription (Figure 6.3)

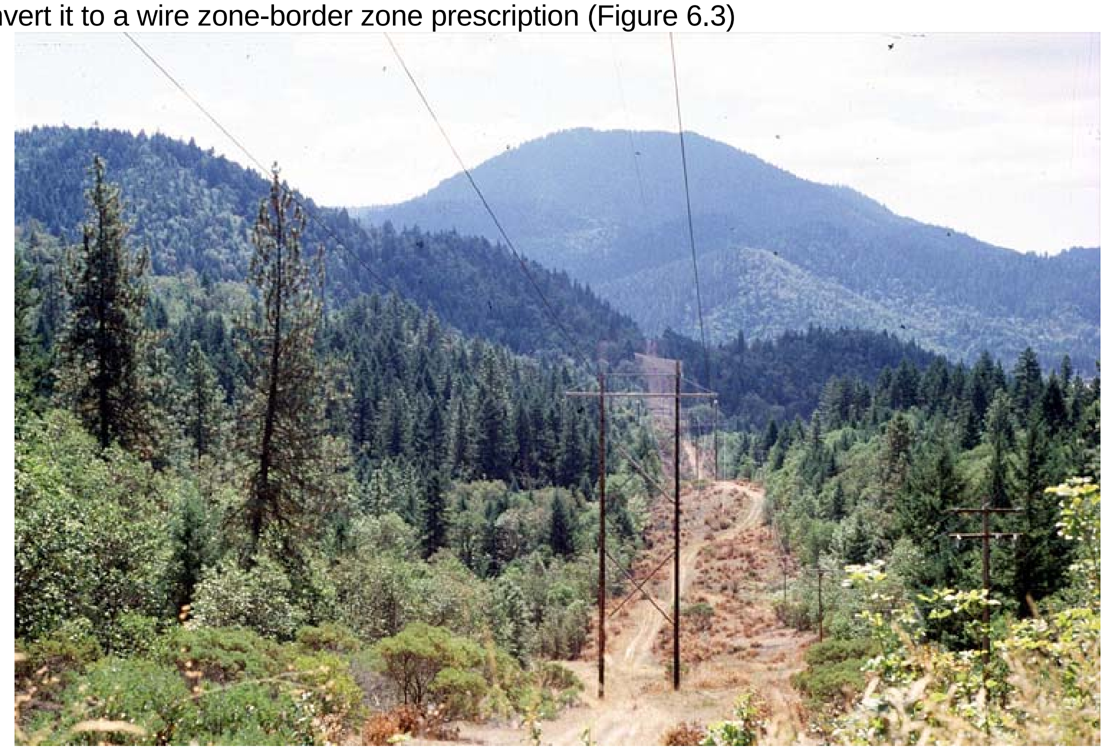


Table 7.1. Buffer Widths to Minimize Impacts on Non-Target Resources (adapted from Childs 2005).

Herbicide Ecological Toxicities and Characteristics	Buffer Width from Water Resource per Application Method			
	Spot	Localized	Broadcast	Mixing, Loading, Cleaning
Practically Non-toxic to Slightly Toxic	Up to the Edge	Up to Edge	50 feet	100 feet
Moderately Toxic, or Label Advisory for Ground/Surface Water	25 feet	35 feet	300 feet	250 feet
Highly Toxic to Very Highly Toxic	35 feet	100 feet	Noxious weed control only. Buffers shall comply with local regulations	250 feet

In the event of a spill or misapplication:

- STOP, CONTAIN, ISOLATE
  - Stop the source of the spill
  - Contain the spill (it is especially important to prevent the spill from entering waterways)
- Isolate the area – prevent people or vehicles from passing through the area.
- Report the spill to the Spill Hotline: 800.94.SPILL and provide:
  - Caller and manager's name
  - Date and time spill was discovered
  - Location (address or longitude and latitude)
  - Manufacturer name and serial number
  - Cause of spill
  - Amount of spill
  - Types of surfaces contaminated
  - Containment and/or clean up activities performed so far
- Request the help of and notify supervisor/GF and PacifiCorp forester.
- Remediate the spill
  - Clean up the spill or have it cleaned up, following directives from the Spill Hotline
  - Wash equipment and vehicles.
  - Properly dispose of cleanup materials
  - Follow up with appropriate cleanup documentation.
- Clean-up at or near PacifiCorp generating sites or substations must comply with site specific spill prevention and remediation plans.

7.2.5 Inappropriate Applications

There are situations where herbicide applications are inappropriate. If application company representatives are uncertain whether or not applications are appropriate, they shall consult the appropriate forester. Inappropriate situations include (but are not limited to):

- Areas where the property owner expresses objections to herbicide use.
- Governmental lands where herbicides are prohibited.
- Conditions of heavy precipitation or strong winds. If these conditions exist, the treatment should be deferred until weather improves.
- High temperatures that would cause product volatility and damage off-target plants. This is particularly important for foliar applications. During high temperatures, treatment should be deferred until weather cools.
- Trees that could be root grafted to desirable trees.
- Trees that are near desirable plants where the herbicide could move into contact with off target foliage or roots.
- Trees that are sufficiently close to contaminate agricultural crops or harvestable, edible plants.

If there is any uncertainty regarding whether or not an application is appropriate, contact the appropriate forester.

7.2.6 Application Methods

Herbicide application methods are categorized by the quantity of herbicide used, the character of the target, vegetation density and site parameters. Dyes can be used in the herbicide mix to mark areas that have been treated. Treatments include individual stem, broadcast and aerial treatments.

7.2.6.1 Individual Stem Treatment

Individual stem treatments are selective applications. They include stump, basal, injection, frill, selective foliar and side-pruning applications. Due to their specific nature, proper individual stem applications work well to avoid damage to sensitive or off target plants. However, they are impractical against broad areas or sites dominated by undesirable species.

Stump applications are a common individual stem treatment, where herbicides are applied to the stump cut surface around the cambium and to the top side of the bark. Water-based formulations require immediate stump treatment, while oil-based herbicides can be applied hours, days or even weeks after cutting.

Injections involve inserting herbicide into a tree. Frill (commonly called “hack and squirt”) treatments, consist of herbicide application into cuts in the trunk. Injections or frill treatments are especially useful against large incompatible trees to be left standing for wildlife.

Basal applications often use an herbicide in an oil-based carrier at the base of stems and root collar. The oil penetrates the bark, carrying the herbicide into the plant. Although basal applications can be made year round, dormant treatment is often best on deciduous plants, when they do not have foliage that can obstruct access to individual stems.

Selective foliar applications are done by spraying foliage and shoots of specific target plants. They can be either low or high volume treatments. For low volume applications, comparatively high concentrations of herbicide active ingredient are made in lower volumes of water than would be used with high volume treatment. Foliar applications are only made during the active growing season, normally late spring to early fall.

Side pruning is a technique where non-translocatable herbicides are applied to control specific branches growing toward the electric facility. Treating large branches could damage trees in the same way as removing them through pruning.

7.2.6.2 Broadcast Treatment

Broadcast treatments are nonselective because they control all plants sensitive to a particular herbicide in a treatment area. They can provide a degree of selectivity with proper herbicides. Even then, broadcast treatments do not differentiate between compatible and incompatible plants that the herbicide controls. Broadcasting is particularly useful to control large infestations of incompatible vegetation (including invasive species) in rights-of-way or along access roads.

Broadcast techniques include high-volume foliar, cut-stubble and bare ground applications. High volume foliar applications are similar to high volume selective foliar applications. The difference is that broadcast high volume foliar treatments target a broad area of incompatible species, rather than individual plants or pockets of plants. Cut-stubble applications are made over areas that have just been mowed. Bare-ground treatments are used for clearing all plant material in a prescribed area, such as in substations or around poles to protect against fire. Bare-ground applications are usually granular or liquid applications following mechanical removal of vegetation, or used as a pre-emergent in maintaining graveled areas such as substations.

7.2.6.3 Aerial Treatment

Aerial treatments are made by helicopter (rotary wing) or small airplane (fixed wing). Rotary wing aircraft provide the most accuracy, because helicopters can fly more slowly and are more maneuverable than airplanes. However, airplanes are less expensive to operate than helicopters. Aerial control methods are also nonselective, but can provide a level of selectivity with proper herbicides. Aerial applications can be useful in remote or difficult to access sites, and be cost effective and quick, especially if large areas need to be treated. They also can be used where incompatible vegetation dominates a right-of-way. The primary disadvantage of aerial application is that it carries the threat of off-target drift, so it must be performed under low-wind conditions with low toxicity herbicides.

7.3 Approved Herbicides

A list of approved products appears in the following sections. PacifiCorp's director of vegetation management must authorize other chemicals.

7.3.1 Stump Application

- 2, 4-D
- Glyphosate
- Picloram
- Triclopyr

7.3.2 Low Volume Basal Application

- Imazapyr
- Triclopyr

7.3.3 Foliar Application

- 2, 4-D
- Aminopyralid
- Fosamine ammonium
- Glyphosate
- Metasulfuron methyl
- Picloram
- Sulfometuron methyl
- Triclopyr

7.3.4 Soil Application

- Diuron
- Imazapyr

- Picloram
- Sulfentrazone
- Tebuthiuron

7.4 Tree Growth Regulators

Tree Growth Regulator (TGR) applications are intended to retard fast-growing trees so that they will not interfere with facilities or violate state regulatory agency tree policy before the next scheduled maintenance.

7.4.1 Approved TGR Application Chemicals

- Fluprimidol
- Paclobutrazol

8. CUSTOMER RELATIONS

Representatives of vegetation management meet with more customers than any other Company department. As a result, customers often develop an impression of the entire Company based on their experience with PacifiCorp vegetation management. Since vegetation management work is often controversial, excellent customer service is imperative for a successful program. Company and contract personnel must be professional, prompt, fair and courteous to customers.

8.1 Educational Information

PacifiCorp has a variety of educational materials about tree-power line conflicts and planting the right tree in the right place.

8.1.1 Trees and Power Lines Brochure

The *Trees and Power Lines* brochure is a companion to the "yellow door card" (see Section 8.2.1). It explains the need for line clearance work, as well as natural target pruning. It also provides color pictures of how properly pruned trees could look following line clearance.

8.1.2. Small Trees for Small Places

The *Small Trees for Small Places* is a publication in PDF format available at PacificPower.net or RockyMountainPower.net. It provides tree selection tree planting and electrical safety information. It offers an easy to use chart on ornamental and adaptive characteristics of 100 different species that can be used adjacent to power lines. Not all these trees can be used everywhere in PacifiCorp's service territory. However, the idea is that with a choice of 100 small-statured trees, there should be a choice of several to use in any given location around PacifiCorp's system.

8.1.3 Right Tree in the Right Place Poster

The *Right Tree in the Right Place* poster provides illustrations and descriptions of small trees that are suitable across PacifiCorp's service territory. It also relates information about proper utility tree pruning and tree planting.

8.2 Notification for Tree Work

Notification for tree work is not required by any state tariff in PacifiCorp’s service territory. However, PacifiCorp vegetation management attempts to notify property owners or tenants prior to vegetation management work at home and business sites. PacifiCorp area foresters should authorize any line clearance work to be done without property owner or tenant notification. In cases of municipal, county, state or federal properties, the proper agency representative shall be notified. The appropriate customer and community relations manager should be notified prior to meeting with governmental officials.

Notification, including that for tree or chemical work, should be by letter, phone, personal visit or door card at least five business days, but no more than six weeks, prior to the crew arriving. Notification shall be documented on an *Activity Report* (Figure 4.3). Notification cards shall not be placed in U.S. Mail boxes. Notification cards should be used only where the owner or tenant is likely to be present on a regular basis. Some circumstances, such as work on historic, unique or unusual trees, could warrant personal contact with the customer.

8.2.1 Door hangers

PacifiCorp has a variety of door hangers (Figure 8.1). These door hangers come in Pacific Power and Rocky Mountain Power versions. Pacific Power door hangers shall be used in California, Oregon and Washington. Rocky Mountain Power printings shall be used in Idaho, Utah and Wyoming.

8.2.1.1 Distribution (Yellow)

PacifiCorp's distribution door hanger is yellow, and should be used to notify customers of upcoming distribution cycle or interim work. The door hanger has forest tech contact information, an explanation of the need for line clearance work, of how the work will be performed and how much clearance is required. The door hanger informs customers that volunteer trees (those not planted as part of a landscape) six-inches or fewer in diameter at breast height will be removed. It also includes drawings of shapes customers could expect from the work, and tips about tree planting (Figure 8.2)

8.2.1.2 Ticket (Blue)

The blue door hanger should be used to communicate with customers who have called in requests for tree work. It has four check boxes with the most common responses to customer requests. The tree(s):

- Do not pose an immediate threat to electric service.
- Are not affecting PacifiCorp facilities.
- Are growing in proximity to service lines, but do not threaten electric service. If a customer wishes to have the tree pruned, PacifiCorp can disconnect the line to enable the customer to safely perform the work or hire a professional tree care company to do it for them.
- Are the customer's responsibility because they have more than ten feet from distribution primary conductors.

The form also has space for comments, and forest tech contact information.

8.2.1.3 Distribution Removal (White)

The white door hanger is a tree removal request, to fulfill PacifiCorp's requirement for written permission to remove trees where no easement granting authority exists to do so (see Section 2.7.1). The white door hanger identifies trees to be removed, has check boxes indicating whether or not the logs will be cut to firewood length and the stumps treated with herbicide. The door card also provides contact information for the forest tech, or comments and a sketch to help the customer understand the request.

8.2.1.4 Rural Transmission (Purple)

The rural transmission door hanger explains the need to remove trees under transmission lines. It relates the process the customer can expect, how trees and how debris will be left. It informs them that herbicide could be used on their property, and that we have a coupon program for tree replacement. It provides information on the voltage of the line and widths of the right-of-way. The door hanger also has a wire zone-border zone illustration and offers forest tech contact information.

Figure 8.1 Various PacifiCorp Vegetation Management door hangers.

8.2.1.5 Urban Transmission (Forest Service Green)

The green transmission door hanger is for use in urban or developed areas. It differs from the rural door hanger insofar as it doesn't have a diagram of wire-border zone technique. It still stresses removal.

8.2.1.6 TGR (Grey)

The grey TGR door hanger is for notifying customers about upcoming tree growth regulator application on their property. It provides space to see what trees will be treated and forest tech contact information.

8.2.1.7 Herbicide (Grey)

The grey herbicide door hanger is for notifying customers about upcoming herbicide application on their property.

8.2.1.8 Tree Crew Request (Orange)

The orange door hanger is for tree crews to use to ask customers for their cooperation with upcoming tree work. It provides information about when a tree crew will arrive on site, and has check

Figure 8.2. "Yellow" door hanger.

About Tree Pruning

How much necessary for safety?

Depending on species and speed of growth, trees require different clearance. Clearance is measured from the top wire.

- Fast-growing species require at least 14 feet of clearance (e.g. willow, Siberian elm, cottonwood, boxelder)
- Medium-growing species require at least 12 feet of clearance (e.g. ash, Norway maple, birch, pine)
- Slow-growing species require at least 10 feet of clearance (e.g. spruce, oak)

In addition to trimming, trees not intentionally planted as part of the landscape that measure less than six inches in diameter at 4.5 feet high will be removed and treated with herbicide. All firewood will be left on site.

Utah Power does not allow our contractors to use "round over" trimming, which causes a tree to grow unnaturally and severely wounds the tree.

Here are some shapes you may expect from proper pruning:

Fast growing trees may be treated with tree growth regulators which slow growth.

Tips for planting

To reduce the need for future pruning, be sure you plant the right tree in the right place. Some things to keep in mind as you're planting:

- Plant tall-growing trees (over 25 feet when mature) at least 25 feet away from overhead power lines.
- Low-growing trees (under 25 feet when mature) may be planted adjacent to overhead power lines.
- Trees and shrubs should be planted at least 10 feet away from ground-mounted transformers.
- Locate underground utilities before you plant. Call us at **1-888-221-7070** and we'll give you the number for the locating service in your area.
- Plant deciduous trees on the southeast and southwest exposures for summer shade and winter sun.
- Plant evergreen trees to provide winter windbreaks.
- For more information on the right type of tree to plant adjacent to power lines, call **1-888-221-7070** for a copy of our *Small Trees for Small Places* booklet.

Tree Maintenance
NOTICE

We will be in your neighborhood soon to conduct tree work. We thought you might like to learn more about tree pruning, safety and planting. If you have any additional questions, please contact me.

Date: ______________________

Contact: ______________________

Phone No: ______________________

Details: ______________________

____

____

____

- We regularly prune and remove trees to provide safe and reliable electric service to your community. Trees that grow too close to power lines create hazardous conditions that can interrupt service to you and your neighbors.
- We hire arborists to maintain a safe corridor around power lines. These arborists are knowledgeable about the proper way to prune trees and use specially designed equipment to work near electric lines.
- Our tree contractors use natural pruning methods to maintain the health of the trees. Natural pruning, besides being healthier for the tree, also reduces resprouting in problem areas and limits the length of sprouts that do occur. The tree's species, structure and the strength of wood are all considered when trees are pruned.

Look up and live!

Never climb trees near power lines, and never climb a utility pole for any reason. When working outside with antennas, ladders and other long-handled tools, remember to always look up to see if power lines are near. Never trim limbs or remove trees around power lines. Call Pacific Power for assistance.

Para más información, llame al 1-888-225-2611 y podrá hablar con un representante que hable español.

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Making it happen.

boxes for requests to move something (like a car) from under the tree or secure a dog. It also can be used for permission to dive on property and has space for comments.

8.2.1.9 Pole Clearing

The pole clearing door hanger is to notify California customers of upcoming work to comply with California Resource Code 2492 (see Section 5.6)

8.2.2 Other Customer Contact Forms

In addition to door hangers, PacifiCorp has two forms for use in customer communication. The *Property Owner Permission* form has check boxes requesting authorization for tree removal, tree and brush disposal, mowing, notification of herbicide and TGR application. It provides a space for the property owner's signature. Property owner signatures are required for tree removal, but not brush disbursal or herbicide application.

PacifiCorp also has a *Refusal /Complaint Form.* This form should be completed by forest techs, supervisors/GFs, tree crews or foresters whenever a customer has concerns about upcoming or recently completed work. It identifies the property owner, the type of project and the nature of the refusal or complaint. These documents should be kept in a permanent file.

8.2.3 Crew Arrival on Site

When crews arrives for work at a residential site, as a courtesy they should knock at the door to let the home owner or tenant know they are about to begin work. If no one is home, the crew should proceed with the planned tree work.

8.3 Customer and Property Owner Refusal Procedure

The customer refusal process is presented in Figure 8.4. Detailed records must be kept of every conversation, including the date and time it occurred, and summary of the matters discussed. If a vegetation management representative makes a failed attempt to contact a refusal by phone, the date and time of the call should also be noted.

8.3.1 Forest Tech Refusal Procedure

When a property owner refuses to allow the work necessary to satisfy PacifiCorp specifications, the forest tech shall complete a *Property Owner Refusal/Complaint Report* and notify their supervisor/GF, and area forester within two working days and before any work is performed on the property. Forest techs shall not compromise clearances.

8.3.1.1 Easements

After documenting the refusal, the forest tech should research the right-of-way to determine PacifiCorp's property rights for that location. PacifiCorp often owns easements, copies of which are available from PacifiCorp right-of-way services. In addition, states grant prescriptive rights if the line has existed for specified length of time. This time period varies depending on the state (Table 8.1). This information should be provided to the appropriate GF/supervisor.

8.3.2 Crew Leader Refusal Procedure

When a property owner refuses to allow the crew leader to obtain specification clearances, the crew leader shall complete a *Property Owner Refusal/Complaint Report* and notify their GF/supervisor, forest tech, or area forester within two working days and before any work is performed on the property. Crew leader notification initiates the refusal procedure from the beginning.

8.3.3 General Foreman/Supervisor Procedure

The supervisor/GF should contact the property owner within two weeks of being informed of a refusal to try to resolve the situation. The GF/Supervisor should review the documentation surrounding the refusal before contacting the customer. GF/supervisors should not compromise work below the specification without written authorization from the responsible area forester. If a prescriptive or written easement exists, the supervisor/GF should inform the customer of our rights under those easements. Notwithstanding, the general foreman/supervisor should not have the trees worked without customer consent.

If the general foreman/supervisor cannot resolve the refusal to full specification, he or she shall refer it to their area forester by turning in the *Property Owner Refusal/Complaint Report.*, along with any associated easement information.

8.3.4 Area Forester Procedure

When an area forester receives a refusal that the forest tech and general foreman/supervisor have been unable to resolve, within two weeks he or she shall contact the property owner to attempt to resolve the refusal. The forester may compromise work below the specifications, provided that trees have not grown within work thresholds in tables 5.1 or 6.1 and the agreement will not present unreasonable safety or electric service risks until the next regularly scheduled work This section is not intended to defer judgment to property owners on how much clearance to allow. Neither is it intended to justify clearances outside of specification in order to avoid dealing with an escalated complaint.

If the forester cannot resolve the refusal, the customer shall be sent a certified letter informing them that PacifiCorp has a duty to clear the trees from the conductors to Company specifications. The letter shall set a date and time that the tree will be worked. The date shall be at least five business days from the time the letter is postmarked. The letter should reference the applicable written or prescriptive easement if they exist. The forester shall alert the director of vegetation management, transmission and distribution support managing director, as well as the appropriate operations manager, customer and community manager, wires director, and regulatory analyst about the letter. The regulatory analyst will inform the proper regulatory agency about the action. If it appears the media could become involved, the Media Hotline should be notified.

Once the letter is sent, tree crews shall be dispatched to work the site to specifications at the assigned date and time, regardless of whether or not a right-of-way or prescriptive easement exists. The forester or GF/supervisor should be on site during work. Records shall be kept for use in potential litigation. Before and after photos of the site should be taken.

8.4 Customer and Property Owner Complaints

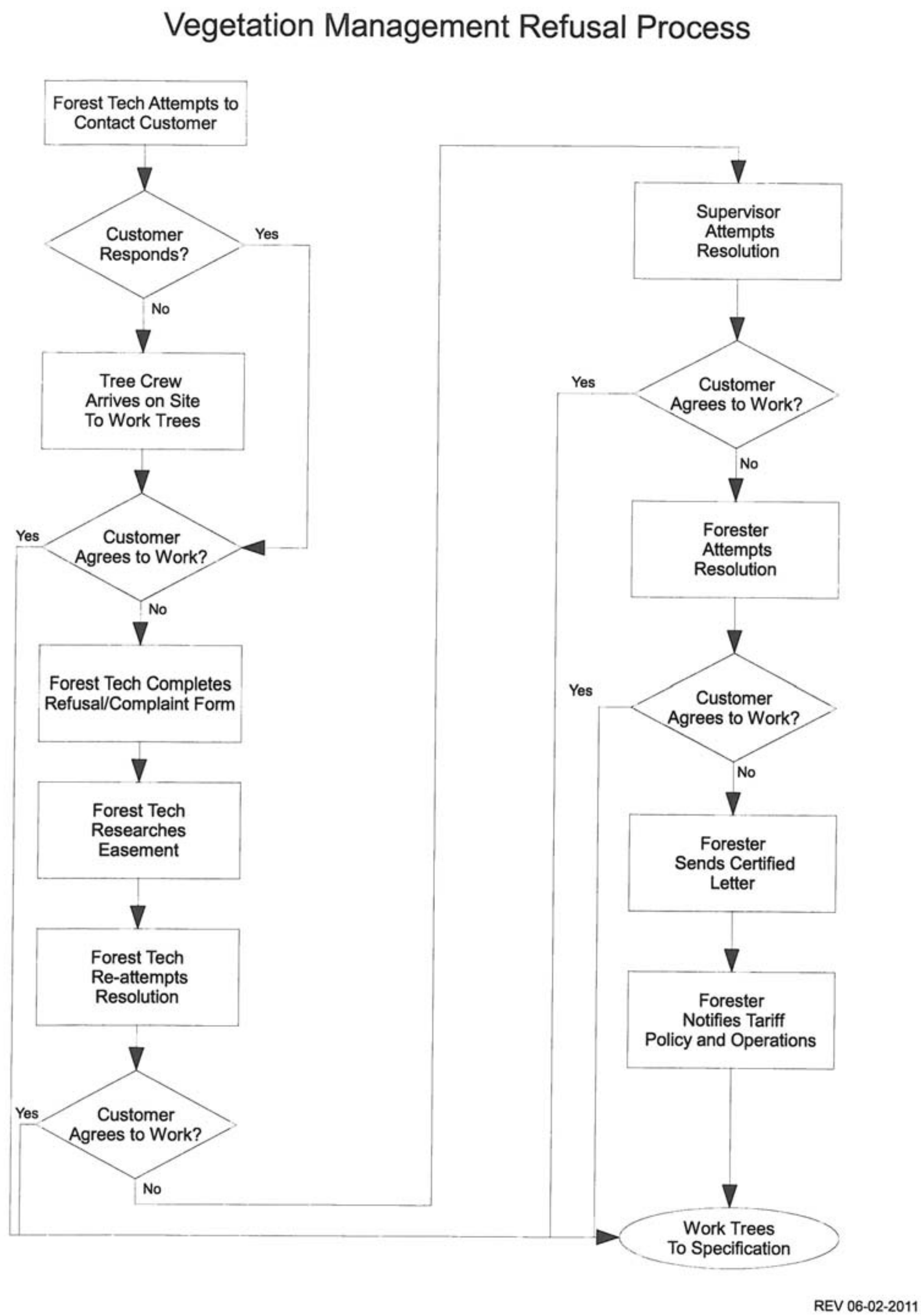
Customer and property owner complaints regarding any aspect of the vegetation management program shall be

TABLE 8.1. Prescriptive easement time requirements by state

State	Time
California	5 years
Idaho	20 years
Oregon	10 years
Utah	20 years
Washington	10 years
Wyoming	10 years

Figure 8.3. Information surrounding refusals should be documented and electronically filed with the appropriate project.

Figure 8.4. Refusal process.



addressed promptly, fairly and professionally. PacifiCorp should be notified of complaints using a *Property Owner Refusal/ Complaint Report.* Customers will be contacted within 48 hours of receipt of the complaint. Documentation surrounding the refusal should be digitally filed to be accessed with other information from the specific project for use the next time through.

8.5 Commission Complaints

Commission responses should go through tariff policy with assistance from the vegetation management service coordinator. It is important to provide timelines with appropriate summaries of vegetation management's interaction with the subject party. Response for data request should be provided within 24 hours if at all possible, but no later than 72 hours.

8.6 Customer Survey

PacifiCorp has Pacific Power and Rocky Mountain Power customer surveys. Surveys are vitally important for quality control, and for giving customer's a voice regarding vegetation management's performance.

The survey asks customers to rate from 1 (lowest) to 5 (highest) Vegetation Management's performance relative to five questions:

- Our notification clearly explained the work we would be doing.
- The workers were friendly and courteous.
- The work was completed as you understood it would be.
- The property was left neat and orderly.
- Overall, I am satisfied with how the work was handled.
- It also allows space for comments and for the customer to identify him/herself.

Tree crews should leave customer surveys on each property on which utility tree work is performed. For work on municipal or other government agency trees, a survey should be provided to the appropriate management authority. The area forester should also see that surveys are left on properties where they conduct crew audits. The survey is self addressed and postage paid for the respondent's convenience.

9. DEFINITIONS

Allelopathy. Production of a chemical by one plant to suppress competing plants of other species.

BMP. Best management practice

Border zone. The Region A right-of-way portion that extends from the right-of-way edge to 10 feet from the outside phases.

Branch bark ridge. Area of raised bark between two stems. The ridge is formed as the two stems grow together, pushing the bark outward. A raised branch bark ridge is often a sign of a strong branch attachment.

Branch collar. Wood formed around a branch attachment. It contains wood from both the branch and parent stem.

Branch core. Area in the trunk of a tree that traces the branch back to its origins as a bud on a twig.

Branch protection zone. Area in the branch core that undergoes chemical change in response to wounding or disease in the branch. The chemicals protect the tree by inhibiting or preventing diseases from passing from the branch to the parent stem.

Caliper. The diameter of a tree six inches off the ground.

Cambium. Area of cell division responsible for stem diameter growth.

Clearance. Line de-energizing for safety purposes. Clearances require 48 hour notices to all customers that will be effected by the outage.

Clearance 1. As defined by the NERC Standard FAC-003-1 (2006) as clearances between trees and transmission lines to be achieved at the time of work on bulk (main grid) transmission lines. They appear in Table 6.1.

Clearance 2. As defined by the NERC Standard FAC-003-1 (2006) as clearances between trees and transmission lines that should never be breached. The correspond to Institute of Electronic and Electrical Engineers Standard 516-2003. They appear in Table 6.1.

Company. PacifiCorp.

Crown reduction. Reduction of the top or sides of the tree by thinning cuts (lateral or branch collar cuts).

Crown Restoration. Restoring a previously headed stem's natural structure by thinning sprouts emanating from the old wound. Crown restoration should be done incrementally over the course of several cycles. The crowns of many third order trees may be so damaged they may never be restored.

Cycle buster. Fast-growing tree species that will not hold for a complete cycle.

DBH. Diameter at breast height.

Danger tree. A tree on or off the right-of-way that may contact electric facilities either through growth or if it should fall.

Decurrent form. Trees lacking a strong central leader, resulting in a spreading crown (for example, American elm [*Ulmus americana]*).

Distribution line. Lines energized between 600 and 45,000 volts.

Drip line. The horizontal extent of the crown out to the branch tips.

Drop-crotch. Archaic term for lateral cut.

Excurrent form. Tree with a strong central leader (for example, Ponderosa pine [*Pinus ponderosa]*).

Fast -growing species. Tree species that grow more than three feet per year.

Flush cut. A final pruning cut flush with the parent stem (the trunk, for example) that cuts into or removes the branch collar. Flush cuts are damaging and inappropriate.

GF. General foreman.

Hazard tree. Dead, dying, diseased, deformed, or unstable trees which have a high probability of falling and contacting a substation, distribution or transmission conductors, structure, guys or other Company electric facility.

Heading cut. Internodal cut on a stem, or a cut made to an inappropriate lateral.

Hold. Deactivating the automatic re-closers and the line. Holds are issued to a Journeyman lineman who, in the event of an outage, is responsible for ensuring that it is save to re-energize the line.

Included bark. Bark included in the juncture between two stems. It is a structural defect that can lead to stem failure.

Integrated Vegetation Management (IVM). Integrated vegetation management is a system of managing vegetation in which undesirable vegetation is identified, action thresholds are considered, all possible control options are evaluated, and selected control(s) are implemented (ANSI 2006).

Interim Work. Scheduled work in the interim half way between cycles. For example, most of Oregon is on a four years cycle. Two years after completing cycle work, most feeders will be scheduled for a systematic pass to work trees that will not hold for the rest of the cycle.

ISA. International Society of Arboriculture.

kV. One thousand volts.

Lateral cut. A cut that shortens a branch to a lateral no less than one-third the diameter of the original stem and removing no more than one-half the lead's foliage.

Lead. An upright trunk or major limb with a dominant role in the tree crown, and a lateral is a branch off a parent stem

Low-growing tree species. Trees with a potential mature height under 25 feet.

Merchantable timber. Trees with a DBH of 6 inches or more, which are recoverable and have a market in the area.

Moderate-growing species. Tree species that can be expected to grow between one and three feet per year under normal conditions.

Natural target. Proper final pruning cut location at a strong point in a tree's disease defense system. They are branch collars and proper laterals.

Pruning. Scientifically-based arboricultural practice of removing tree parts.

Readily climbable tree. Readily climbable trees have low limbs that are accessible from the ground and sufficiently close together so that the tree can be climbed by a child or average person without using a ladder or special equipment. Vehicles do not render trees climbable. Climbable trees should have a main stem or major branch that would support a child or average person either within arm's reach of an uninsulated energized electric line or within such proximity to the electric line that the climber could be injured by direct or indirect contact. They are located near homes, schools, parks, businesses or other locations where people (particularly children) frequent.

Refusal. A case where a property owner does not allow trees to be cleared from PacifiCorp facilities to specification.

Region A. The area in transmission rights-of-way where the wire is less than 50 feet off the ground.

Region B. The area in transmission rights-of-way where the wire is between 50 feet and 100 feet off the ground.

Region C. The area in transmission rights-of-way where the wire is more than 100 feet off the ground.

Round over. A traditional line clearing technique that lowers a tree to a specified clearance distance and sculpts it into a ball. Round overs are a damaging practice that expressly violate PacifiCorp specifications.

Sapling. Young tree under four inches in diameter.

Secondary line. Wire energized to less than 600 volts.

Service line. A secondary line that runs between the electric supply and the customer.

Shall. A mandatory requirement.

Short-growing tree. A tree with a potential mature height of 25 feet or less.

Should. An advisory recommendation.

Slash. Brush and stems under 6 inches in diameter removed from trees during vegetation management operations.

Slow-growing species. Tree species that can be expected to grow less than one foot per year.

Subordination. Removing the terminal, typically upright or end portion of a parent branch or stem to slow the growth rate so other portions of the tree grow faster (Gilman 2002).

Tall-growing species. Tree species that grow to 25 feet or more at maturity.

TGR. Tree Growth Regulator. In the context of these specifications, TGR refers to chemicals that slow growth of some tree species.

Third order pruning. Utility lateral pruning on trees that have received many cycles of roundovers.

Transmission lines. Wire energized over 45 kV

Trimming. Reducing the length of toenails, hair, the amount of budgets and other things, Christmas tree decoration and unskilled removal of tree parts.

Volunteer. A naturally seeded, non-landscape tree.

Wetland. Wetlands are lands where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface (EPA 2004) http://www.epa.gov/owow/wetlands/vital/what.html.

Whorl. A node in a pine tree where three or more limbs commonly originate.

Wire zone. Right-of-way portion that is directly under the wires and within 10 feet to the field side of the outside phases (Bramble et al. 2001).

Work threshold. Distance from conductors inside of which trees should be pruned or removed during cycle work.

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ATTACHMENT P1-5
NOXIOUS WEED PLAN

Noxious Weed Plan

Boardman to Hemingway Transmission Line Project

1221 West Idaho Street
Boise, Idaho 83702

June 2017

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ACRONYMS AND ABBREVIATIONS

BLM	Bureau of Land Management
BOR	Bureau of Reclamation
DOI	Department of the Interior
GPS	Global Positioning System
IPC	Idaho Power Company
kV	kilovolt
O&M	operation and maintenance
ODA	Oregon Department of Agriculture
ODOE	Oregon Department of Energy
ORS	Oregon Revised Statute
OSWB	Oregon State Weed Board
Plan	Noxious Weed Plan
Project	Boardman to Hemingway Transmission Line Project
PUP	Pesticide Use Plan
ROW	right-of-way
SPCC	Spill Prevention, Control, and Countermeasures
USFS	United States Forest Service

1.0 INTRODUCTION

1.1 Background

Idaho Power Company (IPC) is proposing to construct and operate approximately 296.6 miles of new transmission line known as the Boardman to Hemingway Transmission Line Project (Project). The Project will include a 500-kilovolt (kV) single-circuit line, rebuilding of a portion of a 230-kV transmission line, rebuilding of a 138-kV transmission line, and a removal of a portion of an existing 69-kV transmission line between Boardman, Oregon, and the Hemingway Substation (located approximately 30 miles southwest of Boise, Idaho). The Project includes ground-disturbing activities associated with the construction of above-ground, single- and double-circuit transmission lines involving towers, access roads, multi-use areas, light-duty fly yards, pulling and tensioning sites as well as associated stations, communication stations, and electrical supply distribution lines.

The Project area, or Site Boundary, as defined in Oregon Administrative Rule 345-001-0010(55) includes "the perimeter of the site of a proposed energy facility, its related or supporting facilities, all temporary laydown and staging areas, and all corridors and micrositing corridors proposed by the applicant." The Site Boundary for this Project includes the following facilities in Oregon:

- The Proposed Route, consisting of 270.8 miles of new 500-kV electric transmission line, removal of 12 miles of existing 69-kV transmission line, rebuilding of 0.9 mile of a 230-kV transmission line, and rebuilding of 1.1 miles of an existing 138-kV transmission line;
- Four alternatives that each could replace a portion of the Proposed Route, including the West of Bombing Range Road Alternative 1 (3.7 miles), West of Bombing Range Road Alternative 2 (3.7 miles), Morgan Lake Alternative (18.5 miles), and Double Mountain Alternative (7.4 miles);
- One proposed 20-acre station (Longhorn Station);
- Ten communication station sites of less than ¼ acre each and two alternative communication station sites;
- Permanent access roads for the Proposed Route, including 206.3 miles of new roads and 223.2 miles of existing roads requiring substantial modification, and for the Alternative Routes including 30.2 miles of new roads and 22.7 miles of existing roads requiring substantial modification; and
- Thirty-one temporary multi-use areas and 299 pulling and tensioning sites of which four will have light-duty fly yards within the pulling and tensioning sites.

The Project features are fully described in Exhibit B, and the location of the Project features and the Site Boundary is described in Exhibit C and Table C-24. The location of the Project features and the Site Boundary is outlined in Exhibit C.

This Noxious Weed Plan (Plan) includes a discussion of 1) the Plan purpose, goals, and objectives, 2) the regulatory framework, 3) current status of noxious weeds within the Site Boundary, 4) noxious weed management practices, 5) monitoring and reporting, and 6) herbicide application, handling, and cleanup.

1.2 Purpose

Invasive plant species are non-native, aggressive plants with the potential to cause significant damage to native ecosystems and/or cause significant economic losses. Invasive plants are opportunistic plant species that readily flourish in disturbed areas, are difficult to control, and thereby, can compete with and/or prevent native plant species from re-establishing. Invasive plants are a concern for federal, state, and local agencies because of their potential to degrade wildlife habitat, reduce native plant diversity, adversely affect agricultural production, and impact the general ecological health and diversity of native ecosystems. Noxious weeds are a subset of invasive plants that are officially designated by a federal, state, or local agency as injurious to public health, agriculture, recreation, wildlife, or property (Sheley and Petroff 1999).

Soil disturbances, such as those caused by the construction and operation and maintenance (O&M) of the Project, could result in the establishment of new populations and spread of existing populations of noxious weeds. The purpose of this Noxious Weed Plan is to describe the measures IPC will undertake to control noxious weed species and prevent the introduction of these species prior to construction and during construction and O&M of the Project. It is the responsibility of IPC and the Construction Contractor(s), working with the appropriate land management agencies and the Oregon Department of Energy (ODOE), to ensure noxious weeds are identified and controlled during the construction and O&M of Project facilities and that all federal, state, county, and other local requirements are satisfied.

This Plan is applicable Project-wide, and it is expected that modifications to this Plan will be made once final Project design is complete and agreements are reached with applicable federal and state land management agencies and ODOE, as well as with counties and individual landowners. The Final Noxious Weed Plan (see Section 7.0) will meet the standards of all applicable federal and state land management agencies, ODOE, as well as county weed boards.

Measures that will be taken to restore areas that have been impacted by construction activities are discussed in the Reclamation and Revegetation Plan (Exhibit P1, Attachment P1-3). Methods in which vegetation along the transmission line will be managed during O&M of the Project are described in the Vegetation Management Plan (Exhibit P1, Attachment P1-4).

1.3 Goals and Objectives

The goal of this Plan is to describe methods for early detection, containment, and control of noxious weeds that will be implemented during Project construction and operation. This Plan describes the known status of noxious weed species within the Site Boundary, the regulatory agencies responsible for the control of noxious weeds, and steps IPC will take in controlling and preventing the establishment and spread of noxious weed species during Project construction and O&M activities. General preventive and treatment measures are described in Section 4.0 of this Plan. Monitoring (Section 5.0) to evaluate of the effectiveness of the prescribed noxious weed prevention and control measures will be implemented during the operational phase of the Project. In addition to providing updated information, the final Noxious Weed Plan (Section 7.0) will include information on locations of significant noxious weed populations within the Project construction footprint and proposed treatment methods, as applicable.

The objectives of this Plan and the focus of IPC’s noxious weed control efforts will be to prevent and control the spread of new infestations resulting from Project activities. While this Noxious Weed Plan documents noxious weed species within the Site Boundary, IPC will only be responsible for the control of noxious weeds that are within the final Project right-of-way (ROW) and up to 50 feet outside the ROW in Malheur County and are a result of their construction- or operation-related, surface-disturbing activities. IPC is not responsible for controlling noxious weeds that occur adjacent to the Project ROW or for controlling or eradicating noxious weed species that were present prior to the Project. However, preconstruction treatments will be conducted, where appropriate and as agreed upon with the land management agency or landowner, to minimize the spread of existing noxious weed infestations through Project activities.

Goals, objectives, and noxious weed control activities for the Project include:

- Inventory the existing occurrence, distribution, and abundance of noxious weeds in the Project ROW prior to construction;
- Monitor and document the occurrence, distribution, and abundance of noxious weeds in the Project ROW following the completion of construction activities along each Project segment;
- Reduce infestations of noxious weeds caused by Project-related activities and prevent the spread of new and existing populations within the Project ROW both during construction as well as operations of the Project;
- Ensure any occurrences of threatened and endangered plants along the transmission line are not negatively impacted by weed-control activities by including site-specific planning where needed; and
- Coordinate and consult with appropriate land-management personnel, as appropriate, regarding noxious weed inventory and control activities conducted by IPC.

2.0 REGULATORY FRAMEWORK

The following provides a brief overview of federal and state legislation and regulatory compliance applicable to noxious weeds that have been considered in development of this Plan.

2.1 State of Oregon

In Oregon, noxious weeds are defined under Oregon Revised Statute (ORS) 569.175 as "terrestrial, aquatic, or marine plants designated by the State Weed Board under ORS 569.615 as among those representing the greatest public menace and as a top priority for action by weed control programs." Noxious weeds have been declared by ORS 569-350 as a menace to public welfare and control of these plants is the responsibility of private landowners and operators, and county, state, and federal governments. The Oregon State Weed Board (OSWB) was established under ORS 561.650. The OSWB provides direction to control noxious weeds at the state level and develops and maintains the State Noxious Weed List. The OSWB and the Oregon Department of Agriculture (ODA) classify noxious weeds in Oregon in accordance with the ODA Noxious Weed Classification System (ODA 2016a). There are three designations under the State's system:

- **Class "A" State Listed Noxious Weed:** A weed of known economic importance which occurs in the state in small enough infestations to make eradication or /containment possible; or is not known to occur in Oregon, but its presence in neighboring states makes future occurrence seem imminent.
- **Recommended action:** Infestations are subject to eradication or intensive control when and where found.
- **Class "B" State Listed Noxious Weed:** A weed of economic importance that is regionally abundant but may have limited distribution in some counties.

- **Recommended action:** Limited to intensive control at the state, county, or regional level as determined on a site-specific, case-by-case basis. Where implementation of a fully integrated statewide management plan is not feasible, biological control (when available) shall be the primary control method.
- **Class "T" Designated State Noxious Weeds:** Priority noxious weed species selected and designated by the OSWB as the focus of prevention and control actions by the Noxious Weed Control Program. "T"-designated noxious weeds are selected annually from either the "A" or "B" list and the ODA is directed to develop and implement a statewide management plan for these species.

In addition to the state-listed noxious weeds, the five Oregon counties crossed by the Project (Baker, Malheur, Morrow, Umatilla, and Union) each maintain a county-designated noxious weed list. These lists also classify noxious weeds into different categories (typically Class A, B, and C); however, the definition of each class differs slightly from the state classification system and differs slightly by county. Recommended actions for noxious weeds in the five Oregon counties crossed by the Project are as follows:

- **Class "A" County Noxious Weed:** Recommended for mandatory control county-wide in Baker, Malheur, and Morrow counties and subject to intensive control where found in Umatilla and Union counties.
- **Class "B" County Noxious Weed:** Recommended for moderate to intensive control at the county level in Baker County; subject to intensive control or eradication where feasible at the county level in Malheur and Morrow counties; limited to intensive control county-wide as determined on a case-by-case basis in Umatilla County; recommended for moderate control and/or monitoring at the county level in Union County. Additionally, in Malheur County, Class B weeds are required to be controlled within 50 feet of all property lines, easements, and ROWs, pursuant to ORS 570.525.
- **Class "C" County Noxious Weeds:** Recommended for moderate control at the county level in Baker County; treated at landowner's discretion in Malheur County. Morrow, Umatilla, and Union counties do not currently list Class C noxious weeds.
- Baker, Malheur, Morrow, Umatilla, and Union county weed management agencies were contacted to inquire about weed species of highest concern in each of the counties, as well as to determine if each county requires or implements specific noxious weed control methods or best management practices. No specific best management practices were requested by any of the county weed management personnel contacted.

2.2 Federal Noxious Weed Act of 1974 (as amended 1990)

The Federal Noxious Weed Act of 1974 (7 United States Code 2801-2813) defines a noxious weed as "a plant which is of foreign origin, is new to, or is not widely prevalent in the United States, and can directly or indirectly injure crops or other useful plants, livestock, or the fish and wildlife resources of the United States, or the public health." This act directs each federal agency to develop and coordinate a management program for control of undesirable plants on federal lands under the agency's jurisdiction.

2.3 Executive Order 13112

Executive Order 13112 (1999) directs federal agencies to: (1) identify actions that may affect the status of an invasive species; (2)(a) prevent introduction of such species; (b) detect and control such species; (c) monitor population of such species; (d) provide for restoration of native species; (e) conduct research on invasive species and develop technologies to prevent introduction of such species; (f) promote public education of such species; and (3) not authorize, fund, or carry out actions likely to cause the introduction or spread of invasive species in the United States or elsewhere unless the benefits of the action clearly outweigh the harm and the agencies take steps to minimize the harm.

2.4 U.S. Department of Agriculture, Forest Service

United States Forest Service (USFS) Manual 2900 - Invasive Species Management directs each Forest Supervisor to “manage aquatic and terrestrial invasive species (including vertebrates, invertebrates, plants, and pathogens)” on all National Forest System lands. Per the manual, invasive species management activities of National Forest System lands will be conducted according to the following objectives: 1) prevention, 2) early detection and rapid response, 3) control and management, 4) restoration, 5) organizational collaboration. Additionally, the Record of Decision for the Final Environmental Impact Statement on the Umatilla National Forest Invasive Plants Treatment Project (USFS 2010) outlines the use of the 10 herbicides approved for use in Region 6 of the USFS, including the Umatilla National Forest.

2.5 Bureau of Land Management

The Bureau of Land Management (BLM) defines a noxious weed as “a plant that interferes with management objectives for a given area of land at a given point in time.” BLM Manual 9015 (BLM 1992) directs the BLM to manage noxious weeds and undesirable plants on BLM lands by preventing establishment and spread of new infestations, reducing existing population levels, and managing and controlling existing stands. Required management for ground-disturbing actions includes determining the risk of spreading noxious weeds associated with the project and ensuring contracts contain provisions which hold contractors responsible for the prevention and control of noxious weeds caused by their operations if the activity is determined to be moderate to high risk. Additionally, herbicide treatment of noxious weeds on BLM lands in Oregon follows the guidelines outlined in the Record of Decision for the Final Environmental Impact Statement on Vegetation Treatments Using Herbicides on BLM Lands in Oregon (BLM 2010a). Pending site specific National Environmental Policy Act analysis at the District level, this programmatic, statewide decision expands the number of herbicides available for use by Oregon BLM Districts and allows for the use of 17 herbicides east of the Cascades.

2.6 Bureau of Reclamation

The Bureau of Reclamation (BOR) is responsible for identification and proper management of pests on BOR lands in accordance with federal, state, and local policies, laws, and standards. The BOR’s Reclamation Manual (BOR 1996a, 1996b) includes standards and directives for pest management and Integrated Pest Management (Reclamation Manual ENV-01). Additionally, the Department of the Interior (DOI) Departmental Manual (609 DM 1; DOI 1995) states that “it is the DOI’s policy to control undesirable plants on the lands, waters, or facilities under its jurisdiction to the extent economically practicable and as needed for resource/environmental protection and enhancement, as well as the accomplishment of resource management objectives and the protection of human health.” This manual also provides directives and standards for control of undesirable plants and implementation of Integrated Pest Management programs on DOI lands including BOR land. In keeping with this policy, the use of Integrated Pest Management techniques is emphasized. These techniques combine the use of chemical controls (pesticides), mechanical controls (mowing, pulling), environmental controls (cultural methods), and biological controls (insects).

3.0 NOXIOUS WEEDS IN THE SITE BOUNDARY

This section of the Plan describes the known status of noxious weed species within the Site Boundary based on existing information, as well as results of field surveys of the Site Boundary. Section 3.1 discusses the state of Oregon listed noxious weeds that have the potential to occur in the counties crossed by the Project. Section 3.2 discusses the noxious weed species identified within the Site Boundary based on existing BLM and USFS databases and those observed during field surveys.

3.1 Oregon State Noxious Weeds Lists

The ODA updates the state of Oregon noxious weed list each year (ODA 2016a). Currently, 131 plant species are listed as noxious in Oregon. As stated above, in addition to the state list of noxious weeds, the five Oregon counties crossed by the Project each maintain a county designated noxious weed list.

Table 1 lists the Oregon state listed noxious weeds known to occur within the counties that will be crossed by the Project. This list is based on information obtained from publicly available sources including the Oregon WeedMapper (ODA 2016b), Oregon Noxious Weed Profiles (ODA 2016c), the INVADERS database (University of Missoula-Montana 2016), and the U.S. Department of Agriculture Natural Resources Conservation Service PLANTS database (NRCS 2016). Based on these sources, 91 state and/or county listed noxious weed species have the potential to occur within the Site Boundary (Table 1).

Table 1. Designated Noxious Weeds Known to Occur or with the Potential to Occur within the Site Boundary

Scientific Name (Synonym Name)	Common Name	Oregon State Noxious Weed Category[1]	Oregon County Noxious Weed Category[2]	Project Counties in Which Known to Occur
Abutilon theophrasti	Velvetleaf	B	–	Union
Acroptilon repens (Centaurea repens)	Russian knapweed	B	A (Union) B (Baker, Malheur[3], Morrow, Umatilla)	Baker, Malheur, Morrow, Umatilla, Union
Aegilops cylindrica	Jointed goatgrass	B	A (Baker, Malheur) B (Morrow, Umatilla, Union)	Baker, Malheur, Morrow, Umatilla, Union
Ailanthus altissima	Tree of heaven	B	–	Baker, Malheur, Morrow, Umatilla, Union
Alhagi maurorum (*A. pseudalhagi*)	Camelthorn	A	A (Malheur, Umatilla)	Umatilla
Alliaria petiolata	Garlic mustard	B, T	–	Umatilla
Ambrosia artemisiifolia	Ragweed	B	B (Umatilla) C (Malheur)	Malheur, Morrow, Umatilla, Union
Amorpha fruticosa	False indigo bush	B	–	Baker, Malheur, Morrow, Umatilla
Anchusa officinalis	Common bugloss	B, T	A (Union) Watch List[4] (Baker)	Baker, Umatilla, Union
Avena fatua	Wild oat	–	C (Union)	Union
Bassia scoparia (*Kochia scoparia*)	Kochia; burning bush	B	B (Morrow, Umatilla) Agricultural Class B[5] (Union) C (Baker, Malheur)	Baker, Malheur, Morrow, Umatilla, Union
Bromus tectorum[6]	Cheatgrass	–	C (Malheur)	Baker, Malheur, Morrow, Umatilla, Union
Buddleja davidii (*B. variabilis*)	Butterfly bush	B	–	Umatilla
Butomus umbellatus	Flowering rush	B, T	–	Umatilla
Cannabis sativa	Marijuana	–	A (Umatilla)	Malheur
Cardaria chalepensis (*Lepidium chalepensis*)	Lens-podded whitetop	B	–	Malheur

Scientific Name (Synonym Name)	Common Name	Oregon State Noxious Weed Category[1]	Oregon County Noxious Weed Category[2]	Project Counties in Which Known to Occur
Cardaria draba *(Lepidium draba)*	Whitetop; hoary cress	B	A (Baker[7], Morrow, Union) B (Baker[7], Malheur, Umatilla)	Baker, Malheur, Morrow, Umatilla, Union
Carduus nutans	Musk thistle	B	A (Morrow) B (Malheur, Umatilla) Watch List (Baker)	Baker, Malheur, Morrow, Umatilla, Union
Centaurea calcitrapa	Purple starthistle	A, T	A (Malheur, Umatilla)	Umatilla
Centaurea diffusa	Diffuse knapweed	B	A (Baker, Malheur) B (Morrow, Umatilla, Union)	Baker, Malheur, Morrow, Umatilla, Union
Centaurea nigrescens (*C. debeauxii; C. jacea x nigra; C. pratensis*)	Meadow knapweed Short-fringe knapweed	B	A (Malheur, Union)	Baker, Umatilla, Union
Centaurea solstitialis	Yellow starthistle	B	A (Baker, Malheur, Morrow, Union) B (Umatilla)	Baker, Malheur, Morrow, Umatilla, Union
Centaurea stoebe subsp. *micranthos* *(C. maculosa)*	Spotted knapweed	B, T	A (Baker, Malheur, Umatilla) B (Morrow, Union)	Baker, Malheur, Morrow, Umatilla, Union
Centaurea virgata *(C. triumfetti)*	Squarrose knapweed	A, T	A (Malheur)	Baker, Malheur, Union
Centromadia pungens subsp. *pungens*[8] (*Hemizonia pungens*)	Spikeweed; common tarweed	B	A (Morrow)	Morrow, Umatilla
Ceratocephala testiculata (*Ranunculus testiculatus*)	Bur buttercup	–	C (Baker)	Baker, Malheur, Morrow, Umatilla, Union
Chondrilla juncea	Rush skeletonweed	B, T	A (Baker, Malheur, Morrow, Umatilla, Union)	Baker, Malheur, Morrow, Umatilla, Union
Cichorium intybus	Chicory	–	B (Baker)	Morrow, Umatilla, Union
Cicuta douglasii[9]	Water hemlock	–	B (Morrow) C (Baker)	Malheur, Morrow, Umatilla, Union
Cirsium arvense	Canada thistle	B	B (Malheur, Morrow, Umatilla, Union)	Baker, Malheur, Morrow, Umatilla, Union

Scientific Name (Synonym Name)	Common Name	Oregon State Noxious Weed Category[1]	Oregon County Noxious Weed Category[2]	Project Counties in Which Known to Occur
Cirsium vulgare	Bull thistle	B	B (Baker) Agricultural Class B[5] (Union) C (Malheur)	Baker, Malheur, Morrow, Umatilla, Union
Conium maculatum	Poison hemlock	B	B (Morrow) Agricultural Class B[5] (Union) C (Baker, Malheur)	Baker, Malheur, Morrow, Umatilla, Union
Convolvulus arvensis	Field bindweed	B, T	B (Morrow) C (Baker, Malheur)	Baker, Malheur, Morrow, Umatilla, Union
Conyza canadensis[9]	Horseweed; mares tail	–	Agricultural Class B[5] (Union)	Malheur, Union
Crupina vulgaris	Common crupina	B	A (Malheur, Morrow)	Baker, Umatilla
Cuscuta spp.	Dodder	B	B (Baker, Morrow, Umatilla) C (Malheur)	Baker, Malheur, Morrow, Umatilla, Union
Cynoglossum officinale	Houndstongue	B	A (Morrow) Agricultural Class B[5] (Union) B (Malheur)	Baker, Malheur, Morrow, Umatilla, Union
Cyperus esculentus	Yellow nutsedge	B	C (Malheur)	Malheur, Morrow, Umatilla
Cytisus scoparius	Scotch broom	B	A (Union)	Baker, Umatilla, Union
Datura stramonium	Jimsonweed	–	A (Malheur)	Morrow, Union
Dipsacus fullonum	Fuller's teasel	–	B (Baker)	Baker, Morrow, Umatilla, Union
Elymus repens (*Agropyron repens*)	Quackgrass	–	B (Umatilla) Agricultural Class B[5] (Union) C (Malheur)	Malheur, Umatilla
Equisetum arvense[9]	Western horsetail	–	C (Malheur)	Baker, Malheur, Umatilla, Union
Euphorbia esula	Leafy spurge	B, T	A (Baker, Malheur, Morrow, Umatilla, Union)	Baker, Malheur, Morrow, Umatilla, Union
Euphorbia myrsinites	Myrtle spurge	B	B (Baker, Morrow)	Baker, Malheur, Morrow, Umatilla, Union
Galium aparine[9]	Catchweed bedstraw	–	Agricultural Class B[5] (Union)	Baker, Malheur, Morrow, Umatilla, Union

Scientific Name (Synonym Name)	Common Name	Oregon State Noxious Weed Category[1]	Oregon County Noxious Weed Category[2]	Project Counties in Which Known to Occur
Halogeton glomeratus	Halogeton	B	C (Malheur)	Malheur
Hedera helix	English ivy	B	–	Union
Hibiscus trionum	Venice mallow	–	B (Baker)	Malheur
Hieracium aurantiacum (Pilosella aurantiacum)	Orange hawkweed	A, T	A (Union)	Morrow, Union
Hieracium caespitosum (*H. pratense; Pilosella caespitosum*)	Meadow hawkweed	B, T	A (Union)	Umatilla, Union
Hieracium piloselloides (Pilosella piloselloides)	King-devil hawkweed Tall hawkweed	A	A (Union)	Umatilla
Hyoscyamus niger	Black henbane	–	A (Baker)	Baker, Morrow, Umatilla
Hypericum perforatum	St. Johnswort; Klamathweed	B	A (Malheur) Agricultural Class B[5] (Union) B (Baker, Morrow, Umatilla)	Baker, Malheur, Morrow, Umatilla, Union
Iris pseudacorus	Yellow flag iris	B	A (Baker, Union)	Baker, Malheur, Umatilla, Union
Isatis tinctoria	Dyer's woad	B	A (Malheur) Watch List[4] (Baker)	Baker, Malheur, Umatilla, Union
Lathyrus latifolius	Perennial peavine	B	–	Baker, Morrow, Umatilla, Union
Lepidium latifolium	Perennial pepperweed	B, T	A (Baker, Malheur[10], Union) B (Malheur[10], Morrow, Umatilla)	Baker, Malheur, Morrow, Umatilla, Union
Linaria dalmatica	Dalmation toadflax	B, T	A (Baker, Malheur, Morrow) B (Umatilla, Union)	Baker, Malheur, Morrow, Umatilla, Union
Linaria vulgaris	Yellow toadflax	B	A (Malheur, Morrow) B (Baker)	Baker, Morrow, Umatilla, Union
Lythrum salicaria	Purple loosestrife	B	A (Baker, Morrow, Umatilla) B (Malheur, Union)	Baker, Malheur, Morrow, Umatilla, Union
Melilotus officinalis	Sweet clover	–	C (Malheur)	Baker, Malheur, Umatilla, Union
Myriophyllum spicatum	Eurasian watermilfoil	B	-	Morrow, Umatilla, Union

Scientific Name (Synonym Name)	Common Name	Oregon State Noxious Weed Category[1]	Oregon County Noxious Weed Category[2]	Project Counties in Which Known to Occur
Onopordum acanthium	Scotch thistle	B	A (Baker, Morrow) B (Malheur, Umatilla, Union)	Baker, Malheur, Morrow, Umatilla, Union
Orobanche minor	Small broomrape	B	–	Baker
Panicum miliaceum	Wild proso millet	–	A (Malheur)	Baker
Phalaris arundinacea	Reed canarygrass; ribbongrass	B, T	–	Baker, Malheur, Morrow, Union
Phragmites australis	Common reed	B	B (Malheur)	Malheur, Morrow, Umatilla, Union
Polygonum cuspidatum (Fallopia japonica)	Japanese knotweed	B	A (Baker, Union)	Baker, Malheur. Morrow, Umatilla, Union
Polygonum sachalinensis (*Fallopia sachalinense*)	Giant knotweed	B	A (Union)	Morrow, Umatilla
Potentilla recta	Sulfur cinquefoil	B	A (Malheur, Union[11]) B (Baker, Union[11])	Baker, Malheur, Morrow, Umatilla, Union
Rorippa sylvestris	Creeping yellow cress	B	A (Umatilla)	Morrow, Umatilla, Union
Rubus armeniacus	Armenian (Himalayan) blackberry	B	–	Baker, Malheur, Morrow, Umatilla, Union
Salsola tragus (S. iberica; S. kali)	Russian thistle	–	Agricultural Class B[5] (Union) C (Baker, Malheur)	Malheur, Morrow, Umatilla
Salvia aethiopis	Mediterranean sage	B	A (Malheur, Morrow) Watch List (Baker)	Baker, Malheur, Morrow, Umatilla Union
Secale cereal	Cereal rye	–	B (Morrow, Umatilla)	Union
Senecio jacobaea	Tansy ragwort	B, T	A (Baker, Malheur, Morrow, Umatilla, Union)	Baker, Malheur, Morrow, Umatilla, Union
Silybum marianum	Milk thistle	B	A (Malheur)	Umatilla
Solanum elaeagnifolium	Silverleaf nightshade	A	A (Malheur)	Baker, Umatilla
Solanum rostratum	Buffalobur	B	A (Baker, Malheur)	Baker, Malheur, Umatilla, Union
Sonchus arvensis	Perennial sowthistle	–	B (Morrow)	Baker, Morrow, Umatilla
Sorghum halepense	Johnsongrass	B	A (Malheur) B (Morrow, Umatilla)	Malheur, Morrow, Umatilla
Sphaerophysa salsula	Swainsonpea; Alkali swainsonpea	B	A (Malheur) B (Umatilla)	Morrow, Umatilla

Scientific Name (Synonym Name)	Common Name	Oregon State Noxious Weed Category[1]	Oregon County Noxious Weed Category[2]	Project Counties in Which Known to Occur
Taeniatherum caput-medusae	Medusahead rye	B	A (Union) B (Morrow) C (Baker, Malheur)	Baker, Malheur, Morrow, Umatilla, Union
Tamarix ramosissima	Saltcedar	B, T	A (Baker) C (Malheur)	Baker, Malheur, Morrow, Umatilla, Union
Tanacetum vulgare	Common tansy	–	B (Baker)	Baker, Umatilla
Tribulus terrestris	Puncturevine	B	B (Baker, Morrow, Umatilla, Union) C (Malheur)	Baker, Malheur, Morrow, Umatilla, Union
Ventenata dubia	Ventenata; North Africa grass	–	B (Malheur, Morrow)	Baker, Umatilla, Union
Verbascum blattaria	Moth mullein	–	C (Baker)	Baker, Malheur, Umatilla, Union
Verbascum thapsus	Common mullein	–	C (Baker)	Baker, Umatilla, Union
Xanthium spinosum	Spiny cocklebur	B	A (Malheur)	Baker, Malheur, Morrow, Umatilla, Union

[1] – = not applicable
[2] This column includes county listed noxious weeds for the five counties in Oregon crossed by the Project.
[3] Owners or occupants in Malheur County with Russian knapweed infestations are required to control a minimum 20 percent of their annual infestation per discreet parcel of land per year. This includes a 50-foot buffer plus additional amounts that total 20 percent of the infestation.
[4] Watch List – Few known sites; controlled by Weed Supervisor county-wide (Baker County).
[5] Agricultural Class B is defined as "…a weed of economic importance, specifically in Union county agriculture, which is both locally abundant and abundant in neighboring counties."
[6] Due to the widespread nature of cheatgrass (*Bromus tectorum*) within the Site Boundary, this species was not mapped during surveys and is not included in Table 2.
[7] Whitetop is listed as a "B" weed in the portion of Baker County that the Project overlaps, though considered an "A" weed in nearby areas of the county, including West Baker Valley, where control is mandatory.
[8] Considered native in California, but introduced in Oregon (Baldwin and Strother 2006; Jaster et al. 2016).
[9] This species is native to Oregon.
[10] Perennial pepperweed is a "B" weed in the portion of Malheur County that the Project overlaps, though considered an "A" weed in a portion of Malheur County south of the Project.
[11] This species is listed on both the Class A and Class B lists in Union County.

3.2 Current Noxious Weed Inventories and Surveys

Surveys for Oregon State and/or Baker, Malheur, Morrow, Umatilla, or Union county listed noxious weeds were conducted within the Site Boundary between 2011 through 2016 (Exhibit P1, Attachment P1-7a, Biological Survey Summary Report). Populations of target noxious weeds (i.e., species on the state or county lists) observed were mapped using Trimble Global Positioning System (GPS) units. Additionally, existing site-specific disturbances and land uses (e.g., grazing, grading, etc.) that could be contributing to the introduction, spread, or viability of weed populations were also recorded. Surveys were based on the current state and county noxious weed lists at the time of the surveys; therefore, some species listed in Table 1 were not surveyed for in all years.

Approximately 67 percent of the Site Boundary was surveyed during Terrestrial Visual Encounter Surveys, which included surveys for noxious weeds, conducted between 2011 through 2016 (Figure 1). Surveys were conducted in all areas with signed right-of-entry agreements. Those areas that were not surveyed, due to unsigned right-of-entry agreements or changes in the Proposed Route and alternative route, will be surveyed following issuance of the site certificate. Additionally, a preconstruction noxious weed inventory of areas that will be disturbed during construction will be conducted (see Section 3.3).

In addition to surveys of the Site Boundary conducted by Tetra Tech between 2011 through 2016, the BLM National Invasive Species Information Management System and USFS Current Invasive Plants Inventory databases (BLM 2016; USFS 2016) were queried to determine known populations of noxious weeds within the Site Boundary. Table 2 lists the 36 noxious weed species observed within the Site Boundary during the 2011 through 2016 field surveys or recorded as occurring within the Site Boundary in the BLM and USFS databases and summarizes the acres of observed or recorded noxious weed species that occur within the Project construction and operation footprint.

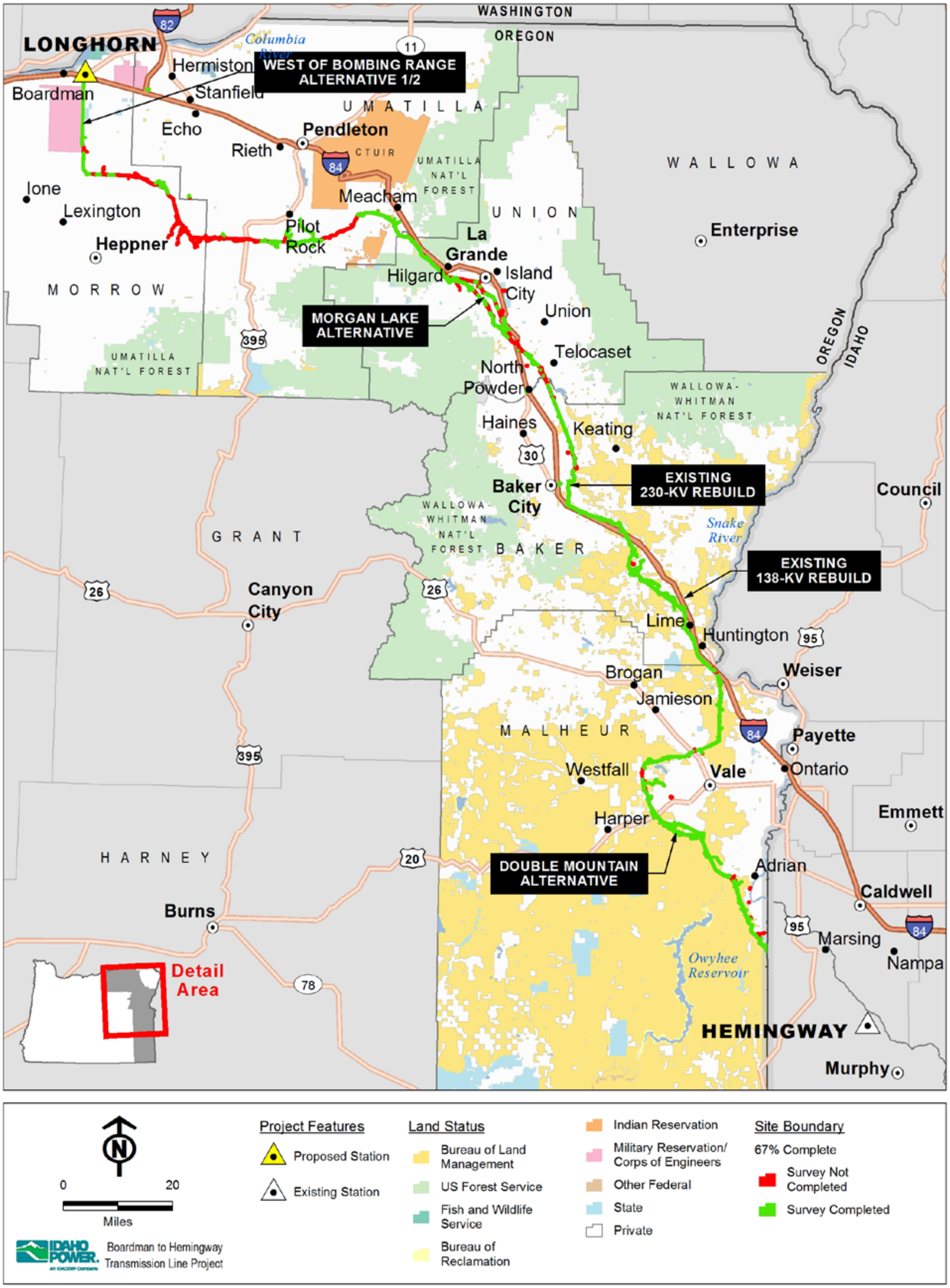

Figure 1. Terrestrial Visual Encounter Surveys within the Site Boundary 2011–2016

Table 2. Oregon State and County Listed Noxious Weeds Observed during 2011–2016 Field Surveys or From Existing Databases

Scientific Name (Synonym Name)	Common Name	Counties Where Observed[1]	Estimated Acres within Site Boundary	Estimated Acres within Construction Footprint[2]	Estimated Acres within Operation Footprint[2]
Acroptilon repens (*Centaurea repens*)	Russian knapweed	Morrow	5.51	1.42	0.49
		Umatilla	12.95	9.92	–
		Union	0.50	0.50	–
Aegilops cylindrica	Jointed goatgrass	Baker	37.06	3.43	2.11
		Umatilla	21.74	4.70	1.88
		Union	0.50	0.13	0.06
Ailanthus altissima	Tree of heaven	Umatilla	0.50	0.06	0.05
Bassia scoparia (*Kochia scoparia*)	Kochia; burning bush	Baker	6.18	1.23	0.78
		Malheur	6.27	1.27	0.11
		Morrow	4.92	1.80	0.20
		Umatilla	1.19	–	–
		Union	0.50	0.50	0.00
Cardaria draba (Lepidium draba)	Whitetop; hoary cress	Baker	208.80	40.10	9.31
		Malheur	185.80	44.50	7.42
		Union	6.08	5.98	–
Carduus nutans	Musk thistle	Baker	4.26	0.59	0.23
		Malheur	6.50	1.24	0.35
		Union	10.07	0.23	0.16
Centaurea diffusa	Diffuse knapweed	Baker	4.98	1.11	0.19
		Malheur	1.81	0.08	0.04
		Morrow	23.58	4.53	0.77
		Umatilla	0.45	0.32	0.04
		Union	11.79	1.69	0.19
Centaurea stoebe subsp. *micranthos* *(C. maculosa)*	Spotted knapweed	Baker	0.58	0.08	0.04
		Malheur	1.91	0.11	0.06
		Morrow	0.10	–	–
		Umatilla	1.99	–	–
Centromadia pungens subsp, *pungens* (*Hemizonia pungens*)	Spikeweed; common tarweed	Morrow	0.46	–	–
Ceratocephala testiculata (*Ranunculus testiculatus*)	Bur buttercup	Baker	26.95	9.69	1.23
		Malheur	185.07	43.91	9.61
		Umatilla	0.10	0.10	–
Chondrilla juncea	Rush skeletonweed	Baker	9.07	0.21	0.17
		Malheur	326.80	67.73	16.65
		Morrow	0.06	–	–
Cichorium intybus	Chicory	Baker	0.10	0.03	0.02
		Union	10.85	2.68	0.59

Scientific Name (Synonym Name)	Common Name	Counties Where Observed[1]	Estimated Acres within Site Boundary	Estimated Acres within Construction Footprint[2]	Estimated Acres within Operation Footprint[2]
Cirsium arvense	Canada thistle	Baker	10.70	3.26	0.46
		Malheur	3.95	0.56	0.35
		Morrow	7.23	1.30	0.23
		Umatilla	28.61	4.94	1.14
		Union	21.61	4.08	0.83
Cirsium vulgare	Bull thistle	Baker	1.70	0.17	0.09
		Morrow	0.10	–	–
		Umatilla	3.45	0.33	0.14
		Union	3.15	0.67	0.32
Conium maculatum	Poison hemlock	Baker	1.90	0.18	0.16
		Morrow	0.33	0.33	–
		Umatilla	0.16	0.06	–
Convolvulus arvensis	Field bindweed	Baker	67.77	8.90	2.96
		Malheur	59.52	22.24	2.71
		Umatilla	27.34	3.71	1.43
		Union	4.88	0.71	0.56
Cynoglossum officinale	Houndstongue	Baker	24.20	3.41	2.29
		Umatilla	21.81	5.70	1.46
		Union	63.42	8.67	2.50
Dipsacus fullonum	Fuller's teasel	Baker	3.52	0.49	0.42
		Morrow	0.33	–	–
		Umatilla	23.21	3.66	1.21
		Union	3.82	0.11	0.06
Euphorbia esula	Leafy spurge	Baker	0.69	0.04	0.03
Galium aparine	Catchweed bedstraw	Baker	1.09	–	–
		Union	0.10	0.01	–
Halogeton glomeratus	Halogeton	Malheur	6.45	1.14	0.70
		Umatilla	0.10	0.02	0.01
Hypericum perforatum	Klamathweed; St. Johnswort	Baker	0.10	0.05	0.02
		Umatilla	24.38	6.27	1.23
		Union	10.48	2.06	0.21
Lepidium latifolium	Perennial pepperweed	Baker	4.24	0.65	–
		Malheur	5.52	0.33	0.16
Linaria dalmatica	Dalmation toadflax	Malheur	0.24	0.04	0.03
Linaria vulgaris	Yellow toadflax	Umatilla	9.92	9.92	–
Melilotus officinalis	Sweet clover	Baker	0.82	0.03	0.02
		Malheur	1.00	0.02	0.01
		Umatilla	0.10	–	–
Onopordum acanthium	Scotch thistle	Baker	156.38	25.30	9.61
		Malheur	263.13	72.69	10.71
		Morrow	2.51	0.13	0.07
		Umatilla	3.19	0.37	0.15
		Union	16.43	5.56	0.88

Scientific Name (Synonym Name)	Common Name	Counties Where Observed[1]	Estimated Acres within Site Boundary	Estimated Acres within Construction Footprint[2]	Estimated Acres within Operation Footprint[2]
Potentilla recta	Sulfur cinquefoil	Baker	0.09	–	–
		Union	19.06	1.86	1.29
Salsola tragus (S. iberica; S. kali)	Russian thistle	Baker	20.33	7.81	1.50
		Malheur	75.94	18.19	3.62
		Morrow	38.89	17.80	6.10
		Umatilla	5.32	1.47	0.33
		Union	0.46	0.09	0.08
Salvia aethiopis	Mediterranean sage	Malheur	5.61	1.38	–
Taeniatherum caput-medusae	Medusahead rye	Baker	156.28	23.79	6.83
		Malheur	101.65	29.35	4.64
		Morrow	0.10	0.03	0.02
		Umatilla	124.58	24.92	5.20
		Union	41.92	7.88	2.22
Tamarix ramosissima	Saltcedar	Malheur	102.86	17.59	4.87
		Umatilla	0.74	0.22	0.10
Tribulus terrestris	Puncturevine	Baker	0.23	0.16	0.04
		Union	0.40	0.10	0.08
Ventenata dubia	Ventenata; North Africa grass	Baker	0.50	0.31	0.05
		Union	0.50	0.49	0.04
Verbascum blattaria	Moth mullein	Baker	0.09	–	–
		Malheur	0.10	–	–
		Umatilla	0.10	–	–
Verbascum thapsus	Common mullein	Baker	17.23	3.31	1.41
		Malheur	0.10	–	–
		Umatilla	0.50	0.03	0.02
		Union	9.01	3.07	0.31

[1] Not every noxious weed listed is considered noxious in the state of Oregon or in every county where observed. Refer to Table 1 for state and county designations.
[2] "–" = not observed within construction or operation footprint.

3.3 Preconstruction Noxious Weed Inventory

Per Table 1 of the Revised Final Biological Survey Work Plan (Exhibit P1, Attachment P1-2), a preconstruction noxious weed inventory of areas that will be disturbed during construction will be conducted prior to construction. This inventory will be used to develop final noxious weed treatment and monitoring methods. The Construction Contractor(s) will conduct the preconstruction noxious weed surveys within all areas expected to be subject to ground disturbance. These surveys will be conducted during the appropriate growing season to observe and identify noxious weed species. Existing infestations of noxious weed species adjacent to the Project will be documented during preconstruction surveys, as well as adjacent land uses which can contribute to the proliferation of noxious weeds. The preconstruction noxious weed inventory map will be used to delineate noxious weed infected area(s) prior to construction and will serve as the basis for comparison of post-construction conditions to document any noxious weed infestations that originate from or spread into Project work areas, and thus which IPC is responsible for treating. The map will also be used to identify areas for preconstruction noxious weed control treatments.

Prior to construction, areas of noxious weed infestations identified during these surveys will be flagged by the Construction Contractor(s) and reviewed by the appropriate land management agency and ODOE. This flagging will alert construction personnel to the presence of noxious weeds and will prevent access to these areas until noxious weed control measures, as applicable, have been implemented.

The results of the preconstruction surveys will be included in the Final Noxious Weed Plan. Once the preconstruction surveys are completed, noxious weeds identified during the surveys will be reported, in a format agreed upon between the Construction Contractor(s) and the applicable land-managing agency in whose jurisdiction the weeds occur.

4.0 NOXIOUS WEED MANAGEMENT

This section of the Plan describes the steps IPC will take to prevent and control the establishment and spread of noxious weed species that are the result of Project activities. Noxious weeds will be controlled and monitored during both construction and O&M of the Project. IPC will work to control any new noxious weed population that is demonstrated to be the result of Project construction, operation, or maintenance (i.e., a new infestation in an area disturbed by Project activities).

If construction, operation, and/or maintenance of the Project cause an existing noxious weed infestation to exceed the extent identified and delineated within areas subject to disturbance during preconstruction surveys, IPC will be required to monitor and control the infestation. However, IPC will not be responsible for control of pre-existing noxious weed populations outside of the Project ROW, unless done so at IPC's or the Construction Contractor(s) discretion to minimize the spread of existing infestations through Project activities (where applicable and as agreed upon with the land management agency and/or landowner). In addition, IPC will not be responsible for noxious weeds along roads that are outside of the ROW.

The management of noxious weeds will be considered throughout all stages of the Project and will include:

- Educating all construction personnel regarding locations of noxious weed infestations and the importance of preventive measures and treatment methods.
- Implementing measures outlined in Sections 4.1 through 4.3 to prevent the spread of noxious weeds during construction, operation, and maintenance activities.
- Treating noxious weed infestations both before and after Project construction.

Weed control and prevention measures will adhere to all agency standards and guidelines. Measures proposed by IPC to help prevent or minimize spread of noxious weeds and to ensure successful reclamation and revegetation of disturbed areas are described in the sections below.

4.1 Education and Personnel Requirements

Prior to the initiation of construction activities, all construction personnel will be instructed on the importance of controlling noxious weeds. As part of start-up activities, and to help facilitate the avoidance of existing infestations and identification of new infestations, the Construction Contractor(s) will provide information and training to all construction personnel regarding noxious weed identification and management. The importance of preventing the spread of noxious weeds in areas not currently infested, and controlling the proliferation of noxious weeds already present in the Project ROW, will be emphasized..

The Construction Contractor(s) will ensure that weed management actions will be carried out by specialists with the following qualifications:

- Experience in native plant and noxious weed identification;
- Experience in noxious weed mapping;
- Possession of a Public Pesticide Applicator License from the ODA (if chemical control is used);
- Training in weed management or Integrated Pest Management with an emphasis in weeds; and
- Experience in coordination with agency and private landowners.

4.2 Prevention

Measures will be implemented to prevent the spread of noxious weeds during construction activities, reclamation efforts, and O&M activities. Detailed information regarding reclamation is contained in Exhibit P1, Attachment P1-3, Reclamation and Revegetation Plan.

To help prevent the spread of noxious weeds during construction, all Construction Contractor(s) vehicles and equipment will be cleaned using high-pressure air or water equipment prior to arrival at the work site. The cleaning activities will concentrate on tracks, feet, or tires and the undercarriage with special emphasis on axles, frame, cross members, motor mounts, underneath steps, running boards, and front bumper/brush guard assemblies. Vehicle cabs will be swept out or vacuumed. Additionally, when moving from weed-contaminated areas to other areas along the transmission line ROW, all construction vehicles and equipment will be cleaned using compressed water or air in designated wash stations before proceeding to new locations. All washing of construction vehicles and equipment must be performed in approved wash stations.

The vehicle cleaning stations will be located within each of the Project multi-use areas as identified in Exhibit B and Exhibit C of this application. The Construction Contractor(s) will include in the Final Noxious Weed Plan a detailed design identifying all of the components of the wash stations, including rock surface and geomembrane layer to provide a barrier between noxious weeds and seeds and the soil for approval by the appropriate land management agency and ODOE. The Construction Contractor(s) will also provide a description of how residue from the wash station will be disposed of for approval by the appropriate land management agency and the ODOE. Where feasible, construction will begin in weed-free areas before operating in weed-infested areas. The feasibility of this approach will be determined after survey data is completed to identify weed-free and weed-infested areas.

All movement of construction vehicles outside of the ROW will be restricted to pre-designated access, contractor-acquired access, or public roads. All construction sites and access roads, including overland access routes, will be clearly marked or flagged at the outer limits prior to the onset of any surface-disturbing activity. All personnel will be informed that their activities must be confined within the marked or flagged areas. Disturbance of soils and vegetation removal will be limited to the minimum area necessary for access and construction.

Preventive measures, such as quarantine and closure, will be implemented to reduce and contain existing noxious weed populations. Flagging will alert personnel and prevent access into areas where noxious weeds occur. Construction disturbance will be minimized in these areas until control measures have been implemented, with the exception of reclamation treatments, as applicable. Construction personnel will inspect, remove, and appropriately dispose of weed seed and plant parts found on their clothing and equipment.

Where preconstruction surveys have identified noxious or invasive weed species infestations, topsoil and other soils will be placed next to the infested area and clearly identified as coming from an infested area. Movement of stockpiled vegetation and salvaged topsoil will be limited to eliminate the transport of soil-borne noxious weed seeds, roots, or rhizomes, and will be marked as containing noxious seed materials to avoid mixing with weed-free soil. Topsoil will be returned to the area it was taken from and will not be spread in adjacent areas. If the topsoil is not suitable for backfill, it will be spread in another previously disturbed area and clearly identified for future weed treatments as applicable. As directed by the BLM or USFS, the Construction Contractor(s) may be required to provide additional treatments (i.e., pre-emergent pesticides) to prevent return of noxious weeds.

Soil stockpiles in areas containing noxious weeds will be kept separate from soil removed from areas that are free of noxious weed species, and the soil will be replaced in or near the original excavation. If requested by the applicable land management agency, soil stockpiles will be covered with plastic if the soil stockpile will be in place for 2 weeks or longer and is not actively being used. On lands managed by the USFS or per private landowner request, stockpiles will not be covered with plastic.

To help limit the spread and establishment of noxious weed species in disturbed areas, desired vegetation needs to be established promptly after disturbance. IPC will rehabilitate significantly disturbed areas as soon as possible after ground-disturbing O&M activities and during the optimal period. To minimize potential damage from wildland fires, IPC will not reseed areas within a 20-foot radius around structures. IPC will treat and reseed disturbed areas in accordance with the Final Reclamation and Revegetation Plan. This includes reseeding significantly disturbed areas with a non-invasive seed mix approved by the applicable land management agency, ODOE, or landowner.

Straw, hay, mulch, gravel, seed, and other imported materials must be certified weed-free. If certified weed-free materials are not available, then alternative materials will be used with agency approval.

If noxious weed species occur within IPC’s ROW as a result of IPC activities, IPC will coordinate treatment with the BLM, USFS, ODOE, or other landowner as applicable. Treatments will be in compliance with BLM and USFS land use plans and guidance. When determining whether treatment is necessary and whether it will produce the desired results, IPC will consider surrounding site conditions and whether weed-control activities will be conducted by other parties. IPC is only responsible for controlling noxious weeds to pre-disturbance levels.

Before beginning an O&M project on federal, state, or private land, IPC or its contractors will comply with the Final Noxious Weed Plan and Final Reclamation and Revegetation Plan as appropriate to prevent the spread of noxious weeds.

4.3 Control Measures

Noxious weed control measures will be implemented prior to construction (Section 4.3.1), during construction (Section 4.3.2) and following construction (Section 4.3.3). IPC will be responsible for providing the necessary personnel or hiring a contractor, with qualifications as described in Section 4.1, to implement noxious weed control procedures. In the event new noxious weed populations are identified on the Project in the future, the protocols and methods outlined in this Plan will be followed.

Methods to control noxious weeds associated with Project activities may include mechanical, cultural, biological, or chemical measures. Each of these control methods is briefly described below. Noxious weed control measures will be implemented in accordance with existing state and county regulations and applicable land management agency or ODOE requirements. Control measures will be based on species-specific and site-specific conditions (e.g., proximity to water or riparian areas, agricultural areas, occurrence of special status plant species, and season of application) and will be coordinated with the appropriate land management agencies and ODOE, as well as the OSWB and county weed boards or weed control districts, and the Construction Contractor(s) weed management specialist. Following preconstruction surveys, the Construction Contractor(s) weed management specialist will provide a detailed control methodology for each noxious weed species to be controlled. These species-specific control methodologies will be documented in the Final Noxious Weed Plan. The appropriate land management agencies and ODOE will review and approve the Final Noxious Weed Plan prior to implementation.

Mechanical

Mechanical control methods rely on removal of plants and/or cutting roots with a shovel or other hand tools or equipment that can be used to remove, mow, or disc weed populations. Mechanical methods are useful for smaller, isolated populations of noxious weeds in areas of sensitive habitats, or if larger populations occur in agricultural lands, where tillage can be implemented. Some rhizomatous plants can spread by discing or tillage; therefore, implementation of this method will be species specific. If such a method is used in areas to be reclaimed, subsequent seeding will be conducted to re-establish a desirable vegetative cover that will stabilize the soils and slow the potential re-invasion of noxious weeds. Discing or other mechanical treatments that disturb the soil surface within native habitats will be avoided in favor of herbicide application, which is an effective means of reducing the size of noxious weed populations as well as preventing the establishment of new colonies.

Cultural

Cultural control methods rely on preventive education of the public and construction, operation, and maintenance personnel. Cultural control of noxious weeds can also include the minimization of personnel and vehicular travel through areas of known noxious weed populations. To avoid spreading noxious weed seed or plant materials, noxious weed populations identified during preconstruction surveys or by the BLM, BOR, USFS, and/or state weed control officials will be cordoned off and flagged and to alert construction personnel of the presence of noxious weeds (see Section 4.2). Access to these areas will be prevented until weed management control measures have been implemented. Additionally, prior to the initiation of construction activities all construction personnel will be instructed on the importance of controlling noxious weeds and will be provided information and training regarding noxious weed identification and management (see Section 4.1).

Biological

Biological control involves the use of living organisms (insects, diseases, and livestock) to control noxious weeds to achieve management objectives. Many noxious weed and invasive plants species have been introduced recently into North America and have few natural enemies to control their population. The biological control agent is typically adapted to a specific species and selected for their ability to attack critical areas of the plant that contribute to its persistence. One component of the ODA's Weed Control Policy is developing and managing a biological weed control program (ODA 2016a).

Chemical

Chemical control can effectively remove noxious weeds through use of selective herbicides. Herbicide treatment can be temporarily effective for large populations of noxious weeds where other means of control may not be feasible. The type of herbicide and method of use will be approved by the applicable land-managing agency prior to their use. On private and state lands, appropriate federal and state approved herbicides will be used.

BLM (2010a) lists herbicides acceptable for use on BLM-administered lands in Oregon. In addition to being approved by the BLM nationally, the herbicides must be registered with the Environmental Protection Agency and the State of Oregon (BLM 2010a). USFS (2010) outlines the use of the 10 herbicides approved for use in Region 6 of the USFS, including the Umatilla National Forest. The herbicides listed in Appendix A – Agency-Approved Herbicides may be used in the Project area after coordination with the Construction Contractor(s) and after submittal of Pesticide Use Plans (PUP) (see below). Revisions to the approved pesticide list will occur in conjunction with agency-approved pesticide list updates.

Application of herbicides on BLM or USFS land will also require submittal of PUPs, which identify and describe the location of the area to be treated, the target species, the herbicide and application rate, and application method to be used, as well as describing all anticipated impacts to non-target species and susceptible areas (BLM 2010b). PUPs may also be required for treatment on BOR-managed lands. Herbicides approved for use within the Project ROW will be reviewed and approved by the BLM, USFS, ODA, and County Weed Supervisors or Superintendents prior to beginning construction and/or prior to use. Prior to any herbicide application on federally controlled lands, a PUP that includes the dates and locations of application, target species, herbicide, adjuvants, and application rates and methods (e.g., spot spray vs. boom spray) and anticipated impacts to non-target species and susceptible areas will be submitted. Herbicide will not be applied prior to notification and approval from the applicable land management agency, ODOE, or landowner. No herbicide will be applied to any private property without written approval of the landowner. This written approval must be obtained annually.

A licensed pesticide (herbicide) applicator, certified by the ODA, will perform the application using herbicides selected and approved by the appropriate land management agency and ODOE in accordance with applicable laws, regulations, and permit stipulations. The pesticide applicator will have readily available copies of the appropriate safety data sheets for the herbicides used. All pesticide applications must follow Environmental Protection Agency label instructions, as well as federal, state, and/or county regulation, BLM and USFS recommendations, and landowner agreements. Application of herbicides will be suspended in accordance with herbicide labels and county, state, and federal regulations (e.g., strong winds, etc.), and all herbicide spills will be reported in accordance with applicable laws and requirements.

Transportation, mixing, and storage of herbicides will include the following provisions:

- Concentrate will be transported only in approved containers in a manner that will prevent tipping or spilling, and in a location isolated from the vehicle’s driving compartment, food, clothing, and safety equipment.
- Mixing will be done over a drip-catching device in an area devoid of sensitive vegetation and in an area that will limit human, pet, and wildlife exposure. Flowing water, wetlands, or other areas of sensitive resources where herbicides may be applied will be detailed in the Final Noxious Weed Plan. Areas of flowing water, wetlands, or other sensitive resources where herbicide use will be prohibited will be described in the Final Noxious Weed Plan and be identified on construction maps and flagged.

- All herbicide equipment and containers will be inspected daily for leaks.
- Disposal of spent containers will be in accordance with the herbicide label.

Herbicides may be applied using a broadcast applicator mounted on a truck or all-terrain vehicle, backpack sprayers, or with hand sprayers as conditions dictate. Herbicide applications will be conducted by licensed operators or under the supervision of a licensed operator in accordance with state laws and BLM and USFS weed policies. Vehicle-mounted sprayers (e.g., handgun, boom, and injector) may be used in open areas readily accessible by vehicle. Where allowed, a broadcast applicator will likely be used. In areas where noxious weeds are more isolated and interspersed with desirable vegetation, noxious weeds will be targeted by hand application methods (e.g., backpack spraying), thereby avoiding other plants. Preconstruction herbicide applications will not occur within 100 feet of known special status plant species or waterbodies. Calibration checks of equipment will be conducted at the beginning and periodically during spraying to ensure proper application rates are achieved.

State and federal herbicide recording requirements, including BLM and USFS recording requirements, will be followed. The Final Noxious Weed Plan will contain a list of approved herbicides that may be used, target species, best time for application, and application rates. If the federal land-managing agency determines that a previously approved pesticide and/or plan is unacceptable, they will notify IPC. Revisions to the approved herbicide list will occur in conjunction with agency-approved herbicide/pesticide list updates.

Final species-specific noxious weed control methodologies will be included by the Construction Contractor(s) in the Final Noxious Weed Plan. Herbicide applications will be controlled, as described in Section 6.0 – Pesticide Application, Handling, Spills, and Cleanup, to minimize the impacts on the surrounding vegetation.

4.3.1 Preconstruction Noxious Weed Control

Based on the preconstruction noxious weed inventory (Section 3.3) and working in conjunction with the appropriate land management agencies and ODOE and state and county weed districts, the Construction Contractor(s) will identify areas where preconstruction noxious weed control measures will be implemented. Preconstruction weed treatments will be limited to areas expected to have unavoidable ground-disturbing activities and the potential to spread weeds due to construction activities. Treatments will be conducted prior to the start of ground-disturbing activities and at the time most appropriate for the target species.

These areas and the measures to be implemented will be described in the Final Noxious Weed Plan. Noxious weed species on Oregon's OSWB Class A and T lists, and Baker, Malheur, Morrow, Umatilla, and Union county Class A lists will be treated prior to the start of ground-disturbing activities. For other noxious weed species, the decision whether to treat the weeds prior to the start of construction activities will be based on the nature and extent of the infestation, surrounding conditions (e.g., the predominance and density of infestations noxious weeds adjacent to the ROW), landowner permission, land-managing agency requests, timeliness of land-managing agency approval, and the construction schedule. Treatment options could consist of mechanical control, hand spraying of herbicides, and biological controls; the exact method of control will be approved by the land-managing agency or landowner prior to use and will be documented in the Final Noxious Weed Plan. All use of herbicides will comply with the label restrictions, as well as federal, state, and/or county regulations and landowner agreements. All areas treated will be documented using GPS technology and will be included in an annual report.

4.3.2 Noxious Weed Control during Construction

Measures will be taken during construction to further minimize the risk of spreading or introducing noxious weed species. Known locations of existing infestations of noxious weeds will be avoided to the extent practical. When infected areas cannot be avoided, soil removed from these areas will be clearly identified as coming from infected areas; it will be stored separately from uninfected soils, and returned to the area in which it was taken, following construction. Vehicles will be cleaned of soil and herbaceous materials prior to arriving at job-sites, in order to limit the risk of construction equipment serving as a vector for the spread of noxious weed species. The Final Noxious Weed Plan will provide the location of all cleaning stations that will be used, and how the removed materials will be captured or treated so that the cleaning stations will not become infected. All areas that will be used on a regular basis during construction (e.g., storage areas) will be kept clear of noxious weed species during construction, to prevent these areas from becoming a source population for noxious weed spread. Reclamation efforts in disturbed areas will entail measures to further minimize the risk of spreading or introducing noxious weed species (e.g., using weed-free materials). All applicable and required BLM and USFS protocols for preventing and controlling noxious weed species will be followed on federally managed lands. See Section 4.2 above for further discussion on measures that will be implemented during construction to prevent and minimize the introduction and spread of noxious weed species due to Project construction activities.

4.3.3 Post-Construction Noxious Weed Control

Noxious weed control efforts will occur on an annual basis for the first 5 years post-construction. When it is determined that an area of the Project has successfully controlled noxious weeds at any point during the first 5 years of control and monitoring, IPC will request concurrence from ODOE. If ODOE concurs, IPC will consult with ODOE to design an appropriate plan for long-term weed control. If control of noxious weeds is deemed unsuccessful after 5 years of monitoring and noxious weed control actions, IPC will coordinate with ODOE regarding appropriate steps forward. At this point, IPC may suggest additional noxious weed control techniques or strategies, or may request a waiver from further noxious weed obligations at these sites. If a waiver of noxious weed control is granted, it will include justification for how the waiver is consistent with the appropriate Energy Facility Siting Council standards.

As described above, control efforts will be limited to noxious weed species on Oregon's OSWB Class A and T lists, and on Baker, Malheur, Morrow, Umatilla, and Union county Class A lists. Using the prior years' treatment and monitoring information, post-construction noxious weed treatment will be planned by IPC and coordinated with the applicable land-managing agencies to ensure treatment will be conducted at the proper growing period and during favorable environmental conditions. Herbicide use will be planned and coordinated with the applicable agencies and will be based on the results of the prior years' monitoring data to ensure spraying is conducted only where necessary, in areas approved for herbicide use, during the proper growing period, during favorable environmental conditions, and using only the appropriate and agency-approved chemicals to control target noxious weed species.

Noxious weed control measures recommended during monitoring will follow the preventive and control measures outlined in the Final Noxious Weed Plan. Continued cooperation with the applicable land management agencies, ODOE, and state and local weed management authorities is also encouraged.

4.4 Reclamation Actions

As specified in Exhibit P1, Attachment P1-3, Reclamation and Revegetation Plan, reclamation activities will assist in:

- Restoring plant communities and associated wildlife habitat and range;
- Preventing substantial increases in noxious weeds in the Project area;
- Minimizing Project-related soil erosion; and
- Reducing visual impacts on sensitive areas caused by construction activities.

Measures that will be implemented during reclamation activities that will help prevent the spread and establishment of noxious weed species include applying agency-approved seed mixes Project-wide (except in agricultural areas) to the appropriate habitat type, unless directed otherwise by the land management agency and/or landowner. Additionally, the Construction Contractor(s) or weed specialist may recommend modified seeding application rates and timing of implementation to achieve site-specific noxious weed management objectives. Seed mixes will be determined by soil type and site-specific conditions and will be provided to the Construction Contractor(s) by a BLM or USFS specialist, ODOE, or landowner. If areas are not immediately seeded after construction because of weather or scheduling constraints, all noxious weeds will be adequately controlled before seeding. Appropriate herbicides will be used to ensure fall seedings are not affected by residual herbicides.

5.0 MONITORING AND REPORTING

5.1 Monitoring

The objectives of the noxious weed monitoring surveys are to: 1) identify any new noxious weed populations or infestations, and 2) monitor existing infestations and affected/disturbed areas. Monitoring will be initiated during the first summer following construction and will occur during the appropriate growing season when noxious weeds located during the preconstruction surveys are still identifiable. Growing seasons will vary from year to year, and consequently, the timing of monitoring will vary as well.

As stated above, noxious weed monitoring and control will occur during the first 5-year period. When it is determined that an area of the Project has successfully controlled noxious weeds at any point during the first 5 years of control and monitoring, IPC will request concurrence from ODOE. If ODOE concurs, IPC will conclude that it has no further obligation to monitor and control noxious weeds in that area of the Project. If control of noxious weeds is deemed unsuccessful after 5 years of monitoring and noxious weed control actions, IPC will coordinate with ODOE regarding appropriate steps forward. At this point, IPC may suggest additional noxious weed control techniques or strategies, or may request a waiver from further noxious weed obligations at these sites. Noxious weed control measures recommended during monitoring will follow the preventive and control measures outlined in the Final Noxious Weed Plan.

5.2 Reporting

An annual Noxious Weed Monitoring Report will be prepared by the Construction Contractor(s) and submitted to IPC and ODOE and made available to the appropriate land management agencies as required. The purpose of the report is to provide a status update on progress toward meeting the goals of controlling and preventing the spread and introduction of noxious weed species within the ROW due to Project activities.

Areas where the spread of a noxious weed infestation are noted, particularly in previously unaffected locations, will be evaluated to help determine if these areas require remedial action and treatment. The Construction Contractor(s) will note these areas in the annual report and will document any additional noxious weed control treatments implemented or recommended.

5.3 Ongoing Monitoring and Control

IPC will be responsible for ongoing monitoring and focused control of noxious weed infestations inside of the ROW, as needed, for the life of the ODOE Site Certificate, BLM ROW grant, and USFS special-use authorization. The BLM, USFS, ODOE, and counties may contact IPC to report on the presence of noxious weed populations of concern within the ROW.

IPC's operations personnel will be trained in the identification of the predominant noxious weed populations within the Project ROW, and IPC will control the weeds on a case-by-case basis in consultation with the land management agency and/or landowner, as appropriate. If determined necessary, a report on actions taken will be provided to the BLM and USFS on a predetermined schedule.

6.0 HERBICIDE APPLICATION, HANDLING, SPILLS, AND CLEANUP

6.1 Herbicide Application and Handling

The current list of BLM and USFS approved herbicides is provided in Appendix A. Before application, the list of herbicides to be used will be approved by the BLM, USFS, and other land management agencies as appropriate. Additionally, all required permits from the local authorities (e.g., Oregon County Weed Superintendents or weed districts, BLM, BOR, and/or USFS) will be obtained. Permits may contain additional terms and conditions that go beyond the scope of this Plan. Application of herbicides will follow the measures listed in Section 4.3 – Control Measures.

6.2 Herbicide Spills and Cleanup

All reasonable precautions will be taken to avoid herbicide spills. Construction spills, including herbicide and pesticide spills, will be promptly cleaned up, and contaminated materials will be transported to a disposal site that meets local, state, and federal requirements. If a spill occurs whose cleanup is beyond the capability of on-site equipment and personnel, an Emergency Response Contractor available to further contain and clean up the spill will be identified. Potential contractors will be identified prior to the start of construction activities.

For spills in standing water, including herbicide and pesticide spills, absorbent materials will be used as appropriate by the contractor to recover and contain released materials on the surface of the water. If the standing water is considered a water of the state, it will be reported immediately to the appropriate agency. Materials such as fuels, other petroleum products, chemicals, and hazardous materials including wastes will be located in upland areas away from streams or wells and away from storm drains or other drainages.

Hazardous material, including herbicides and pesticides, will not be drained onto the ground or into streams or drainage areas. Totally enclosed containment will be provided for all Project-generated trash. All construction waste, including trash and litter, garbage, other solid waste, petroleum products, concrete curing fluid, and other potentially hazardous materials, will be removed as necessary to a disposal facility authorized to accept such materials.

As identified in Exhibit G, Materials Analysis, concentrated liquid herbicides will be stored in the hazardous materials portion of multi-use areas during construction. During construction, hazardous materials will be delivered to the Project as needed, unless regular use requires storage at the multi-use areas. During operations, small amounts (less than 20 gallons per year) will be used to control vegetation. No herbicide will be stored on-site during the operations phase. Herbicides will be brought to the site as needed. No hazardous materials of any type will be stored on-site during the operations phase.

Spill preventive and containment measures or practices will be incorporated as described in Exhibit G, Materials Analysis, and Attachment G-4, Draft Spill Prevention, Control, and Countermeasures (SPCC) Plan.

During operations, small amounts (less than 20 gallons per year) will be used to control vegetation. No herbicide will be stored on-site during the operations phase. Herbicides will be brought to the site as needed. Additional information regarding the handling of hazardous materials, including herbicides and pesticides, may be found in the Draft SPCC Plan (Exhibit G, Attachment G-4).

6.3 Worker Safety and Spill Reporting

All pesticide contractors will obtain and have readily available copies of the appropriate safety data sheets for the herbicides used. All herbicide spills will be reported in accordance with applicable laws and requirements as discussed in Exhibit G, Materials Analysis, and Attachment G-4, Draft SPCC Plan. Persons should attempt to clean up or control a spill, including herbicide and pesticide spills, only if they have received proper training and possess the appropriate protective clothing and clean-up materials. Untrained individuals should notify the appropriate response personnel. In addition to these general measures, persons responding to spills will consult the SPCC Plan and the material safety data sheets (MSDSs) or U.S. Department of Transportation Emergency Response Guidebook (to be maintained by the Construction Contractor[s] on-site during all construction activities), which outlines physical response guides for hazardous materials spills. The Construction Contractor(s) will verify and update emergency phone numbers before and during construction. The Construction Contractor(s) (or other person in charge) will notify the applicable land management agency and ODOE of all spills or potential spills, including herbicide and pesticide spills, within the Project area.

7.0 PLAN UPDATES

The Construction Contractor(s) will be responsible for development of the Final Noxious Weed Plan, which will include documentation of existing infestations adjacent to the survey area, documenting results of the preconstruction noxious weed inventories (Section 3.3), mapping areas subject to preconstruction noxious weed treatment, and providing a detailed control methodology for each noxious weed species. The Construction Contractor(s) will also be responsible for reporting noxious weed species identified during preconstruction surveys to the applicable land-managing agencies, and submitting PUPs prior to weed treatment on BLM or USFS lands.

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APPENDIX A
AGENCY-APPROVED HERBICIDES

BLM-APPROVED HERBICIDES

(Source: BLM 2010a)

- 2,4-D
- Bromacil
- Chlorsulfuron
- Clopyralid
- Dicamba
- Diflufenzopyr + Dicamba
- Diuron
- Fluridone
- Glyphosate
- Hexazinone
- Imazapic
- Imazapyr
- Metsulfuron methyl
- Picloram
- Sulfometuron methyl
- Tebuthiuron
- Triclopyr

USFS UMATILLA NATIONAL FOREST APPROVED HERBICIDES

(Source: USFS 2010)

- Chlorsulfuron
- Clopyralid
- Glyphosate
- Imazapic
- Imazapyr
- Metsulfuron methyl
- Picloram
- Sethoxydim
- Sulfometuron methyl
- Triclopyr

ATTACHMENT P1-6
FISH AND WILDLIFE HABITAT MITIGATION PLAN

Fish and Wildlife Habitat Mitigation Plan

Boardman to Hemingway Transmission Line Project

1221 West Idaho Street
Boise, Idaho 83702

June 2017

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ACRONYMS AND ABBREVIATIONS

BLM	Bureau of Land Management
EFSC or Council	Energy Facility Siting Council
HMP	Habitat Mitigation Plan
ILF	in-lieu fee
IPC	Idaho Power Company
MZ	Management Zone
OAR	Oregon Administrative Rules
ODOE	Oregon Department of Energy
ODFW	Oregon Department of Fish and Wildlife
Project	Boardman to Hemingway Transmission Line Project
WAGS	Washington ground squirrel

1.0 INTRODUCTION

To obtain an Oregon Energy Facility Siting Council (EFSC or Council) site certificate for the Boardman to Hemingway Transmission Line Project (Project), Idaho Power Company (IPC) must show that the design, construction, and operation of the Project, taking into account mitigation, is consistent with the Oregon Department of Fish and Wildlife's (ODFW) Habitat Mitigation Policy at Oregon Administrative Rule (OAR) 635-415-0025 (see OAR 345-022-0060, EFSC's Fish and Wildlife Habitat Standard). This Fish and Wildlife Habitat Mitigation Plan (HMP) sets forth the mitigation measures IPC will implement to achieve the goals and standards of ODFW's Habitat Mitigation Policy with respect to fish and wildlife species other than the greater sage-grouse (*Centrocercus urophasianus)*, which is addressed in the Greater Sage-Grouse Habitat Mitigation Plan (Exhibit P2, Attachment P2-3).

As background, IPC considered avoidance of sensitive resources a priority throughout the siting process, as explained in the Project's Siting Study (Exhibit B, Attachment B-1), 2012 Siting Study Supplement (Exhibit B, Attachment B-2), and 2015 Supplemental Siting Study (Exhibit B, Attachment B-3). In particular, IPC's initial siting process avoided sensitive resource areas to the extent practical, including Bureau of Land Management (BLM) designated areas of critical environmental concern, BLM-designated wilderness study areas, waterbodies (including wetlands, wild and scenic rivers, streams that support special status species), areas with sensitive wildlife resources (e.g., sage-grouse leks, Washington ground squirrel colonies, raptor nests), U.S. Department of Agriculture Forest Service designated visual resource retention and preservation lands and inventoried roadless areas, city and town boundaries, and irrigated agriculture. Furthermore, the Project is designed to follow existing developments and utility corridors, such as existing roads and transmission lines, to the extent practical and without violating the Western Electricity Coordinating Council's reliability criteria, in order to consolidate impacts on areas that have already been disturbed as opposed to impacting undisturbed areas. IPC will also implement measures during construction and maintenance that are intended to minimize impacts on the environment, and specifically fish and wildlife habitat. Regardless of the efforts to site the Project to avoid high value fish and wildlife habitat and the implementation of measures to minimize impacts on fish and wildlife habitat, unavoidable impacts from the Project will occur.

This Fish and Wildlife HMP presents the direct and indirect impacts to fish and wildlife habitats, provides an approach for quantifying the impact debits resulting from the Project and the mitigation credits created through the proposed mitigation projects, and sets forth a schedule for implementing the necessary mitigation projects. Consistent with the ODFW Habitat Mitigation Policy, mitigation measures will be implemented and completed either prior to or concurrent with the Project.

If, after review and potential approval by EFSC of the Fish and Wildlife HMP, should the approved mitigation projects no longer be available, or if IPC decides to select another mitigation project not previously considered by EFSC, or if the reviewed mitigation projects do not provide sufficient mitigation credit and additional mitigation is necessary, IPC will amend the Fish and Wildlife HMP and submit the same to Oregon Department of Energy (ODOE) for its approval.

2.0 APPLICABLE RULES AND AGENCY GUIDANCE

2.1 General Standards for Siting Facilities

The Fish and Wildlife Habitat Standard at OAR 345-022-0060 states:

> *For the Council to issue a site certificate, it must find that the design, construction, and operation of the facility, taking into account mitigation, are consistent with the fish and wildlife habitat mitigation goals and standards of OAR 635-415-0025 in effect as of September 1, 2000.*

2.2 Implementation of ODFW Habitat Mitigation Recommendations

OAR 635-415-0025[2] provides the following:

> *(1) "Habitat Category 1" is irreplaceable, essential habitat for a fish or wildlife species, population, or a unique assemblage of species and is limited on either a physiographic province or site-specific basis, depending on the individual species, population or unique assemblage.*
>
>> *(a) The mitigation goal for Category 1 habitat is no loss of either habitat quantity or quality.*
>>
>> *(b) The Department shall act to protect Category 1 habitats described in this subsection by recommending or requiring:*
>>
>>> *(A) Avoidance of impacts through alternatives to the proposed development action; or*
>>>
>>> *(B) No authorization of the proposed development action if impacts cannot be avoided.*
>
> *(2) "Habitat Category 2" is essential habitat for a fish or wildlife species, population, or unique assemblage of species and is limited either on a physiographic province or site-specific basis depending on the individual species, population or unique assemblage.*
>
>> *(a) The mitigation goal if impacts are unavoidable, is no net loss of either habitat quantity or quality and to provide a net benefit of habitat quantity or quality.*
>>
>> *(b) The Department shall act to achieve the mitigation goal for Category 2 habitat by recommending or requiring:*
>>
>>> *(A) Avoidance of impacts through alternatives to the proposed development action; or*
>>>
>>> *(B) Mitigation of impacts, if unavoidable, through reliable in-kind, in-proximity habitat mitigation to achieve no net loss of either pre-development habitat quantity or quality. In addition, a net benefit of habitat quantity or quality must be provided. Progress towards achieving the mitigation goals and standards shall be reported on a schedule agreed to in the mitigation plan performance measures. The fish and wildlife mitigation measures shall be implemented and completed either prior to or concurrent with the development action.*
>>
>> *(c) If neither 635-415-0025(2)(b)(A) or (B) can be achieved, the Department shall recommend against or shall not authorize the proposed development action.*

(3) "Habitat Category 3" is essential habitat for fish and wildlife, or important habitat for fish and wildlife that is limited either on a physiographic province or site-specific basis, depending on the individual species or population.

(a) The mitigation goal is no net loss of either habitat quantity or quality.

(b) The Department shall act to achieve the mitigation goal for Category 3 habitat by recommending or requiring:

(A) Avoidance of impacts through alternatives to the proposed development action; or

(B) Mitigation of impacts, if unavoidable, through reliable in-kind, in-proximity habitat mitigation to achieve no net loss in either pre-development habitat quantity or quality. Progress towards achieving the mitigation goals and standards shall be reported on a schedule agreed to in the mitigation plan performance measures. The fish and wildlife mitigation measures shall be implemented and completed either prior to or concurrent with the development action.

c) If neither 635-415-0025(3)(b)(A) or (B) can be achieved, the Department shall recommend against or shall not authorize the proposed development action.

(4) "Habitat Category 4" is important habitat for fish and wildlife species.

(a) The mitigation goal is no net loss in either existing habitat quantity or quality.

(b) The Department shall act to achieve the mitigation goal for Category 4 habitat by recommending or requiring:

(A) Avoidance of impacts through alternatives to the proposed development action; or

(B) Mitigation of impacts, if unavoidable, through reliable in-kind or out-of-kind, in-proximity or off-proximity habitat mitigation to achieve no net loss in either pre-development habitat quantity or quality. Progress towards achieving the mitigation goals and standards shall be reported on a schedule agreed to in the mitigation plan performance measures. The fish and wildlife mitigation measures shall be implemented and completed either prior to or concurrent with the development action.

(c) If neither 635-415-0025(4)(b)(A) or (B) can be achieved, the Department shall recommend against or shall not authorize the proposed development action.

(5) "Habitat Category 5" is habitat for fish and wildlife having high potential to become either essential or important habitat.

(a) The mitigation goal, if impacts are unavoidable, is to provide a net benefit in habitat quantity or quality.

(b) The Department shall act to achieve the mitigation goal for Category 5 habitat by recommending or requiring:

(A) Avoidance of impacts through alternatives to the proposed development action; or

(B) Mitigation of impacts, if unavoidable, through actions that contribute to essential or important habitat.

(c) If neither 635-415-0025(5)(b)(A) or (B) can be achieved, the Department shall recommend against or shall not authorize the proposed development action.

(6) "Habitat Category 6" is habitat that has low potential to become essential or important habitat for fish and wildlife.

(a) The mitigation goal is to minimize impacts.

(b) The Department shall act to achieve the mitigation goal for Category 6 habitat by recommending or requiring actions that minimize direct habitat loss and avoid impacts to off-site habitat.

(7) For proposed developments subject to this rule with impacts to greater sage-grouse habitat in Oregon, mitigation shall be addressed as described in OAR 635-140-0000 through 635-140-0025, except that any energy facility that has submitted a preliminary application for site certificate pursuant to ORS 469.300 et seq. on or before the effective date of this rule is exempt from fulfilling the avoidance test contained in 635-140-0025, Policy 2, subsections (a), (b), (c) and (d)(A). Other mitigation provisions contained in 635-140-0025, Policy 2, subsections (d)(B) and (e), and Policies 3 and 4 remain applicable.

2.3 ODFW Mitigation Framework for Indirect Road Impacts to Rocky Mountain Elk Habitat

In April 2015, ODFW provided IPC with guidance on mitigation for impacts to Rocky Mountain elk (*Cervus canadensis nelsoni*). The guidance document is entitled *Mitigation Framework for Indirect Road Impacts to Rocky Mountain Elk Habitat* (Elk Mitigation Framework) (ODFW 2015). The Elk Mitigation Framework provides a methodology for quantifying the area of indirect impacts from energy facility roads and provides guidance for how ODFW will consider indirect impacts to elk habitat under their Habitat Mitigation Policy. Indirect impacts are calculated in Exhibit P3 and are presented in summary in this Fish and Wildlife HMP.

3.0 ANALYSIS

3.1 Avoidance

ODFW's Habitat Mitigation Policy sets forth a mitigation goal for each of Habitat Category 1 through 6, and provides recommendations or requirements ODFW shall take to achieve the mitigation goals. Depending on the habitat category, ODFW's recommendations or requirements provide that the project proponent must avoid impacts to the habitat or at least consider avoidance of the habitat.

3.1.1 Habitat Category 1

For Habitat Category 1, ODFW's recommendations or requirements provide that impacts to the habitat must be avoided through alternatives to the proposed development action or the project should not be authorized (see OAR 635-415-00252(1)(b)). Here, the Project Site Boundary includes Category 1 habitat associated with raptor nests. Although trees or structures with raptor nests are managed as Category 1 habitat, they are not included in the habitat categorization analysis for acres of Category 1 habitat because of their relatively small size on the landscape. To ensure that Category 1 raptor nests and raptor breeding activities are not disturbed by Project activities, the seasonal and spatial restrictions identified in Exhibit P1, Attachment P1-10 and listed in Exhibit P1, Section 3.5.3.1 will be applied.

There is potential for Category 1 Washington ground squirrel (*Urocitellus washingtoni*, WAGS) habitat to be identified within the Site Boundary during future surveys. IPC has modified the Project location to avoid Category 1 WAGS habitat in the past and will perform WAGS surveys in the future within previously unsurveyed areas to identify Category 1 WAGS habitat for avoidance. IPC is proposing site certificate conditions that will ensure that surveys for raptor nests and WAGS are conducted within an appropriate timeframe prior to construction, that seasonal restrictions are applied to raptor nests to avoid impacts to Category 1 habitat, and that all construction activities avoid Category 1 WAGS habitat. WAGS surveys will be used to complete final design, facility layout, and micrositing of facility components and IPC will not construct any facility components within areas of Category 1 habitat and will avoid temporary disturbance of Category 1 habitat. Refer to Fish and Wildlife Condition 18, Fish and Wildlife Condition 19, and Threatened and Endangered Species Condition 1 in Exhibit P1 and Exhibit Q, Section 4.0. Accordingly, the Project will avoid impacts to Category 1 habitat consistent with ODFW's Habitat Mitigation Policy, and no compensatory mitigation is required or proposed.

3.1.2 Habitat Categories 2 through 6

ODFW's recommendations or requirements for meeting the mitigation goals for Habitat Categories 2 through 6 provide that the project proponent must consider avoiding impacts to the relevant habitats. However, unlike with Habitat Category 1, strict avoidance is not a requirement in Habitat Categories 2 through 6. Rather, unavoidable impacts to Habitat Categories 2 through 5 may be excused by showing the impacts will be mitigated for, and unavoidable impacts to Habitat Category 6 need only be minimized (see OAR 635-415-00252(2)(b)(B), (3)(b)(B), (4)(b)(B), (5)(b)(B), and (6)(b)). Here, as discussed in Exhibit P1, Section 3.5.6, IPC considered avoidance of sensitive resources related to fish and wildlife habitat during initial routing of the Project. IPC is proposing measures to be implemented during construction and operation that will avoid and minimize impacts to fish and wildlife habitats (see Exhibit P1, Section 3.5.6).

3.2 Minimization

3.2.1 Habitat Categories 2 through 5

ODFW's Habitat Mitigation Policy does not specify that unavoidable impacts to Habitat Categories 2 through 5 must be minimized, in addition to being mitigated. Regardless, the minimization measures that IPC is proposing (Exhibit P1, Section 3.5.6) will be implemented Project-wide and across all habitat categories. Therefore, the measures will minimize impacts to Habitat Categories 2 through 5 even though the Habitat Mitigation Policy does not expressly provide for the same.

3.2.2 Habitat Category 6

ODFW's Habitat Mitigation Policy provides for minimizing impacts to Habitat Category 6 and does not require compensatory mitigation for such impacts (see OAR 635-415-00252(6)(b)). Implementation of the Reclamation and Revegetation Plan (Exhibit P1, Attachment P1-3) will minimize impacts to Habitat Category 6 consistent with ODFW's Habitat Mitigation Policy, and no compensatory mitigation is required or proposed.

3.3 Compensatory Mitigation

For unavoidable impacts to Habitat Categories 2 through 5, compensatory mitigation will be required. The following discussion presents the potential impacts to Habitat Categories 2 through 5 and proposed mitigation projects that could be used to offset the Project impacts.

3.3.1 Quantifying Project Impacts

IPC determined the number of fish and wildlife habitat acres impacted by the Project as follows:

- ***Direct impacts to habitat***: IPC identified habitat types within the Site Boundary consistent with the Habitat Mitigation Policy (see Exhibit P1 and Attachment P1-1). IPC then identified the direct impacts of the Project to each habitat type by calculating the number of acres of each habitat type within the construction and operation footprints. The analysis of direct impacts to the habitat types is discussed in more detail below in Section 3.3.1.1, and the resulting impact acres are set forth below in Table 1.
- ***Indirect impacts to elk summer and winter range***: Consistent with ODFW guidance, IPC did not quantify indirect impacts to fish and wildlife habitat, except with respect to elk and sage-grouse. Exhibit P2 discusses sage-grouse impacts and mitigation. IPC quantified the indirect impacts of the Project to elk summer and winter range based on the methodology and principles set forth in the Elk Mitigation Framework. Indirect impacts are calculated in Exhibit P3 and presented in summary in this Fish and Wildlife HMP.
- ***Impacts to greater sage-grouse***: IPC addresses impacts to sage-grouse in Exhibit P2 and Attachment P2-3.

3.3.1.1 Impacts to Habitat

The location of the Project presented in this application is based on a preliminary design developed in September of 2016. Direct and indirect impacts, both temporary and permanent, to fish and wildlife habitat have been estimated using the preliminary design. IPC will update the estimated impacts contained within this Fish and Wildlife HMP based upon the final design of the Project which will occur after issuance of a site certificate and prior to construction. In the third year of operation, IPC will submit a report to ODOE presenting the final compensatory mitigation calculations based on the as-constructed footprint of the Project and showing mitigation is commensurate with those final numbers. The report will come in the third year of operation and not sooner, because the elk mitigation calculations are dependent on the post-construction traffic study that will take place during Year 2 of operation.

Direct Impacts to Habitat

Exhibit P1, Section 3.5.2.4 quantifies the direct impacts of the Proposed Route and alternatives by habitat category, habitat type, and impact type (temporary or permanent). Table 1 quantifies the direct impacts of the Proposed Route and alternatives by habitat category, general vegetation type, and impact type. The general vegetation types are groupings of similar habitat types (see Exhibit P1, Attachment P1-1).

Table 1. Estimated Acreage of Temporary and Permanent Direct Impacts by General Vegetation Type

Habitat Category and General Vegetation Type	Proposed Route		West of Bombing Range Road Alternative 1		West of Bombing Range Road Alternative 2		Morgan Lake Alternative		Double Mountain Alternative	
	Temp[1]	Perm	Temp	Perm	Temp	Perm	Temp	Perm	Temp	Perm
Category 2										
Agriculture / Developed[2]	95.0	10.6								
Bare Ground	2.0	0.3	–	–	–	–	–	–	2.0	0.5
Forest / Woodland	6.8	536.1	–	–	–	–	68.1	12.5	–	–
Open Water / Wetlands	1.0	0.5	–	–	–	–	0.0	0.0	0.0	0.0
Riparian Vegetation	0.6	0.4	–	–	–	–	0.0	0.0	–	–
Shrub / Grassland	1,990.9	334.2	6.3	0.4	6.3	0.4	137.9	19.3	21.9	1.2
Subtotal	*2,123.1*	*882.7*	*6.3*	*0.4*	*6.3*	*0.4*	*206.1*	*31.9*	*23.9*	*1.6*
Category 3										
Agriculture / Developed	10.1	0.8	–	–	–	–	–	–	–	–
Bare Ground	0.3	0.1	–	–	–	–	–	–	0.1	0.0
Forest / Woodland	16.0	458.0	–	–	–	–	31.4	5.8	–	–
Open Water / Wetlands	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Riparian Vegetation	5.5	0.1	–	–	–	–	–	–	–	–
Shrub / Grassland	312.4	29.9	0.0	0.0	0.8	0.8	–	–	36.5	3.5
Subtotal	*344.6*	*489.1*	*0.0*	*0.0*	*0.8*	*0.8*	*31.4*	*5.8*	*36.6*	*3.5*
Category 4										
Open Water / Wetlands	0.0	0.0	–	–	–	–	–	–	–	–
Shrub / Grassland	165.3	26.1	4.9	0.7	6.2	1.2	–	–	15.8	2.5
Subtotal	*165.3*	*26.1*	*4.9*	*0.7*	*6.2*	*1.2*	–	–	*15.8*	*2.5*
Category 5										
Forest / Woodland	–	–	–	–	–	–	0.0	0.0	–	–
Shrub / Grassland	329.3	43.3	13.4	2.5	5.7	1.7	–	–	57.3	16.3
Subtotal	*329.3*	*43.3*	*13.4*	*2.5*	*5.7*	*1.7*	–	–	*57.3*	*16.3*

Habitat Category and General Vegetation Type	Proposed Route		West of Bombing Range Road Alternative 1		West of Bombing Range Road Alternative 2		Morgan Lake Alternative		Double Mountain Alternative	
	Temp[1]	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**
Category 6										
Agriculture / Developed	389.0	259.8	2.3	1.6	1.9	1.5	78.8	15.5	0.1	4.8
Subtotal	*389.0*	*259.8*	*2.3*	*1.6*	*1.9*	*1.5*	*78.8*	*15.5*	*0.1*	*4.8*
TOTAL	**3,351.4**	**1,701.0**	**26.9**	**5.3**	**20.9**	**5.7**	**316.3**	**53.3**	**133.7**	**28.8**

[1] Temporary impacts will be reclaimed as described in Exhibit P1, Attachment P1-3, Reclamation and Revegetation Plan.
[2] The Category 2 Agriculture / Developed general vegetation type includes areas that appear to be in CRP within elk or mule deer winter range.
0.0 = less than 0.05 acre; – = 0.

In categorizing fish and wildlife habitat to identify Project impacts, ODFW directed IPC to consider impacts to the following species-specific habitats: WAGS habitat, elk winter and summer range, mule deer (*Odocoileus hemionus*) winter and summer range, and California bighorn sheep (*Ovis canadensis californiana)* herd range (see Exhibit P1, Attachment P1-1, Appendix A). The preceding quantification of direct impacts includes, in part, impacts to those species-specific habitats. However, in many instances, those species-specific habitats overlap with each other—for example, a particular acre may be considered both elk winter range and mule deer winter range. For purposes of quantifying total acres of direct impacts, IPC counted each acre within the construction and operation footprint only once, even though certain acres may include more than one of the relevant species-specific habitats. Even so, Table 2 shows the acres of direct impacts that occur within each species-specific habitat.

Table 2. Estimated Acreage of Direct Impacts within Wildlife Habitat Layers

Wildlife Habitat Layer	Habitat Category	Acres of Impact				
		Proposed Route	**West of Bombing Range Road Alt. 1**	**West of Bombing Range Road Alt. 2**	**Morgan Lake Alternative**	**Double Mountain Alternative**
WAGS Habitat	2	22.4	6.7	6.7	–	–
Elk Winter Range	2	416.3	–	–	89.6	–
Elk Summer Range	3	132.1	–	–	61.3	–
Mule Deer Winter Range	2	2,951.8	–	–	235.2	25.6
Mule Deer Summer Range	3	894.6	–	–	100.3	–
California Bighorn Sheep Herd Range	2	15.8	–	–	–	–

Indirect Impacts to Habitat

Indirect impacts to fish and wildlife habitat will occur during construction and operation of the Project as described in Exhibits P1 and P3. The nature and extent of indirect impacts varies depending on the species and habitat being affected. There is no guidance on quantifying indirect impacts to fish and wildlife species or their habitat, other than for elk (see Exhibit P3) and sage-grouse (see Exhibit P2). Further, ODFW has advised IPC that ODFW does not require compensatory mitigation for indirect impacts to habitat beyond such impacts to elk habitat and sage-grouse habitat. Therefore, compensatory mitigation for indirect impacts is required only for elk habitat and sage-grouse habitat to meet the goals and objectives of ODFW's Habitat Mitigation Policy. IPC is only proposing compensatory mitigation for indirect impacts to elk habitat within this HMP. Compensatory mitigation for indirect impacts to sage-grouse is presented in Exhibit P2, Attachment P2-3.

3.3.1.2 Impacts to Elk Summer and Winter Range

Direct Impacts to Elk Summer and Winter Range

Direct impacts to elk summer and winter range are included in the direct impacts set forth above in Section 3.3.1.1, Table 2.

Indirect Impacts to Elk Summer and Winter Range

The description and quantification of indirect impacts to elk are detailed in Exhibit P3, Section 3.5.4. For the Proposed Route, indirect impacts to summer range total 5.6 acres and indirect impacts to winter range total 428.0 acres. For the Morgan Lake Alternative, indirect impacts to summer range total 152.7 acres and indirect impacts to winter range total 175.8 acres.

3.3.1.3 Direct and Indirect Impact Summary

Approximately 5,052 acres of Category 2 through Category 6 habitat will be directly affected during construction of the Proposed Route and approximately 434 acres of elk habitat will be indirectly affected due to anticipated traffic increases from new and improved roads associated with the Proposed Route. These disturbances will occur over 270.8 miles of transmission line, crossing five counties in Oregon. The Project crosses four Level III ecoregions: the Columbia Plateau, the Blue Mountains, the Snake River Plain, and the Northern Basin and Range (EPA 2011).

Summarizing impacts within an ecoregional framework will assist in describing potential mitigation (Section 4.2) and accounting for mitigation debits and credits (Section 4.3). For purposes of this Fish and Wildlife HMP, the boundaries of the four ecoregions crossed by the Project are modified slightly and referred to as mitigation zones (MZ) (Figure 1). Mitigation Zone 1 (MZ1) corresponds to the Columbia Plateau ecoregion. MZ2 corresponds to the Blue Mountain ecoregion, without its Continental Zone Foothills Level IV ecoregion. MZ3 combines the Snake River Plain, Northern Basin and Range, and the Continental Zone Foothills of the Blue Mountains ecoregion into a single zone. This was done to group the mitigation debits and credits from the shrub/grassland vegetation type within the Baker, Keating, and Durkee valleys with those in the Northern Basin and Range and Snake River Plain.

Impacts are summarized for the Proposed Route only. The two West of Bombing Range Road alternatives are in MZ1, the Morgan Lake Alternative is in MZ2, and the Double Mountain Alternative is in MZ3. Since each of the alternatives is wholly contained within an MZ, Table 1 and Table 2 above can be referenced for direct impacts. Section 3.3.1.2 quantifies the indirect impacts on elk habitat associated with the Morgan Lake alternative contained within MZ2.

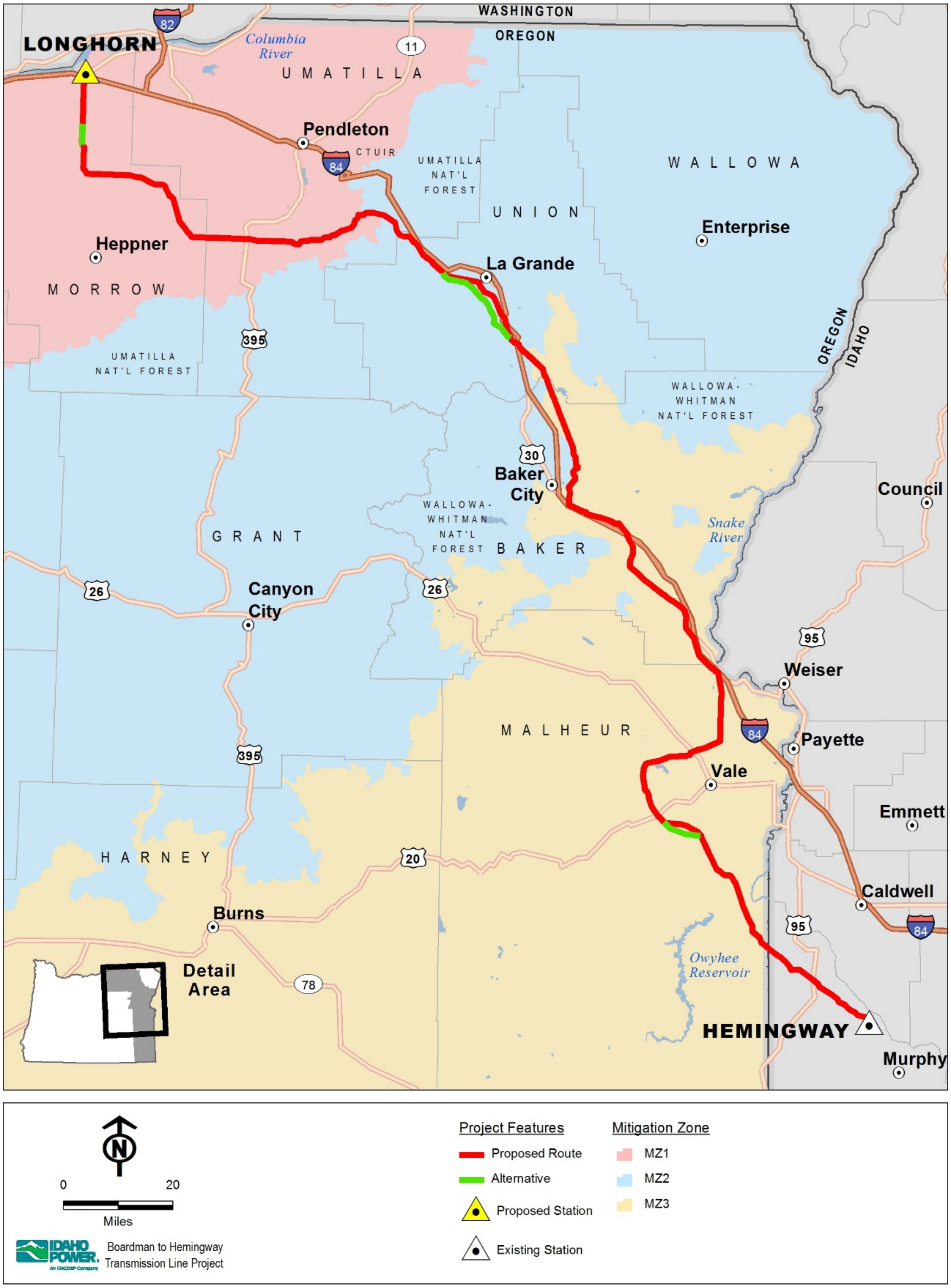

Figure 1. Mitigation Zones

MZ1 Impacts

MZ1 encompasses the northern portion of the Proposed Route from the Longhorn Station, through the Naval Weapons System Training Facility Boardman, east from Morrow County into Umatilla County, across highway 395 and into the foothills of the Blue Mountains south and east of Pilot Rock, Oregon. Approximately 1,173 acres of direct impacts and 0 acres of indirect impacts are anticipated within MZ1, with a majority of impacts occurring within agriculture/developed and shrub/grassland general vegetation types (Table 3). Impacts on the shrub/grassland general vegetation type occur mostly within the introduced upland vegetation and native grassland habitat types, with fewer impacts occurring in shrubland habitat types.

Table 3. Direct and Indirect Impacts from the Proposed Route on General Vegetation Types by ODFW Habitat Categories in MZ1

General Vegetation Type	ODFW Habitat Categories (acres)					Total	*General Veg. Type Subtotal Temporary*	*General Veg. Type Subtotal Permanent*
	2	3	4	5	6			
Direct Impacts								
Agriculture/ Developed	105.6	10.9	–	–	290.9	**407.4**	***300.8***	***106.7***
Forest/ Woodland	7.6	–	–	–	–	**7.6**	**–**	***7.6***
Open Water/ Wetlands	0.5	0.0	–	–	–	**0.5**	***0.3***	***0.2***
Riparian Vegetation	0.5	0.1	–	–	–	**0.6**	***0.4***	***0.2***
Shrub/ Grassland	609.0	14.6	19.2	113.8	-	**756.5**	***643.5***	***113.0***
Indirect Impacts								
Impact Area[1]	–	–	–	–	–	**–**	**–**	**–**
Totals								
Total	**724.0**	**25.6**	**19.2**	**113.8**	**290.9**	**1,173.4**	***945.7***	***227.7***
Category Subtotal Temporary	***614.1***	***21.5***	***15.8***	***98.8***	***195.6***	***945.7***	–	–
Category Subtotal Permanent	***109.9***	***4.1***	***3.5***	***15.0***	***95.2***	***227.7***	–	–

[1]The vegetation composition of the indirect impact area in elk summer and winter range has not been attributed at this time. Currently, no indirect impacts to elk summer or winter range have been identified within MZ1.
Note: 0.0 = less than 0.05 acre; – = 0

Within MZ1, impacts overlap with habitat for WAGS, elk, and mule deer. Table 4 identifies the acreage of each wildlife habitat layer within MZ1 that will be affected by the Proposed Route. MZ1 contains all of the Project’s impacts on WAGS habitat.

Table 4. Direct and Indirect Impacts from the Proposed Route on Wildlife Habitat in MZ1

Wildlife Habitat Layer[1]	Habitat Category	Impact Type			***Total***
		Temp	Perm	Indirect	
WAGS	2	19.7	2.7	–	***22.4***
Elk winter range	2	54.6	8.5	–	***63.2***
Elk summer range	3	20.4	2.8	–	***23.2***
Mule deer winter range	2	593.8	106.4	–	***700.2***
Mule deer summer range	3	–	–	–	***–***

[1] Habitat layers overlap each other; therefore, acres of impact between habitat layers should not be added together.
Note: – = 0

MZ2 Impacts

MZ2 encompasses the central portion of the Proposed Route from the foothills of the Blue Mountains east of Pilot Rock, Oregon, from Umatilla County across the Blue Mountains into Union County past La Grande, Oregon, to where the Project crosses Interstate 84 near Ladd Canyon and Craig Mountain in the Clover Creek Valley area. Approximately 1,453 acres of direct impacts and 6.3 acres of indirect impacts are anticipated within MZ2, with a majority of impacts occurring within forest/woodland and shrub/grassland general vegetation types (Table 5). Impacts on the forest/woodland general vegetation type occur mostly within the Douglas-fir / mixed grand fir habitat type, as well as ponderosa pine habitat type. A 250-foot-wide corridor around the centerline is assumed to be a permanent disturbance to the forest/woodland general vegetation type within MZ2 because of the vegetation management that will occur under the line. To keep vegetation clear of the conductors, a 250-foot-wide area will be treated and maintained such that a forest/woodland vegetation type cannot reestablish. This is reflected by the greater amount of permanent impacts than temporary impacts to forest/woodland in MZ2. Impacts on shrub/grassland general vegetation type occur mostly within the native grassland and shrub-steppe habitat types.

Table 5. Direct and Indirect Impacts from the Proposed Route on General Vegetation Types by ODFW Habitat Categories in MZ2

General Vegetation Type	ODFW Habitat Categories (acres)						Total	***General Veg Type Subtotal Temporary***	***General Veg Type Subtotal Permanent***
	1	2	3	4	5	6			
Direct Impacts									
Agriculture/ Developed	–	–	–	–	–	179.2	**179.3**	***137.7***	***41.4***
Bare Ground	–	–	–	–	–	–	**–**	***–***	***–***
Forest/ Woodland	–	388.5	474.0	–	–	–	**862.5**	***22.2***	***840.4***
Shrub/ Grassland	–	187.8	163.5	15.4	12.6	–	**379.4**	***345.7***	***33.7***
Open Water/ Wetlands	–	0.1	0.2	0.0	–	–	**0.3**	***0.2***	***0.1***
Riparian Vegetation	–	0.0	5.4	–	–	–	**5.4**	***5.4***	***0.1***

General Vegetation Type	ODFW Habitat Categories (acres)						Total	*General Veg Type Subtotal Temporary*	*General Veg Type Subtotal Permanent*
	1	**2**	**3**	**4**	**5**	**6**			
Indirect Impacts									
Impact Area[1]	–	–	6.3	–	–	–	***6.3***	–	***6.3***
Totals									
Total	–	**602.4**	**649.4**	**15.4**	**12.6**	**179.2**	**1,459.1**	***536.8***	***922.3***
Category Subtotal Temporary	–	***198.5***	***176.4***	***12.5***	***11.6***	***137.7***	***536.8***	–	–
Category Subtotal Permanent	–	***403.9***	***473.0***	***2.9***	***1.1***	***41.4***	***922.3***	–	–

[1]The vegetation composition of the indirect impact area in elk summer and winter range has not been attributed at this time.
Note: 0.0 = less than 0.05 acre; – = 0.

Within MZ2, impacts overlap with habitat for elk and mule deer. Table 6 identifies the acreage of each wildlife habitat layer within MZ2 that will be affected by the Proposed Route. Table 6 includes the indirect impacts within elk winter range and elk summer range. Elk and deer seasonal ranges cover a vast majority of the impacts from the Proposed Route that occur within MZ2, speaking to the importance of this zone to big game species.

Table 6. Direct and Indirect Impacts from the Proposed Route on Wildlife Habitat in MZ2

Wildlife Habitat Layer[1]	Habitat Category	Impact Type			*Total*
		Temp	**Perm**	**Indirect**	
Elk winter range	2	83.2	137.9	–	***221.1***
Elk summer range	3	23.0	86.2	6.3	***115.6***
Mule deer winter range	2	169.8	403.2	–	***573.0***
Mule deer summer range	3	180.0	503.4	–	***683.4***

[1] Habitat layers overlap each other; therefore, acres of impact between habitat layers should not be added together.
Note: – = 0

MZ3 Impacts

MZ3 encompasses the southern portion of the Proposed Route, from south of Ladd Canyon and Craig Mountain in the Clover Creek Valley area, across the Union/Baker county line, east of the Baker Valley across the Burnt River Canyon towards Huntington, Oregon and the remainder of the Project area in Malheur County. MZ3 is the largest mitigation zone and is where most of the Project's direct impacts occur. Approximately 2,642 acres of direct impacts and 432.7 acres of indirect impacts are anticipated within MZ3, with a vast majority of impacts occurring within the shrub/grassland general vegetation type (Table 7). Impacts on the shrub/grassland general vegetation type occur mostly within the shrub-steppe with big sage and introduced upland vegetation habitat types, with fewer impacts in native grassland and other shrub habitat types.

Table 7. Direct and Indirect Impacts from the Proposed Route on General Vegetation Types by ODFW Habitat Categories in MZ3

General Vegetation Type	ODFW Habitat Categories (acres)						Total	General Veg Type Subtotal Temporary	General Veg Type Subtotal Permanent
	1	2	3	4	5	6			
Direct Impacts									
Agriculture/ Developed	–	–	–	–	–	178.8	**178.8**	***55.7***	***123.2***
Bare Ground	–	2.3	0.4	–	–	–	**2.7**	***2.3***	***0.4***
Forest/ Woodland	–	146.8	–	–	–	–	**146.8**	***0.6***	***146.2***
Shrub/ Grassland	–	1,306.5	221.8	156.8	246.1	–	**2,095.6**	***1,808.7***	***286.9***
Open Water/ Wetlands	–	0.9	0.3	0.0	–	–	**1.2**	***0.8***	***0.4***
Riparian Vegetation	–	0.5	0.0	–	–	–	**0.5**	***0.3***	***0.2***
Indirect Impacts									
Impact Area[1]	–	427.3	–	–	–	–	**427.3**	**–**	***427.3***
Totals									
Total	–	**2,106.7**	**165.0**	**156.8**	**246.1**	**178.8**	**2,853.5**	***1,868.9***	***984.6***
Category Subtotal Temporary	**–**	***1,310.5***	***146.7***	***137.1***	***219.0***	***55.7***	***1,868.9***	–	–
Category Subtotal Permanent	**–**	***796.2***	***18.3***	***19.7***	***27.2***	***123.2***	***984.6***	–	–

[1] The vegetation composition of the indirect impact area in elk summer and winter range has not been attributed at this time.
Note: 0.0 = less than 0.05 acre; – = 0

Within MZ3, impacts overlap with habitat for elk, mule deer, and California bighorn sheep. Table 8 identifies the acreage of impacts to each wildlife habitat layer within MZ3 that will be affected by the Proposed Route. Table 8 includes the indirect impacts within elk winter range and elk summer range. The East Beulah Management Unit is managed by ODFW as an elk de-emphasis area and occurs within MZ3. Project impacts' habitat categories are not modified by overlap with elk winter and summer range within the de-emphasis area.

Table 8. Direct and Indirect Impacts from the Proposed Route on Wildlife Habitat in MZ3

Wildlife Habitat Layer[1]	Habitat Category	Impact Type			*Total*
		Temp	Perm	Indirect	
Elk winter range	2	100.8	32.3	427.3	***566***
Elk summer range	3	–	–	–	***–***
Mule deer winter range	2	1,309.9	368.7	–	***1,678.7***
Mule deer summer range	3	108.7	102.5	–	***211.2***
California Bighorn Sheep Herd Range	2	1.6	14.2	–	***15.8***

[1] Habitat layers overlap each other; therefore, acres of impact between habitat layers should not be added together.
Note: – = 0

3.3.2 Calculating Debits

Permanent impacts will be mitigated through the restoration, establishment, enhancement, and/or preservation of similar habitat. Table 9 outlines the approach to calculating the mitigation debit accrued from permanent impacts.

Table 9. Accounting for Mitigation Debit for Permanent Direct Impacts

Habitat	Impact Acres	Mitigation Debit	Mitigation Explanation
Category 2	1	>1	The mitigation goal for Category 2 habitat is "no net loss" and "net benefit." Accordingly, mitigation for permanent impacts on Category 2 habitat needs to demonstrate a net benefit in quality or quantity. Mitigation debits are accrued at a greater amount of acreage than what is impacted by the Project.
Category 3 & Category 4	1	1	The mitigation goal for Category 3 & 4 habitat is "no net loss" in quantity or quality. Mitigation debits are accrued at an equal amount of acreage to what is impacted by the Project.
Category 5	1	<1	The mitigation goal for Category 5 habitat is a "net benefit in habitat quantity or quality." Mitigation debits are accrued at a lesser amount (but greater than zero) of acreage than what is impacted by the Project; however, mitigation actions performed to offset the Category 5 debits will be improving the quality of Category 2, 3, or 4 habitats and result in a net benefit to quality.
Category 6	1	0	The mitigation goal for impacts on Category 6 habitat is minimization; no compensatory mitigation proposed. A majority of impacts on Category 6 habitat occurs within agricultural areas. IPC has prepared an Agricultural Impacts Mitigation Plan (Exhibit K, Attachment K-1) to address these impacts.

Temporary impacts will be restored during reclamation. IPC plans for reclamation to be successful. IPC will mitigate beyond reclamation for temporary impacts on Category 2 habitat to meet the net benefit requirement. IPC is also proposing to mitigate beyond reclamation for the temporal loss of Category 2, 3, and 4 habitat functionality that occurs from temporary impacts during recovery of habitat. Table 10 outlines the approach to calculating the mitigation debit accrued from temporary impacts.

Table 10. Accounting for Mitigation Debit for Temporary Direct Impacts

Habitat	Impact Acres	Mitigation Debit	Mitigation Explanation
Category 2	1	>1	The mitigation goal for Category 2 habitat is “no net loss” and “net benefit.” Accordingly, mitigation for temporary impacts on Category 2 habitat needs to demonstrate a net benefit in quality or quantity. Mitigation debits are accrued at a greater amount of acreage than what is impacted by the Project. All areas of temporary disturbance will be revegetated at the site of impact. Mitigation debits are accrued to meet the “net benefit” requirement and to account for the temporal loss of habitat function during reclamation.
Category 3 & Category 4	1	<1	The mitigation goal for Category 3 & 4 habitat is “no net loss” in quantity or quality. Mitigation debits are accrued at a lesser amount (but greater than 0) of acreage than what is impacted by the Project. All areas of temporary disturbance will be revegetated at the site of impact. Mitigation debits are accrued to account for the temporal loss of habitat function during reclamation.
Category 5	1	0	The mitigation goal for Category 5 habitat is a “net benefit in habitat quantity or quality.” IPC assumes that reclamation activities will result in a higher functioning habitat and therefore be a “net benefit” in habitat quality for all temporary impacts on Category 5 habitat; therefore, no mitigation debits are accrued.
Category 6	1	0	The mitigation goal for Category 6 habitat is minimization; no mitigation debits are accrued. A majority of impacts on Category 6 habitat occurs within agricultural areas. IPC has prepared an Agricultural Impacts Mitigation Plan (Exhibit K, Attachment K-1) to address these impacts.

Indirect impacts on elk winter range, a Category 2 habitat, and elk summer range, a Category 3 habitat, will be mitigated similar to permanent impacts. Table 11 outlines the approach to calculating the mitigation debit accrued from indirect impacts. The elk and deer habitat layers contain significant overlap, so the mitigation debits accrued for each should not be considered additive. Section 3.3.4.3 includes a discussion on how the wildlife habitat layer overlap may be addressed in the accounting process.

Table 11. Accounting for Mitigation Debit for Indirect Impacts

Habitat	Impact Acres	Mitigation Debit	Mitigation Explanation
Elk winter range Category 2	1	>1	The mitigation goal for Category 2 habitat is “no net loss” and “net benefit.” Accordingly, mitigation for impacts on Category 2 habitat needs to demonstrate a net benefit in quality or quantity. Mitigation debits are accrued at a greater amount of acreage than what is impacted by the Project.
Elk summer range Category 3	1	1	The mitigation goal for Category 3 habitat is “no net loss” in quantity or quality. Mitigation debits are accrued at an equal amount of acreage to that impacted by the Project.

3.3.3 Purchasing Credits

IPC proposes offsetting fish and wildlife habitat impacts by either purchasing credits or conducting its own compensatory mitigation projects. With respect to purchasing credits, IPC proposes that it may do so through one or both of the following mechanisms:

- **Mitigation Banking**. Purchasing mitigation credits from mitigation banks to address Project impacts where available; no mitigation banks are currently available within the mitigation service area. In the event that a habitat mitigation bank becomes available within the mitigation service area, IPC would seek to accomplish all or part of its mitigation for the Project by participation in the bank.
- **In-Lieu Fee (ILF)**. Fees paid to an approved ILF sponsor which are then used to develop an on the ground mitigation project within a certain time period. IPC is not aware of any ILF sponsors within the Project's mitigation service area. In the event that an ILF sponsor becomes available within the mitigation service area, IPC would seek to accomplish all or part of its mitigation for the Project by participation through an ILF sponsor.

3.3.4 Creating Credits through Mitigation Projects

If IPC creates credits through a mitigation project or projects rather than purchase all of the required credits, IPC will secure the necessary mitigation sites prior to commencing construction on the Project. In this section, IPC describes the mitigation site selection process, the mitigation credit score assessment approach, the standards for each mitigation project, and the documentation and verification processes for the mitigation projects. In Appendix A, IPC provides a desktop analysis of certain potential mitigation sites that currently are on the market, demonstrating there are mitigation site opportunities sufficient to meet the needs of the Project.

3.3.4.1 Mitigation Project Standards

Mitigation Zones and Service Area

Because the Project crosses multiple habitat types and habitat categories, mitigation will need to occur at multiple locations. The mitigation zones and the mitigation service area[1] were developed to support mitigation planning. As an example, for impacts to the shrub/grasslands general vegetation type within MZ3, IPC will make every effort to identify mitigation within the portion of the service area that is within MZ3 that provides uplift to the shrub/grasslands general vegetation type. Following this approach will simplify the presentation of and accounting for potential mitigation. It may not be possible or necessary to mitigate for all impacts within a MZ with mitigation actions within that same MZ and it may not be possible or necessary to locate all mitigation actions within the mitigation service area (for instance, mitigation for impacts to Category 4 and Category 5 habitat can be located off-proximity).

Bare Ground General Vegetation Habitat

IPC will not seek out specific mitigation opportunities for the bare ground general vegetation type. The bare ground general vegetation type is made up of features that are typically found within the shrub/grassland and forest/woodland general vegetation types; such as rock outcrops, scree slopes, cliffs or canyons, and bare soil. Proposed mitigation of shrub/grassland

[1] The mitigation service area consists of the subbasins (i.e., hydrologic unit boundary 8) in Oregon that are crossed by the Project. See discussion in Section 4.1.1 for a list of subbasins crossed.

and forest/woodland general vegetation types will contain features that are part of the bare ground general vegetation type. Mitigation actions that provide ecological uplift to shrub/grassland and forest/woodland general vegetation types will provide a benefit to those species that utilize bare ground. Bare ground is found within most of the potential mitigation that IPC has identified to date (Appendix A).

Agriculture/Developed Habitat

To address mitigation for areas identified as agriculture/developed, IPC has prepared an Agricultural Impacts Mitigation Plan (Exhibit K, Attachment K-1). Impacts on agricultural habitats presented in this Fish and Wildlife HMP did not consider the methods used to assess impacts on agricultural land in Exhibit K.

Agency Input

IPC has requested input from the following federal, state, and local agencies regarding potential mitigation actions and areas within the mitigation service area. The agencies and organizations that have been or will be contacted include:

- BLM Vale, Oregon Field Office
- BLM Idaho State Office
- Wallowa-Whitman National Forest
- ODFW, La Grande Field Office,
- Idaho Department of Fish and Game
- Natural Resources Conservation Service
- Grande Ronde Model Watershed
- Various Rural Fire Protection Districts that occur along the Project
- Various land trusts
- Private individuals

IPC has worked closely with ODFW to identify potential mitigation for consideration in this Plan. IPC will continue to work with all the listed agencies and organizations as mitigation continues to be developed.

Conservation Actions

Credits may be generated by a combination of the following types of conservation actions:

- **Enhancement**: Measures that increase the quantity and/or quality of fish and wildlife habitat and are aimed at transitioning an area of habitat from a less than desirable state to something more desirable. Appropriate enhancement measures may vary among sites, depending on the initial and desired states of a site.
- **Avoided loss**: Measures that prevent undesirable state changes in areas that are at a demonstrated risk of degradation from threats such as development, wildfire, and invasive species. Depending on the current and anticipated future threats at a given site, appropriate avoided loss activities may include legal protection, fire prevention, and management of invasive species. Avoided loss is not being proposed as a stand-alone mitigation action; it will be considered alongside enhancement actions.

Specific conservation actions will be developed upon identification of a mitigation site and formal valuation of site conditions and possible habitat improvement measures. Table 12 below includes a preliminary list of potential conservation actions that IPC might apply to its mitigation projects.

Further, IPC will continue to seek out mitigation opportunities that would fund private, state, or federal programs and/or projects that would not necessarily involve a land acquisition component. IPC will work with the stakeholders to identify any unfunded or underfunded projects that could benefit from additional funding sources, as well as determining how much mitigation credit each of these projects will represent to the Project. These types of mitigation must remain functional and legally protected through the duration of impacts being mitigated and cannot include programs that have sufficient funding now or are likely to have sufficient funding in the future.

Table 12. Other Potential Mitigation Actions

Mitigation Action	Habitat Benefit	General Vegetation Type[1]	MZ	Size (acres)
Road Closure or Decommissioning	Reduces chronic sediment delivery to riparian areas, reduces potential of human caused fire and invasive species introduction	All	Unknown	Unknown
Stream Habitat Enhancement	Improve water quality, and fish and riparian wildlife habitat	Open Water/Wetlands	Unknown	Unknown
Culvert Removal / Replacement	Improve water quality and aquatic species passage	Open Water/Wetlands	Unknown	Unknown
Upland Habitat Enhancement	Multiple benefits	Shrub/Grassland Forest/Woodland	Unknown	Unknown
Juniper Removal	Improve/restore native grassland and shrub-steppe habitats, improve sage-grouse habitat	Shrub/Grassland	Unknown	Unknown
Fence Removal / Marking	Reduce wildlife collisions	Shrub/Grassland	Unknown	Unknown
Boardman Conservation Area	Preservation and enhancement of native grasslands, WAGS habitat	Shrub/Grassland	MZ1	22,642

3.3.4.2 Mitigation Project Documentation

Mitigation Management Plan

For each habitat mitigation site (mitigation site), IPC will produce a site-specific Mitigation Management Plan that identifies the extent, type, and description of all proposed conservation actions, including the following:

- **Introduction and background** – mitigation site name, date acquired, time period covered by the management plan, plan preparer, mitigation site manager and technical staff, mitigation site size, location, access, and adjacent land use. Also describe the purpose of the mitigation site and how it relates, if at all, with other mitigation properties or existing agency management areas.

- **Mitigation Durability** – description of the management, legal protection, and financial assurances that ensure the mitigation will be in place and effective for the intended duration. The mitigation duration should be commensurate with the duration of the impact, which can range from 3 to 5 years through the Project life.[2]
- **Baseline Ecological Setting** – vegetation mapping via field visit or some combination of remote classification and field verification, wildlife species that are likely to be present, mapped soil types, and a description of hydrologic features and current water rights and usage. Invasive species and noxious weed locations should also be identified and discussed.
- **Proposed Mitigation Goals and Actions** – description of the desired future condition for each habitat type. Describe the mitigation actions and operation and maintenance activities being proposed to achieve the desired future condition (juniper removal, seeding, noxious weed treatment, land management change).
- **Effectiveness** - proposed mitigation actions should be effective or reasonably likely to deliver expected conservation benefits. Mitigation actions should follow reliable methods. Reliable mitigation methods, meaning “a mitigation method that has been tested in areas with site factors similar to the area proposed for mitigation and that has been found (e.g., through field trials, demonstration projects or scientific studies) to produce the habitat effects required to meet the mitigation goal for that action.” OAR 635-415-0005(29). The mitigation methods should be clearly stated or included by reference.
- **Monitoring and Performance Measures** – description of monitoring procedures (including baseline data collection), timeframes, and success criteria. Monitoring plans will incorporate standard monitoring procedures, timeframes, and success criteria. The purpose of the monitoring plans will depend on the mitigation action, but in general they will address long-term project monitoring, corrective actions, and maintenance responsibilities, if apple, including performance objectives, methods for measuring effectiveness/success, reporting requirements, funding source, and responsible parties. IPC will implement monitoring efforts as soon as is reasonable depending on the mitigation action being implemented. Monitoring efforts will occur at appropriate intervals for each individual mitigation action for the life of the Project. Below are some examples of generalized monitoring schedules and success criteria. Inclusion of these examples does not commit IPC to following them during implementation of mitigation.
  - **Monitoring:** Monitoring will occur annually until success criteria are met. Annual reports will be supplied to agencies for review. If the mitigation is not trending towards the defined success criteria within the first 3-5 years, adaptive management strategies will be implemented. Long-term monitoring and reporting will occur at 5 to 10 year intervals after success criteria are met.
  - **Performance Measures:** performance measures are typically very specific to the mitigation site where actions are being applied and the desired outcomes determined in consultation with a permitting agency. However, the following is a non-specific list of examples.
    - Native grass establishment with greater than 25 percent total canopy cover with 60 percent of the plant cover from planted species within 4 years.

[2] Under OAR 635-415-0005(27), “Project life” means “the period of time during which a development action is subject to regulation by local, state or federal agencies.” For the B2H Project, that period will be continuously until the facility site is restored and the site certificate is terminated in accordance with OAR 345-027-0110.

    - Increase in density or cover of desirable native species.
    - Increase in desirable perennial plants over five years.
    - Elimination of noxious weeds or other undesirable plant species or reduced to a level that does not interfere with mitigation goals.
    - 20 to 40 percent of planted sagebrush seedlings survey after the third growing season following planting.
    - Site is trending toward its ecological site description over five years.
    - Juniper is removed form a site and long-term treatment maintains the absence of juniper trees.
    - Natural recruitment of sagebrush is occurring.
    - Successful establishment of important shrub species for big game winter range.
    - Demonstrate effectiveness in excluding livestock from and allowing big game access to the mitigation site.
    - Demonstrate effectiveness of new water source in providing water.
    - Demonstrate effectiveness in reducing erosion.
    - The conditions on the rest of the mitigation site do not pose a threat to maintaining the habitat quality where mitigation actions have improved habitat.
    - Fencing has been properly constructed and continues to be effective.
    - Traffic volume is reduced through access control device or road decommissioning.
- **Management Restriction and Prohibitions** – if the mitigation site is a conservation easement, describe landowner reserved rights and when, where, how much, and how those rights are managed. Define each prohibited use and explain any exceptions. Describe any findings from the Phase I environmental site assessment that may affect management.
- **Other Management Actions** – water usage and water rights management, infrastructure management, proposed access control, describe existing access rights or easements, and protection of historical resources.
- **Adaptive Management** – describe potential issues that could delay or eliminate the mitigation site from achieving mitigation goals and provide a framework process to address the issues.
- **Reporting** – list all reporting requirements for baseline, mitigation monitoring, and general management reports.
- **Appendices** – include all pertinent supporting information (mining permits, water rights certificates, access easements, previous baseline studies, etc.)

Legal Protections and Financial Assurances

Mitigation projects must be durable—that is, the period of time that mitigation is effective must be commensurate with the duration of the impacts being offset. Demonstrating project durability requires that legal protections be put in place to ensure the mitigation project benefits are not disturbed for the life of the credits. Legal protection may be demonstrated through term or permanent conservation easements or through other tools ensuring the protections will last for the duration of the impacts.

Financial assurances must be in place to ensure appropriate management will occur throughout the life of the credits. Funding for site management may occur through various mechanisms, provided they ensure management will persist throughout the life of the mitigation project.

Each Mitigation Management Plan will either include or reference all of the documentation of legal protections and financial assurances.

3.3.4.3 Calculating Credits

IPC will accrue one credit for one acre of habitat acquired or put into easement. For instance, if a 100-acre mitigation site is acquired, IPC would receive 100 credits once certain success criteria are met for the mitigation site. The type and area of ecological uplift actions necessary to meet success criteria and secure mitigation credits will be determined on a site-specific basis. However, IPC assumes that mitigation actions may occur on a portion, but not the entirety, of the mitigation site. That is, IPC does not need to conduct mitigation actions on all 100 acres of the mitigation site to receive 100 credits.

IPC will account for the location (MZ), general vegetation type, wildlife habitat layer, and habitat category when evaluating mitigation sites against the mitigation debit balance. IPC may need to account at the habitat type level instead of the general vegetation type level, such as to ensure adequate credits are developed in habitat types with a big sagebrush component to account for mitigation debits accrued within big sagebrush habitat types. The habitat type and category attributed to acres within each mitigation site will follow the same methodology performed to attribute Project impacts (Exhibit P1, Attachment P1-1).

The mitigation sites included in Appendix A have had a desktop assessment performed that identified habitat types and habitat categories within the mitigation site. Most of the mitigation sites in Appendix A were selected by IPC with input from ODFW because of their overlap with the wildlife habitat layers used to attribute habitat categories to Project impacts. Therefore, a vast majority of the available mitigation credits within the mitigation sites occurs within Category 2 and Category 3 habitats.

Stacking

In calculating credits accrued by a mitigation site, IPC will provide for “stacking” of habitat credit requirements (FWS 2014). Credit stacking occurs where more than one resource or credit type occurs on spatially overlapping areas. Here, IPC must offset Project impacts to habitat types (Table 1), WAGS habitat, elk winter and summer range, mule deer winter and summer range, California bighorn sheep herd range (Table 2), and sage-grouse (Exhibit P2 and Attachment P2-3). To the extent a mitigation site includes an area comprising more than one of those habitats, IPC will receive credit towards each of the habitats. For example, a single credit may satisfy compensatory mitigation needs on an impact site where elk winter range and mule deer winter range overlap. IPC may propose mitigation that enhances one acre of habitat that is within elk winter range and mule deer winter range that would count as 1 credit against the total debits for both elk winter range and mule deer winter range as well as the total debits for Category 2 habitat. Within the geographical information system used to maintain the project impacts and resulting habitat categorization of those impacts, IPC is able to identify how much wildlife habitat overlap occurs on each acre impacted and the types of habitat overlapping.

3.3.4.4 Verification

Monitoring conducted at reclamation sites related to temporarily disturbed areas, and the associated annual reports to the applicable agencies, are discussed in IPC’s Reclamation and Revegetation Plan (Exhibit P1, Attachment P1-3). The following discussion addresses monitoring related to mitigation sites. Mitigation site monitoring is also part of the Mitigation Management Plan discussed in Section 3.3.4.2.

Performance Measures

The criteria used to measure success will depend on the extent of impacts and the final mitigation strategy (e.g., success criteria could be different if mitigation is conducted through payments to a conservation bank as opposed to permittee-responsible mitigation sites). The criteria used to measure mitigation success will be site-specific, will depend on the goals and objectives of the mitigation site, and will need to be developed for each individual mitigation site prior to the onset of mitigation efforts.

Reporting

IPC will document the progress of mitigation efforts to applicable federal and state-management agencies in a progress report that will be provided following the periodic monitoring surveys. These reports will also contain recommendations from IPC regarding any additional remedial actions that may be necessary. It is expected that the applicable federal and state management agencies will provide comments and counter suggestions, or approval of IPC's suggestions if remedial efforts are required (i.e., corrective measures if revegetation or mitigation efforts were not successful). Separate monitoring reports may be prepared for each individual mitigation site. Reports will contain information regarding the mitigation actions taken during the reporting period, the success of these actions (based on predefined success criteria established for that mitigation site), and a description of the methods used to monitor the mitigation site.

4.0 DRAFT MITIGATION SITE ASSESSMENTS

Prior to commencement of construction, IPC will secure mitigation sites with sufficient credits to offset the impacts of the Project. In order to show there are mitigation site opportunities sufficient to meet the needs of the Project and to demonstrate how IPC's debiting and crediting approach will be implemented, in the following discussion and in the HMP appendices, IPC discusses potential mitigation sites and provides a desktop-level assessment of the credits available at each site.

4.1 Desktop Habitat Mitigation Site Assessment

There are a number of factors that influence the suitability of potential mitigation. In order to assess the potential mitigation opportunities consistently, IPC (in cooperation with ODOE) developed a desktop habitat mitigation site assessment (desktop assessment) form that was used to assess more than 40 potential mitigation properties. Properties that passed the desktop assessment were then reviewed by IPC and ODOE to determine which properties provided the greatest opportunity for IPC to meet its mitigation needs for the Project. IPC has included in this HMP the properties that provide the greatest opportunity, with their respective desktop assessment forms in Appendix A.

The desktop assessment has two parts, as described below.

4.1.1 Desktop Assessment – Part 1

The first part of the desktop assessment is to complete the desktop assessment worksheet that describes the location and ecological setting of the property. During this step, a determination is made as to whether a property passes or fails the desktop assessment. If the property passes, because it is located in an appropriate ecological setting, the second part of the desktop assessment is completed.

Location – When reviewing the location of a property, preference is given to a location that:

- Is within the mitigation service area (Figure 2). The mitigation service area consists of the subbasins (i.e., hydrologic unit boundary 8) in Oregon that are crossed by the Project. Implementing mitigation projects within this area will ensure that ecological uplift will result in a beneficial effect to species and habitat impacted by the Project. The mitigation service area includes the following subbasins: Umatilla; Middle Columbia-Lake Wallula Subbasin (restricted to Oregon); Upper Grande Ronde; Burnt; Powder; Bully; Willow; Lower Malheur; Lower Owyhee; and Brownlee Reservoir (the area south of where the Burnt River enters the reservoir). Mitigation actions and areas outside of the mitigation service area will still be considered if agreement is reached with permitting agencies that the mitigation would benefit species/habitats affected by the Project.
- Involves large parcels of land, or parcels whose size corresponds to specific mitigation needs.
- Is adjacent to existing wildlife management areas or parcels sought after by a state or federal land management agency to achieve wildlife habitat goals.
- Is not located close to land uses that will obviate long-term success of the mitigation. A qualitative discussion is presented regarding adjacent land use and infrastructure occurrence.

Ecological Setting – When reviewing the ecological setting of a property, preference is given to settings where:

- Baseline habitat quality and conditions are similar in kind to habitat structures and functions that will be displaced by the Project.[3]
- Regional Gap Analysis Project (USGS 2011) data were used to identify the habitat types that occur within the mitigation site and correspond to habitat disturbed by the Project.
- Potential mitigation sites within designated wildlife habitat ranges disturbed by the Project were prioritized. These included those for WAGS, sage-grouse, elk, and deer.
- Implementation of mitigation on the property is likely to create a “net benefit” as defined in OAR 635-415-0005(21).
- Soil types – The Soil Survey Geographic database (NRCS 2011) contains soil maps that provide insight into the potential vegetation that may be considered during restoration efforts.
- Hydrologic features – The National Hydrography Dataset (USGS 2010) and the Oregon Wetlands Cover (Oregon Natural Heritage Information Center & The Wetlands Conservancy 2009) data were reviewed to identify potential wetland and water resources within each potential mitigation site.

[3] "In-kind Habitat Mitigation" means habitat mitigation measures that recreate similar habitat structure and function to that existing prior to the development action (OAR 635-415-0005(12)).

Figure 2. Mitigation Service Area and Mitigation Zones

Pass/Fail – Parameters associated with a property's failure to pass the desktop assessment include:

- 40 percent or more of the property is within the agriculture/developed general vegetation type.
- Infrastructure on the property significantly increased the market value of the property above other properties with similar habitat and similar potential mitigation credit value.
- Property contains a high-voltage transmission line(s).
- Property is too far removed from the mitigation service area.
- Property is made up of disjunct parcels that could not be effectively managed.

4.1.2 Desktop Assessment – Part 2

The second part of the desktop assessment discusses how the property would function as a mitigation site, lists the mitigation actions that may be implemented on the mitigation site, and provides a financial outline.

Mitigation Function – A general description of the Project impacts that the mitigation site would mitigate for:

- Identifies the general vegetation type or specific habitat types the site would offer mitigation for;
- Identifies the wildlife habitat layers that overlay with the mitigation site (e.g., elk winter range); and
- Identifies the ODFW habitat categories that the mitigation site contains.

Mitigation Actions – Lists potential mitigation actions that may be performed within the mitigation site to provide an ecological uplift to the habitat. These potential mitigation actions were often discussed during field visits to the mitigation site. If no field visits occurred, applicable mitigation actions were listed based on known land use and land cover. In general, IPC considered mitigation actions that would improve habitat quality, such as:

- Preserve essential habitats through acquisition and easements;
- Provide general improvement of habitat condition through revegetation efforts;
- Perform treatments to prevent, reduce, or eradicate invasive plants and noxious weeds;
- Implement access control to the mitigation area;
- Implement grazing management techniques that could improve habitat;
- Conduct Phase 1 and Phase 2 juniper removal;
- Remove or mark (e.g., fence marking to avoid collision) anthropogenic structures;
- Conduct fire rehabilitation with native vegetation; and
- Reduce risk of catastrophic fire with creation of a fire readiness plan and use of fire breaks.

Financial Outline – The cost of acquisition of the property and yearly operation and maintenance costs were estimated for each mitigation site. In some instances, the cost of acquisition is unavailable.

4.1.3 Further Development of Desktop Assessments

One desktop assessment has been further developed as an example of how mitigation sites will be brought forward for consideration and ultimately inclusion in a final Fish and Wildlife HMP. IPC sees this format as the next step in the mitigation process from identifying opportunities to proposing mitigation sites that account for the balance of mitigation debits accrued per Section 4.3. The Wolf Creek mitigation site expanded assessment (Appendix B) has been further developed to include mitigation actions that IPC is proposing to gain full mitigation credit for the site (one credit for each acre within the property's boundary). Ongoing coordination with ODOE will identify other mitigation sites, either from those currently included in Appendix A or new opportunities brought to IPC's attention, to move forward in a similar fashion as part of a formal mitigation proposal to be included in the final Fish and Wildlife HMP.

4.2 Habitat Mitigation Sites

Through the desktop assessment and field reviews, IPC has brought forward 14 mitigation sites, which demonstrate that adequate mitigation opportunities exist to address all of the Project's impacts on wildlife habitat. The 14 mitigation sites included in this Fish and Wildlife HMP collectively exceed the quantity of mitigation that will ultimately be needed for the Project by approximately ten- to twenty-fold. IPC will continue to coordinate with ODOE in preparation of a final Fish and Wildlife HMP that will be sufficient to compensate for the Project's impacts on wildlife habitats and achieve the mitigation goals set forth in ODFW's Habitat Mitigation Policy. IPC will begin funding mitigation once a site certificate is issued by EFSC and prior to construction of the Project.[4]

Mitigation sites are presented by their location relevant to the MZs described under Section 3.3.1.3. Presentation of mitigation sites by the MZ will show which Project impacts are being mitigated for at each mitigation site.

4.2.1 MZ1 Mitigation Sites

Within MZ1, IPC has identified four mitigation sites. These include Government Mountain, Olex, Ione, and Eightmile (Appendix A). The Olex and Ione mitigation sites are both potential conservation easements while the Government Mountain and Eightmile mitigation sites are currently for sale and would be fee simple title acquisitions. Government Mountain is also partially within MZ2. For purposes of this HMP, the mitigation site will be considered under MZ1.

All four mitigation sites within MZ1 are outside of the mitigation service area (Figure 3). The focus of mitigation efforts within MZ1 have been to address Project impacts on WAGS habitat. The availability of mitigation sites that contain WAGS habitat is lacking within the mitigation service area in MZ1; therefore, IPC went outside of the mitigation service area to identify mitigation sites. Both the Olex mitigation site and Ione mitigation site were recommended to IPC by ODFW as potential WAGS mitigation.

[4] For all mitigation, IPC will provide ODOE with proof of funding prior to construction. For actions involving land acquisition, IPC will acquire the legal right to create, maintain, and protect habitat mitigation areas for the life of the facility by means of an outright purchase, conservation easement, or similar conveyance or contract.

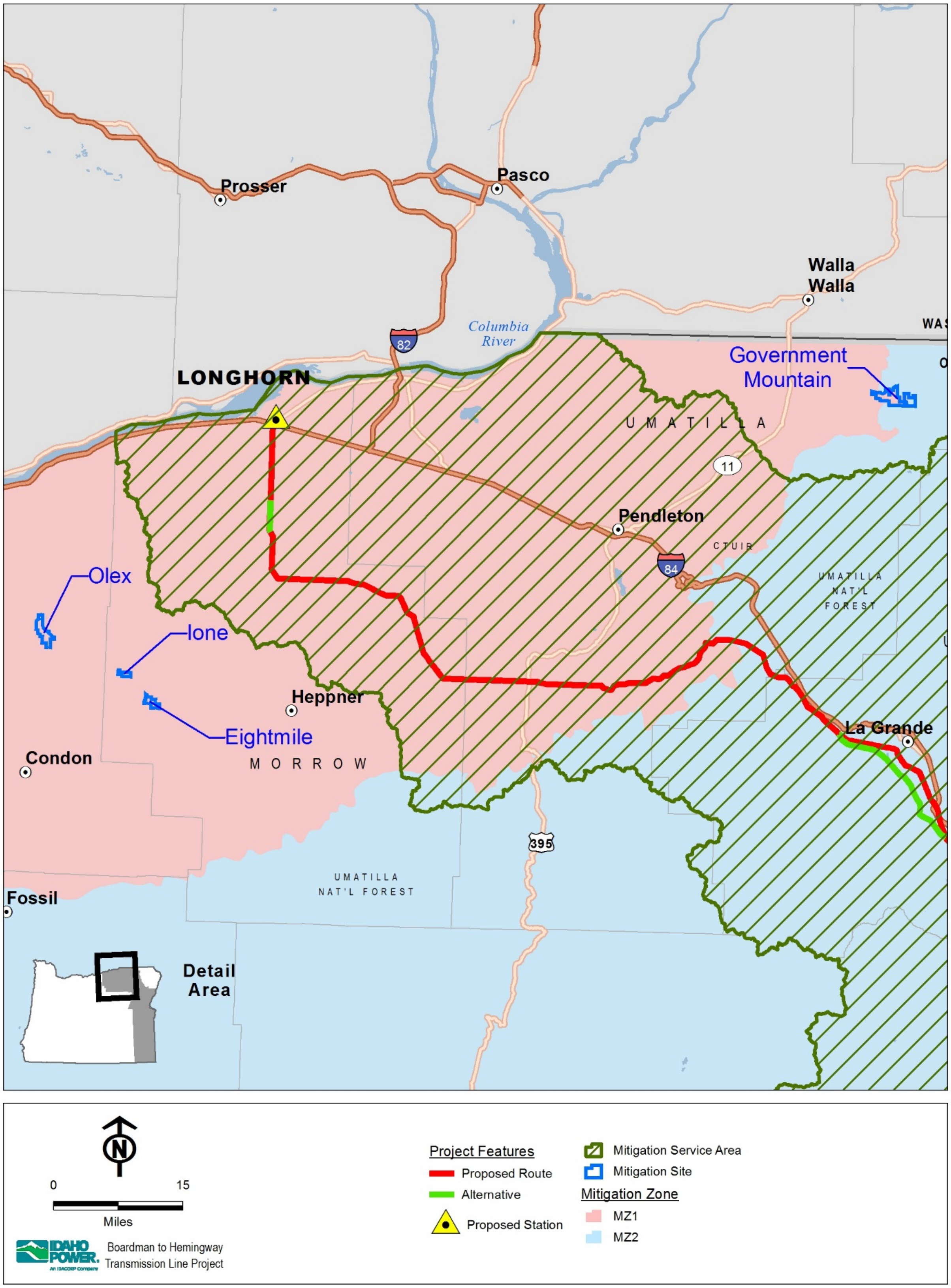

Figure 3. Mitigation Sites within MZ1

Table 13 shows that the mitigation sites identified by IPC within MZ1 provide abundant opportunity to mitigate for Project impacts based on general vegetation types and habitat categories. When considering wildlife habitat layers, the mitigation sites identified within MZ1 provide abundant opportunity to mitigate for Project impacts on WAGS habitat, mule deer winter range, elk winter range, mule deer summer range, and elk summer range (Table 14).

Table 13. Acres of General Vegetation Types by Habitat Category for Mitigation Sites in MZ1

Mitigation Site	General Vegetation Type	ODFW Habitat Categories (acres)						Total
		1	2	3	4	5	6	
Government Mountain	Forest/Woodland	–	1,243.0	399.7	–	–	–	**1,642.7**
	Shrub/Grassland	–	1,572.0	13.8	–	–	–	**1,585.8**
	Agriculture/Developed	–	–	–	–	–	82.7	**82.7**
	Open Water/Wetlands	–	141.2	–	–	–	–	**141.2**
Olex[1]	Agriculture/Developed	–	–	–	–	–	68.2	**68.2**
	Shrub/Grassland	418.6	1,583.2	–	–	–	–	**2,001.8**
Ione	Agriculture/Developed	–	–	–	–	–	–	**–**
	Shrub/Grassland	–	108.0	–	–	–	–	**108.0**
Eightmile	Agriculture/Developed	–	429.9	–	–	–	36.7	**466.6**
	Shrub/Grassland	–	369.5	–	–	–	–	**369.5**
MZ1 Mitigation Site Total		**418.6**	**5,446.8**	**413.5**	**–**	**-**	**187.6**	**6,466.5**

[1] Olex property owner stated that 1,563 acres of the property are available for conservation easement.
Note: – = 0

Table 14. Acres of Wildlife Habitat within Mitigation Sites of MZ1

Wildlife Habitat Layer[1]	Mitigation Site				
	Gov. Mtn.	Olex[2]	Ione	Eightmile	MZ1 Mitigation Site Total
WAGS	–	1,406.4[3]	–	–	**1,406.4[3]**
Elk winter range	3,038.3	–	–	–	**3.038.3**
Elk summer range	2,774.3	–	–	–	**2,774.3**
Mule deer winter range	1,626.4	2,070.0	–	836.1	**2,906.1**
Mule deer summer range	1,822.2	–	–	–	**1,822.2**

[1] WAGS = Category 1 and Category 2; elk winter range = Category 2; elk summer range = Category 3; mule deer winter range = Category 2; mule deer summer range = Category 3.
[2] Olex property owner stated that 1,563 acres of the property are available for conservation easement.
[3] This includes 418.6 acres of Category 1 habitat and 987.8 acres of Category 2 habitat for WAGS.
Note: – = 0

4.2.2 MZ2 Mitigation Sites

Within MZ2, IPC has identified five mitigation sites (Figure 4). These include High Valley, Glass Hill, County Line, Wolf Creek, and Antelope Mountain (Appendix A). All of these mitigation sites would be fee simple title acquisitions. Only the Antelope Mountain mitigation site is currently for sale, the remaining properties' owners have been contacted and have shown some interest in selling all or a portion of their property. In addition to the five mitigation sites, IPC is developing the wetland mitigation property within MZ2. The Government Mountain mitigation site is partially within MZ2, but a majority is within MZ1 and therefore addressed above.

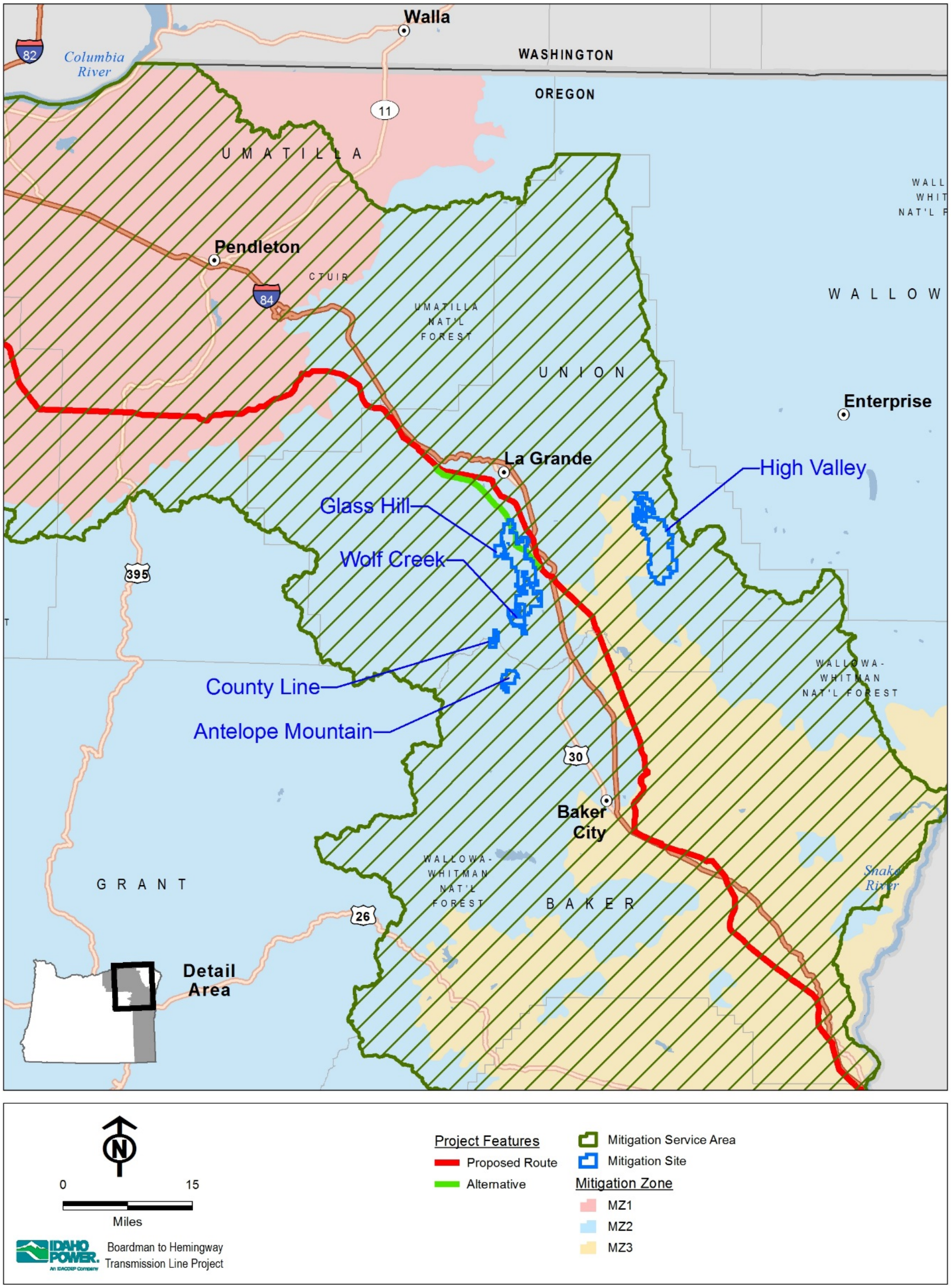

Figure 4. Mitigation Sites within MZ2

The focus of mitigation efforts within MZ2 have been to address Project impacts on the forest/woodland general vegetation type and impacts on elk and mule deer winter and summer range.

Table 15 shows that the mitigation sites identified by IPC within MZ2 provide abundant opportunity to mitigate for Project impacts based on general vegetation types and habitat categories. When considering wildlife habitat layers, the mitigation sites identified within MZ2 provide abundant opportunity to mitigate for impacts on mule deer winter range, elk winter range, mule deer summer range, and elk summer range (Table 16).

Table 15. Acres of General Vegetation Types by Habitat Category for Mitigation Sites in MZ2

Mitigation Site	General Vegetation Type	ODFW Habitat Categories (acres)						Total
		1	2	3	4	5	6	
Antelope Mountain	Forest/Woodland	–	1,239.8	–	–	–	–	**1,239.8**
	Shrub/Grassland	–	325.4	–	–	–	–	**325.4**
	Open Water/Wetlands	–	37.3	–	–	–	–	**37.3**
Wolf Creek	Forest/Woodland	–	1,361.4	–	–	–	–	**1,361.4**
	Shrub/Grassland	–	344.2	–	–	–	–	**344.2**
	Open Water/Wetlands	–	66.9	–	–	–	–	**66.9**
County Line	Forest/Woodland	–	707	–	–	–	–	**707**
	Shrub/Grassland	–	40	–	–	–	–	**40**
	Open Water/Wetlands	–	24.9	–	–	–	–	**24.9**
Glass Hill	Forest/Woodland	–	8,458	3,734	–	–	–	**4,002**
	Shrub/Grassland	–	1,306	96	–	–	–	**1,402**
	Open Water/Wetlands	–	211	80	–	–	–	**291**
High Valley	Forest/Woodland	–	6,934	7,083	–	–	–	**14,017**
	Shrub/Grassland	–	212	126	–	–	–	**338**
	Open Water/Wetlands	–	268	196	–	–	–	**464**
	Agriculture/Developed	–	**–**	–	–	–	**12**	**12**
MZ2 Mitigation Site Total		**–**	**21,536**	**11,315**	–	–	**12**	**32,863**

Note: – = 0

Table 16. Acres of Wildlife Habitat within Mitigation Sites of MZ2

Wildlife Habitat Layer[1]	Mitigation Site					
	Antelope Mtn.	Wolf Creek	County Line	Glass Hill	High Valley	MZ2 Mitigation Site Total
Elk winter range	1,602.5	1,772.5	771.9	9,975.0	7,426.0	**21,547.9**
Elk summer range	1,079.5	1,263.4	771.9	13,215.0	11,850.0	**28,179.8**
Mule deer winter range	1,602.5	2,070.0	771.9	5,498.0	745.0	**10,687.4**
Mule deer summer range	–	1,772.5	771.9	13,823.0	14,516.0	**30,883.4**

[1] Elk Winter Range = Category 2; Elk Summer Range = Category 3; Mule Deer Winter Range = Category 2; Mule Deer Summer Range = Category 3.

Note: – = 0

4.2.3 MZ3 Mitigation Sites

Within MZ3, IPC has identified five mitigation sites (Figure 5). These include Trail Creek, Glasgow, Upper Timber, Pole Creek, and Alder Creek (Appendix A). The mitigation sites within MZ3 would all be fee simple title acquisitions.

The focus of mitigation efforts within MZ3 have been to address Project impacts on the shrub/grassland general vegetation type and specifically the shrub-steppe with big sagebrush habitat type and impacts on sagebrush obligate species and big game species.

Table 17 shows that the mitigation sites identified by IPC within MZ3 provide abundant opportunity to mitigate for Project impacts based on general vegetation types and habitat categories. When considering wildlife habitat layers, the mitigation sites identified within MZ3 provide abundant opportunity to mitigate for impacts on mule deer winter range, elk winter range, mule deer summer range, and elk summer range (Table 18).

Table 17. Acres of General Vegetation Types by Habitat Category for Mitigation Sites in MZ3

Mitigation Site	General Vegetation Type	ODFW Habitat Categories (acres)						Total
		1	2	3	4	5	6	
Pole Creek	Forest/Woodland	–	1,527.9	–	–	–	–	
	Shrub/Grassland	–	1,652.1	–	–	–	–	
	Open Water/Wetlands	–	47.4	–	–	–	–	
Alder Creek	Forest/Woodland	–	18.6	–	–	–	–	
	Shrub/Grassland	–	2,704.3	–	–	–	–	
	Open Water/Wetlands	–	18.9	–	–	–	–	
Glasgow	Forest/Woodland	–	30.7	–	–	–	–	
	Shrub/Grassland	–	1,404.2	–	–	–	–	
	Open Water/Wetlands	–	1.8	–	–	–	–	
Trail Creek	Forest/Woodland	–	20.9	–	–	–	–	
	Shrub/Grassland	–	600.9	–	–	–	–	
	Open Water/Wetlands	–	0.7	–	–	–	–	
Upper Timber	Forest/Woodland	–	4.5	–	–	–	–	
	Shrub/Grassland	–	1,556.4	–	–	–	–	
	Open Water/Wetlands	–	8.9	–	–	–	–	
	Agriculture/Developed	–	7.1	–	–	–	–	
MZ3 Mitigation Site Total		**–**	**9,605.3**		–	**–**	–	**9,605.3**

Note: – = 0

Table 18. Acres of Wildlife Habitat within Mitigation Sites of MZ3

Wildlife Habitat Layer[1]	Mitigation Site					
	Pole Creek	Alder Creek	Glasgow	Trail Creek	Upper Timber	MZ3 Mitigation Site Total
Elk winter range	–	2,947.0	611.8	624.5	153.8	**4,337.1**
Elk summer range	2,287.7	–	622.7	624.5	888.6	**4,423.5**
Mule deer winter range	3,227.4	773.8	1,436.7	–	1,576.9	**7,014.8**
Mule deer summer range	3,178.5	–	–	624.5	–	**3,803.0**

[1] Elk winter range = Category 2; Elk summer range = Category 3; Mule deer winter range = Category 2; Mule deer summer range = Category 3.
Note: – = 0

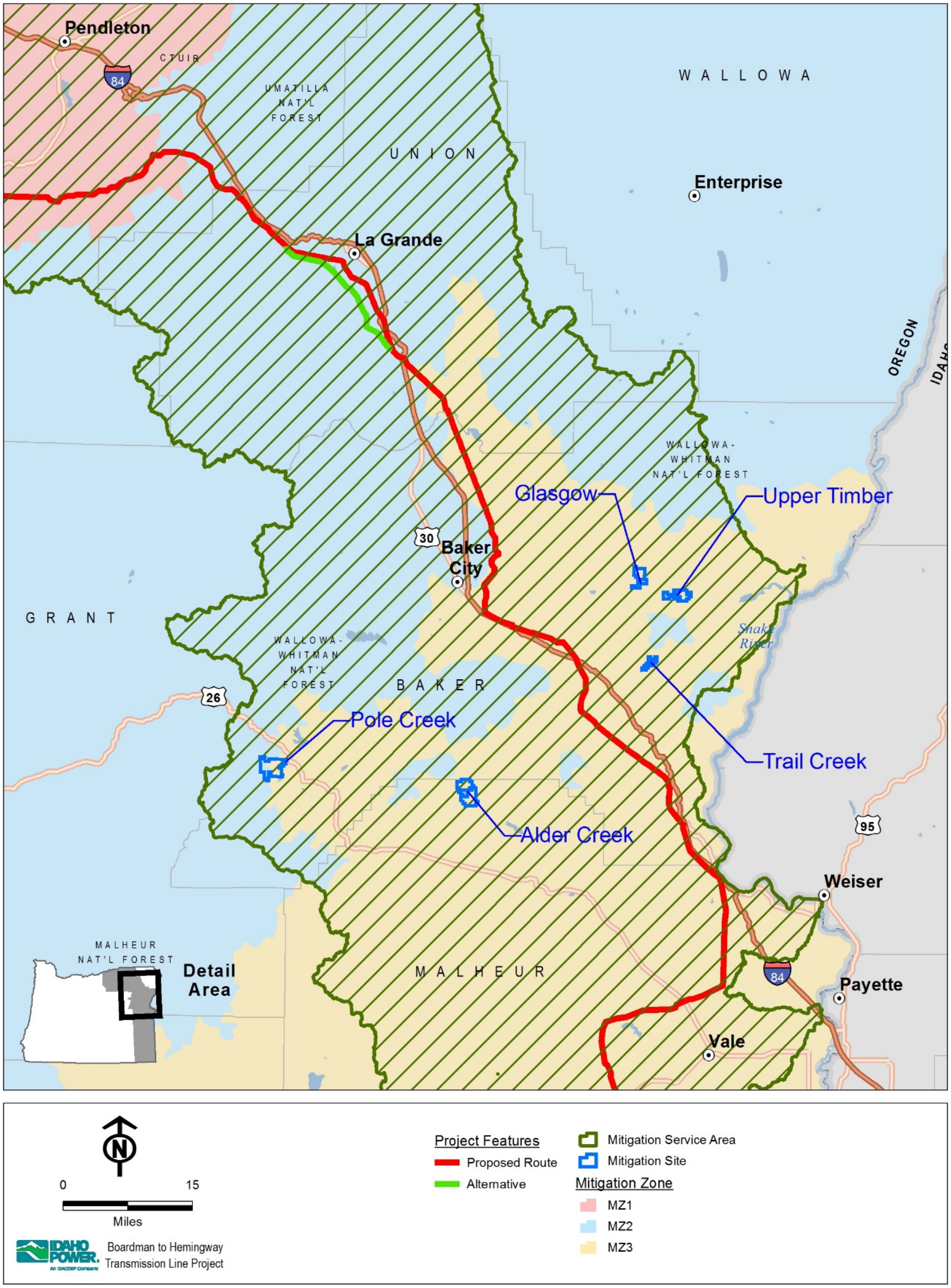

Figure 5. Mitigation Sites within MZ3

4.3 Debit and Credit Accounting for Draft Assessment

4.3.1 MZ1 Accounting

IPC has identified a mitigation debit of approximately 732 to 765 acres that will be accrued for impacts from the Proposed Route within MZ1. Mitigation sites identified within MZ1 account for approximately 6,279 available credits. Table 19 displays the debits and available credits by ODFW habitat category.

Table 19. Mitigation Accounting by Habitat Category in MZ1

ODFW Habitat Category	Impact	Acres	Mitigation Debit	Debit Subtotal by Habitat Category	Subtotal of Available Credits within MZ1 Mitigation Sites from Table 13
1	Temp	–	–	–	418.6
	Perm	–	–		
2	Temp	614.1	>614.1	>724	5,446.8
	Perm	109.9	>109.9		
3	Temp	21.5	<21.5	4.1 to 25.6	413.5
	Perm	4.1	4.1		
4	Temp	15.8	<15.8	>3.5 to 19.2	–
	Perm	3.5	3.5		
5	Temp	98.8	–	<15.0	–
	Perm	15.0	<15.0		
6	Temp	410.2	–	–	187.6
	Perm	60.0	–		
			Total	**>731.6 to 764.6**	**6,278.9**

Note: – = 0

Impacts from the Proposed Route within MZ1 will also accrue species-specific mitigation debits. Table 20 identifies the debits and available credits by wildlife habitat layer. These debits are not in addition to those identified in Table 19. For instance, of the 724 acres of Category 2 debits identified, 22.4 acres originate from impacts to Category 2 WAGS habitat.

Table 20. Mitigation Accounting by Wildlife Habitat Layer in MZ1

Wildlife Habitat Layer	Impact	Acres	Mitigation Debit	Debit Subtotal by Wildlife Habitat[1]	Subtotal of Available Credits within MZ1 Mitigation Sites from Table 14
WAGS	Temp	19.7	>19.7	>22.4	1,406.4
	Perm	2.7	>2.7		
Elk winter range	Temp	54.6	>54.6	>63.2	3,038.3
	Perm	8.5	>8.5		
Elk summer range	Temp	20.4	<20.4	>2.8 to 23.2	2,774.3
	Perm	2.8	2.8		
Mule deer winter range	Temp	593.8	>593.8	>700.2	2,906.1
	Perm	106.4	>9106.4		
Mule deer summer range	Temp	–	–	–	1,822.2
	Perm	–	–		

[1] These subtotals should not be added together as the resulting total would be double-counting acres where wildlife habitat layers overlap. Overlap is abundant between seasonal ranges of both elk and mule deer.

Note: – = 0

IPC will look at the general vegetation type (sometimes habitat type), habitat category, and wildlife habitat layer together when performing the mitigation accounting for MZ1. This accounting will be performed during final selection of habitat mitigation sites and after issuance of the site certificate and prior to construction.

4.3.2 MZ2 Accounting

IPC has identified a mitigation debit of 1,078 to 1,268 acres that will be accrued for impacts from the Proposed Route within MZ2. Mitigation sites identified within MZ2 account for approximately 32,863 available credits. Table 21 identifies the debits and available credits by ODFW habitat category.

Table 21. Mitigation Accounting by Habitat Category in MZ2

ODFW Habitat Category	Impact	Acres	Mitigation Debit	Debit Subtotal by Habitat Category	Subtotal of Available Credits within MZ2 Mitigation Sites from Table 15
2	Temp	198.5	>198.5	>602.4	21,536
	Perm	403.9[1]	>403.9		
3	Temp	176.4	<176.4	>473.0 to 649.4	11,315
	Perm	473.0	473.0		
4	Temp	12.5	<12.5	2.9 to 15.4	–
	Perm	2.9	2.9		
5	Temp	11.6	–	<1.1	–
	Perm	1.1	<1.1		
6	Temp	137.7	–	–	12.0
	Perm	41.4	–		
			Total	**>1,078.3 to 1,268.3**	**32,863**

[1] Includes 0 acres of indirect impacts on elk winter range within MZ2 (Table 6).
[2] Includes 6.3 acres of indirect impacts on elk summer range within MZ2
Note: – = 0

Table 22 identifies the debits and available credits by wildlife habitat layer within MZ2. These debits are not in addition to those identified in Table 21. For instance, of the 602 acres of Category 2 debits identified in Table 21, approximately 573 acres originate from impacts to Category 2 mule deer winter range habitat (Table 22).

Table 22. Mitigation Accounting by Wildlife Habitat Layer in MZ2

Wildlife Habitat Layer	Impact	Acres	Mitigation Debit	Debit Subtotal by Wildlife Habitat[1]	Subtotal of Available Credits within MZ2 Mitigation Sites from Table 16
Elk winter range	Temp	83.2	>219.1	>221.1	21,547.9
	Perm	137.9[2]	>500.4		
Elk summer range	Temp	23.0	<23.0	>92.5 to 115.6	28,179.8
	Perm	92.5[3]	92.5		
Mule deer winter range	Temp	169.8	>169.8	>573.0	10,687.4
	Perm	403.1	>403.2		
Mule deer summer range	Temp	180	<180.0	>503.4 to 683.4	30,883.4
	Perm	503.4	503.4		

[1] These subtotals will not correspond to the mitigation debits calculated by habitat category in Table 21. For instance, some elk summer range Category 3 habitat overlaps with elk winter range Category 2 habitat, these areas default to Category 2. For this reason, these subtotals should not be added together.
[2] Includes 0 acres of indirect impacts on elk winter range within MZ2 (Table 6).
[3] Includes 6.3 acres of indirect impacts on elk summer range within MZ2 (Table 6).
Note: – = 0

IPC will look at the general vegetation type (sometimes habitat type), habitat category, and wildlife habitat layer together when performing the mitigation accounting for MZ2. This accounting will be performed during final selection of habitat mitigation sites and after issuance of the site certificate and prior to construction.

4.3.3 MZ3 Accounting

IPC has identified a mitigation debit of approximately 2,145 to 2,456 acres that will be accrued for impacts from the Proposed Route within MZ3. Mitigation sites identified within MZ3 account for approximately 9,605 available credits. Table 23 identifies the debits and available credits by ODFW habitat category.

Table 23. Mitigation Accounting by Habitat Category in MZ3

ODFW Habitat Category	Impact	Acres	Mitigation Debit	Debit Subtotal by Habitat Category	Subtotal of Available Credits within MZ3 Mitigation Sites from Table 17
2	Temp	1,310.5	>1,310.5	>2,106.7	9,605.3
	Perm	796.2[1]	>796.2		
3	Temp	146.7	<146.7	>18.3 to <165.0	–
	Perm	18.3	18.3		
4	Temp	137.1	<137.1	>19.7 to 156.8	–
	Perm	19.7	19.7		
5	Temp	219.0	–	<27.2	–
	Perm	27.2	<27.2		
6	Temp	55.7	–	–	-
	Perm	123.4	–		
			Total	**>2,144.7 to 2,455.7**	**9,605.3**

[1] Includes 427.3 acres of indirect impacts on elk winter range within MZ3 (Table 8).
Note: – = 0

Table 24 identifies the mitigation debits and available credits by wildlife habitat layer within MZ3. These debits are not in addition to those identified in Table 23. For instance, of the more than 2,106 acres of Category 2 debits identified in Table 23, approximately 1,678 acres originate from impacts to Category 2 mule deer winter range habitat.

Table 24. Mitigation Accounting by Wildlife Habitat Layer in MZ3

Wildlife Habitat Layer	Impact	Acres	Mitigation Debit	Debit Subtotal by Wildlife Habitat[1]	Subtotal of Available Credits within MZ3 Mitigation Sites from Table 18
Elk winter range	Temp	100.8	>100.8	>566	4,337.1
	Perm	459.6[2]	>459.6		
Mule deer winter range	Temp	1,309.9	>1,309.9	>1,678.6	10,408.5
	Perm	368.7	>368.7		
Mule deer summer range	Temp	108.7	<106.9	101.7 to <208.6	7,196.7
	Perm	102.5	101.7		
California Bighorn Sheep Herd Range	Temp	1.6	>1.6	>15.8	-
	Perm	14.2	>14.2		

[1] These subtotals will not correspond to the mitigation debits calculated by habitat category in Table 23 due to overlap among wildlife habitat layers. For this reason, these subtotals should not be added together.

[2] Includes 427.3 acres of indirect impacts to elk winter range within MZ3 (Table 8).

5.0 MITIGATION SCHEDULE

Coordination continues between IPC and the applicable land and wildlife management agencies regarding mitigation projects and options. IPC has identified preliminary scheduling milestones for mitigation that track with the EFSC process (Table 25).

Table 25. Mitigation Schedule

Date Range	EFSC Stage	Mitigation Planning
Present to July 2017	Submittal of 2017 Amended Preliminary Application for Site Certificate (ASC)	Respond to ODOE comments on the HMP included in the amended preliminary ASC.
July 2017 to July 2019	Final Order and Site Certificate	Develop and finalize mitigation sites and associated Mitigation Management Plans. Land acquisition will begin following issuance of the Site Certificate and prior to construction.
July 2019 to start of construction, 2022 or later	Monitoring Project compliance with conditions of approval as described in the Final Order.	All mitigation land acquisitions will be completed. Baseline data acquisition will occur at mitigation sites according to the Mitigation Management Plan. Initial mitigation actions will begin if timing is appropriate. Finalize HMP and submit to ODOE for its approval.

Date Range	EFSC Stage	Mitigation Planning
Start of construction in 2022 or later	Monitoring Project compliance with conditions of approval as described in the Final Order.	Initial mitigation actions (e.g., juniper removal, native seeding) will be completed or continued, and mitigation monitoring will track success.
In Service to Project decommissioning	Monitoring Project compliance with conditions of approval as described in the Final Order.	Any adaptive management techniques will be implemented if mitigation success criteria are not being met. Long-term monitoring and reporting will be performed as needed.

6.0 REFERENCES

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APPENDIX A
HABITAT MITIGATION SITES

Habitat Mitigation Areas with Mitigation Zone 1

- Government Mountain
- Ione
- Olex
- Eightmile

Boardman to Hemingway Transmission Line Project

Desktop Habitat Mitigation Site Assessment Worksheet

Parcel Name: Government Mountain (**Figure 1**)

Landowner:

Parcel Size in Acres: 3,453

Date of Assessment: 9/15/2014

Parcel Elevation (ft): 2,400 – 4,400

Within Mitigation Service Area?: No

Location Description
(County, miles and direction from known location, TRS, UTM, other):

Umatilla County, 20 miles southeast of Walla Walla, WA. Near the OR/WA border.
T5N R38E Sections 17, 18, 19, 20
T5N R37E Sections 13, 14, 15, 22, 23, 24

Vegetation Cover Classes (GAP[1], **Figure 2**)

HMP Habitat Category[2] and Type	HMP General Vegetation Type	Acres	% of Parcel	Wildlife Habitat[3]
Category 1		**0**	**0**	
Category 2		**2,976.8**	**85.7**	**-**
Mixed Grand Fir/Douglas Fir	Forest/Woodland	670.4	19.3	RMEWR, RMESR, MDSR
Mixed Grand Fir/Douglas Fir	Forest/Woodland	334.8	9.6	RMEWR, MDWR, RMESR
Mixed Grand Fir/Douglas Fir	Forest/Woodland	87.5	2.5	RMEWR, MDWR
Mixed Grand Fir/Douglas Fir	Forest/Woodland	13.5	0.4	RMEWR, MDSR
Native Grasslands	Shrub/Grass	428.9	12.3	RMEWR, RMESR, MDSR
Native Grasslands	Shrub/Grass	411.0	11.8	RMEWR, MDWR, RMESR
Native Grasslands	Shrub/Grass	244.8	7.0	RMEWR, MDWR
Native Grasslands	Shrub/Grass	38.9	1.1	RMEWR, MDSR
Subalpine/Montane Forest	Forest/Woodland	25.3	0.7	RMEWR, RMESR, MDSR
Subalpine/Montane Forest	Forest/Woodland	18.8	0.5	RMEWR, MDWR, RMESR
Subalpine/Montane Forest	Forest/Woodland	10.3	0.3	RMEWR, MDWR
Shrub-Steppe with Big Sage	Shrub/Grass	38.9	1.1	RMEWR, RMESR, MDSR
Shrub-Steppe with Big Sage	Shrub/Grass	72.0	2.1	RMEWR, MDWR, RMESR
Shrub-Steppe with Big Sage	Shrub/Grass	75.4	2.2	RMEWR, MDWR
Shrub-Steppe with Big Sage	Shrub/Grass	20.6	0.6	RMEWR, MDSR
Introduced Upland Vegetation	Shrub/Grass	33.3	1.0	RMEWR, RMESR, MDSR
Introduced Upland Vegetation	Shrub/Grass	62.1	1.8	RMEWR, MDWR, RMESR
Introduced Upland Vegetation	Shrub/Grass	41.8	1.2	RMEWR, MDWR

[1]USGS Gap Analysis Project (GAP) GIS data. Ecological systems were cross-walked to HMP Habitat Type as shown in the Habitat Categorization Matrix (Attachment P1-1 of Exhibit P1).
[2]Represents the habitat category based on overlap with wildlife habitat layers. Agriculture and Developed habitat types' categories are not modified by overlap with wildlife habitat.
[3]MDWR = Category 2 habitat for ODFW mule deer winter range; RMEWR = Category 2 habitat for ODFW Rocky Mountain elk winter range; RMESR = Category 3 habitat for Rocky Mountain Elk Foundation Rocky Mountain elk summer range; MDSR = Category 3 habitat for WAFWA mule deer summer range.
[4]Total acres of habitat type may not match actual parcel size due to resolution of the GAP raster dataset. Pixels of the raster dataset were not simplified or smoothed to match the exact shape of the parcel boundary.

Vegetation

HMP Habitat Category[2]	HMP General	Acres	% of	Wildlife Habitat[3]

Cover Classes cont.
(GAP[1])

and Type	Vegetation Type		Parcel	
Category 2 cont.				-
Forested Wetland	Wetland	43.1	1.2	RMEWR, RMESR, MDSR
Forested Wetland	Wetland	79.5	2.3	RMEWR, MDWR, RMESR
Forested Wetland	Wetland	18.6	0.5	RMEWR, MDWR
Shrub-Steppe without Big Sage	Shrub/Grass	49.1	1.4	RMEWR, RMESR, MDSR
Shrub-Steppe without Big Sage	Shrub/Grass	31.2	0.9	RMEWR, MDWR, RMESR
Shrub-Steppe without Big Sage	Shrub/Grass	24.0	0.7	RMEWR, MDWR
Forested-Other	Forest/Woodland	30.9	0.9	RMEWR, RMESR, MDSR
Forested-Other	Forest/Woodland	19.8	0.6	RMEWR, MDWR, RMESR
Forested-Other	Forest/Woodland	5.4	0.2	RMEWR, MDWR
Ponderosa Pine	Forest/Woodland	11.1	0.3	RMEWR, MDWR, RMESR
Ponderosa Pine	Forest/Woodland	15.2	0.4	RMEWR, RMESR, MDSR
Remaining	-	20.2	0.6	-
Category 3		**414.1**	**11.9**	-
Mixed Grand Fir / Douglas Fir	Forest/Woodland	181.8	5.2	RMESR, MDSR
Subalpine/Montane Forest	Forest/Woodland	169.6	4.9	RMESR, MDSR
Forested-Other	Forest/Woodland	44.9	1.3	RMESR, MDSR
Native Grasslands	Shrub/Grass	10.6	0.3	RMESR, MDSR
Shrub-Steppe without Big Sage	Shrub/Grass	2.9	0.1	RMESR, MDSR
Ponderosa Pine	Forest/Woodland	1.8	0.1	RMESR, MDSR
Mixed Tamarack	Forest/Woodland	1.6	0.0	RMESR, MDSR
Shrub-Steppe with Big Sage	Shrub/Grass	0.3	0.0	RMESR, MDSR
Introduced Upland Vegetation	Shrub/Grass	0.0	0.0	RMESR, MDSR
Category 4		**0**	**0**	-
Category 5		**0**	**0**	-
Category 6		**82.7**	**2.4**	-
Agriculture	Ag/ Developed	51.1	1.5	RMEWR, MDWR
Agriculture	Ag/ Developed	17.2	0.5	RMEWR
Agriculture	Ag/ Developed	0.2	0.0	RMESR, MDSR
Developed	Ag/ Developed	12.0	0.3	RMEWR, MDWR
Developed	Ag/ Developed	1.8	0.1	RMEWR
Developed	Ag/ Developed	0.4	0.0	RMESR, MDSR
Total				**-**

[1]USGS Gap Analysis Project (GAP) GIS data. Ecological systems were cross-walked to HMP Habitat Type as shown in the Habitat Categorization Matrix (Attachment P1-1 of Exhibit P1).
[2]Represents the habitat category based on overlap with wildlife habitat layers. Agriculture and Developed habitat types' categories are not modified by overlap with wildlife habitat.
[3]MDWR = Category 2 habitat for ODFW mule deer winter range; RMEWR = Category 2 habitat for ODFW Rocky Mountain elk winter range; RMESR = Category 3 habitat for Rocky Mountain Elk Foundation Rocky Mountain elk summer range; MDSR = Category 3 habitat for WAFWA mule deer summer range.
[4]Total acres of habitat type may not match actual parcel size due to resolution of the GAP raster dataset. Pixels of the raster dataset were not simplified or smoothed to match the exact shape of the parcel boundary.

Soil types	The NRCS Soil Survey Geographic Database (SSURGO) data was reviewed and the following soils were identified on the property (**Figure 3**): *Buckcreek-Gwin association* (**706 acres**). Buckcreek soils consist of moderately deep, well drained soils found on uplands at elevations of 2,000 to 4,500 feet. Buckcreek soils are used for range and wildlife habitat. Native vegetation is Idaho fescue, ninebark and snowberry. Gwin soils consist of shallow, well drained soils found on mountain slopes, basalt plateaus, ridgetops, foothills, structural benches, hill shoulders, summits, backslopes, and footslopes and canyon walls at elevations of 800 to 6,210 feet in Oregon and Idaho. Gwin soils are used for grazing and as wildlife habitat. Native vegetation is mainly bluebunch wheatgrass, Idaho fescue, and Sandberg bluegrass. *Cowsly* (**39 acres**) and *Cowsly silt loam* (**51 acres**). Cowsly soils consist of deep or very deep, moderately well drained soils found on plateaus at elevations from 2800 to 5000 feet. Cowsly soils are used primarily for timber production. Other uses are dryland small grain, pasture, wildlife habitat and water supply. Native vegetation is ponderosa pine and Douglas fir with an understory of spirea, ocean spray, snowberry, Idaho fescue, pinegrass and elksedge. *Gwin-Rock outcrop complex* (**704 acres**). Gwin soils consist of shallow, well drained soils found on mountain slopes, basalt plateaus, ridgetops, foothills, structural benches, hill shoulders, summits, backslopes, and footslopes and canyon walls at elevations of 800 to 6,210 feet in Oregon and Idaho. Gwin soils are used for grazing and as wildlife habitat. Native vegetation is mainly bluebunch wheatgrass, Idaho fescue, and Sandberg bluegrass. *Tolo silt loam* (**400 acres**). Tolo soils consist of deep and very deep, well drained soils found on nearly level upland plateaus and steep north and east-facing mountain side slopes at elevations of 2,800 to 5,400 feet. Tolo soils are used for timber production and livestock grazing with small areas at lower elevations cleared for cultivation. Principal trees include Douglas fir, grand fir, larch, ponderosa pine, and lodgepole pine. *Umatilla-Kahler-Gwin association* (**1,546 acres**). Umatilla soils consist of very deep, well drained soils found on uplands at elevations of 2,000 to 5,000 feet. Umatilla soils are used for timber production, livestock grazing and wildlife habitat. Native vegetation is Douglas-fir, grand fir and ponderosa pine. Kahler soils consist of deep and very deep, well drained soils found on back slopes of plateaus, canyons, hills, and mountains at elevations ranging from 2,000 to 6,000 feet. Kahler soils are used for timber production, limited cropland, livestock grazing, watershed, recreation, and wildlife habitat. Many areas with slopes of less than 15 percent have been cleared and produce dryland hay and grain, or irrigated crops. The native vegetation is mainly ponderosa pine, Douglas fir, pinegrass and elk sedge. Gwin soils consist of shallow, well drained soils found on mountain slopes, basalt plateaus, ridgetops, foothills, structural benches, hill shoulders, summits, backslopes, and footslopes and canyon walls at elevations of 800 to 6,210 feet in Oregon and Idaho. Gwin soils are used for grazing and as wildlife habitat. Native vegetation is mainly bluebunch wheatgrass, Idaho fescue, and Sandberg bluegrass. *Xerofluvents* (**0.1 acre**). A fluvent soil with a xeric moisture regime.

Hydrologic Features Present (SteamNet, NWI, NHD)	Four perennial and three intermittent streams are within the property (NHD), including the North Fork of the Walla Walla River (three miles of river frontage per the real estate listing). Other than an impoundment, all wetland areas (NWI) appear to be associated with riparian corridors of streams identified in NHD.

Adjacent land ownership, use, and condition	Most of the adjacent lands are private; however, the eastern border of the property connects to a large tract of USFS lands. Land use is likely rangeland and timber with agricultural land use in the valley approximately 5 miles to the west.

Infrastructure Density within or Near the Parcel (Qualitative Description)	Ranch includes a historic 1920 cabin, a bunkhouse, a barn, machine shop, fencing, cross fencing, and an old miner cabin (per real estate listing). Several maintained roads access the property.
Summary	The property is outside of the mitigation service area. Property is approximately 2.7 miles north of the South Fork Walla Walla River BLM ACEC, designated to protect and enhance riparian ecosystems, fisheries habitat, and scenic values and recreational use. Borders a large tract of USFS lands including areas with old growth forest and is within elk and mule deer winter range. North Fork of the Walla Walla River is bull trout and steelhead critical habitat, Little Meadow Creek and Big Meadow Creek are steelhead critical habitat. Property is within 2 different ODFW COAs, the Umatilla – Walla Walla area of the Blue Mountains ecoregion and the Walla Walla River area of the Columbia Plateau ecoregion. Conservation actions identified for both areas include maintenance and enhancement of in-channel watershed function, connection to riparian habitat, flow and hydrology; and maintenance or restoration of riparian habitat and ecological function and to ensure sufficient habitat complexity for wildlife. In addition, the Umatilla – Walla Walla COA adds initiation or continuation of wet meadow conservation and restoration; and promotion of early detection and suppression of invasive weeds.
Pass/Fail Desktop Assessment?	Pass

Boardman to Hemingway Transmission Line Project

Consideration of Property as a Potential Mitigation Site

Mitigation Function	This mitigation site has been identified as in-kind and in-proximity mitigation for impacts on Category 2 elk and mule deer winter habitat within the forest/woodland general vegetation type. This mitigation site could help meet the Project need for elk and mule deer summer habitat as well. It contains important habitat features with opportunities to provide durable ecological uplift through implementation of standard mitigation actions. Opportunities to improve the watershed would benefit bull trout and steelhead critical habitat. The mitigation actions listed below, upon successful implementation, will increase the quality of habitat available to elk and mule deer (among other species) within the mitigation site and result in an ecological uplift to the mitigation site above what is provided under the current management.

Mitigation Site Manager	Fee title acquisition with transfer of ownership to State of Oregon, Federal Land Management Agency, approved NPO or Land Trust

Mitigation Actions	The following are mitigation actions that may be implemented at this mitigation site in order to satisfy the mitigation policies/guidelines of the permitting agencies. All mitigation actions will follow reliable methods. The mitigation actions presented here are not comprehensive. Implementation will likely be some combination of one or more of the following: • *Livestock grazing restrictions* – historic grazing practices at this property are unknown. However, the objective would be to avoid grazing practices that would compete with native wildlife life history needs. Targeted grazing may be considered for habitat enhancement/treatment actions. • *Weed treatment* – the extent of noxious weed invasion on the mitigation site is unknown at this time but it is anticipated that opportunities exist to implement this mitigation action. • *Native revegetation/restoration* – the focus would be planting forage shrubs and implementing forest management practices that would create structural diversity and enhance desirable habitat conditions. • *Fire readiness* – efforts made to make the property more resistant to catastrophic fire and a fire response plan could be developed. • *Fence removal/fence upgrade* – opportunities are unknown at this time, but it is anticipated that some unnecessary fencing may be removed or necessary fencing can be upgraded to more wildlife friendly fencing.

Monitoring	A specific plan for monitoring will be developed, but in general, mitigation progress will be monitored through vegetation plot monitoring and establishment of photo locations. Monitoring will occur annually for the first 3-5 years and an annual report will be produced. During the annual monitoring phase, a longer-term monitoring plan will be developed using similar protocols and methods to monitor the mitigation actions at larger time intervals (i.e., 5 years, 10 years).

Success Criteria

Specific success criteria will be developed once baseline conditions have been determined and potential mitigation actions have been confirmed for the site. Success criteria may include but are not limited to:

- Vegetation plots show an increase in native vegetation cover and general trend toward increased habitat quality representing an ecological uplift.
- Successful weed control through documentation of a reduction in weeds and non-native invasive plant species.
- Mitigation success will not be dependent on documentation of increased use of the mitigation site by WAGS or any other wildlife species.

Financial Outline

Estimated Budget for the Government Mountain Mitigation Site

Action	Cost per Unit	Units	Years	Expense
One-time Costs				
Acquisition (from 4/10/2013 listing)	$3,250,000	1	-	$3,250,000
Recurring Costs (Annually)				
O&M[1]	$53.75	3,453	50	$9,279,938
Total	-			$12,529,938 ($3,628/acre)[2]

[1] This O&M cost is an estimate of the cost per acre per year (not including acquisition/easement costs) based on the research presented in the Independent Economic Analysis Board's 2007 *Investigation of Wildlife O&M Costs*. The cost per acre identified in that study for the Elkhorn Wildlife Management Area (which this mitigation site will be modeled after) was $43 in 2004 dollars, this has been adjusted to reflect 2015 dollars.

[2] Cost per acre here includes cost of acquisition/easement and long-term O&M for 50 years.

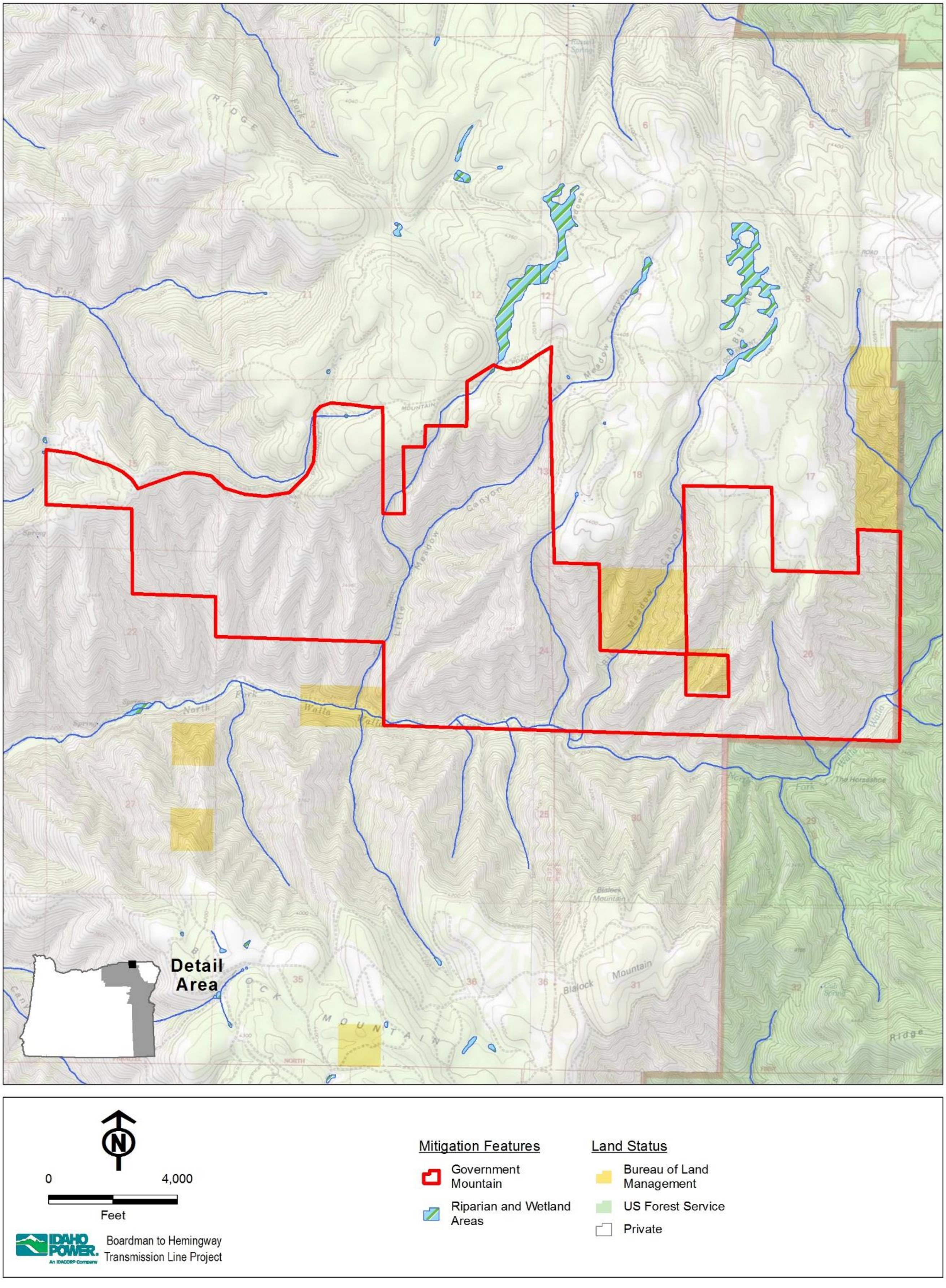

Figure 1. Government Mountain Ownership and Water

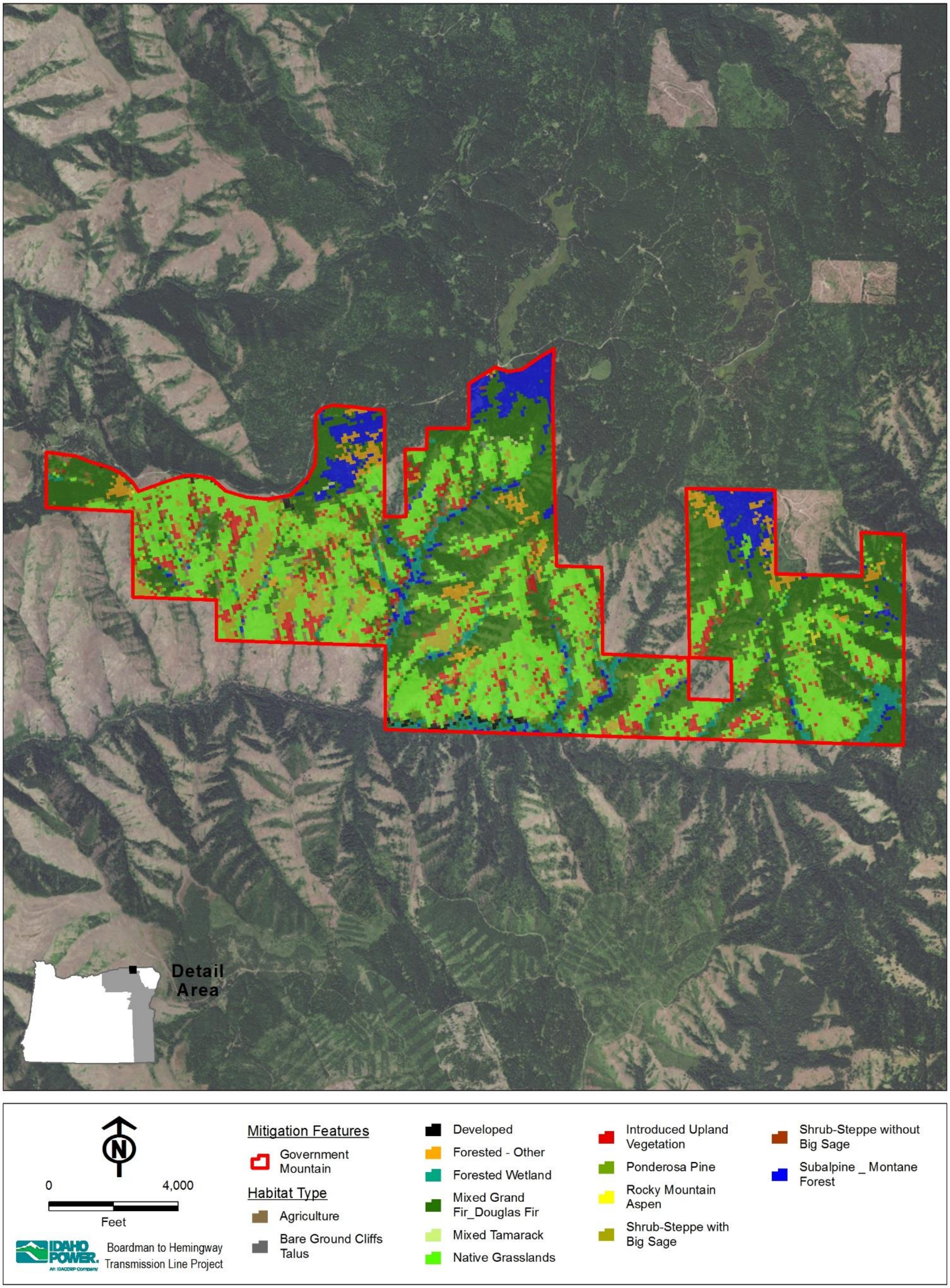

Figure 2. Government Mountain Habitat Types

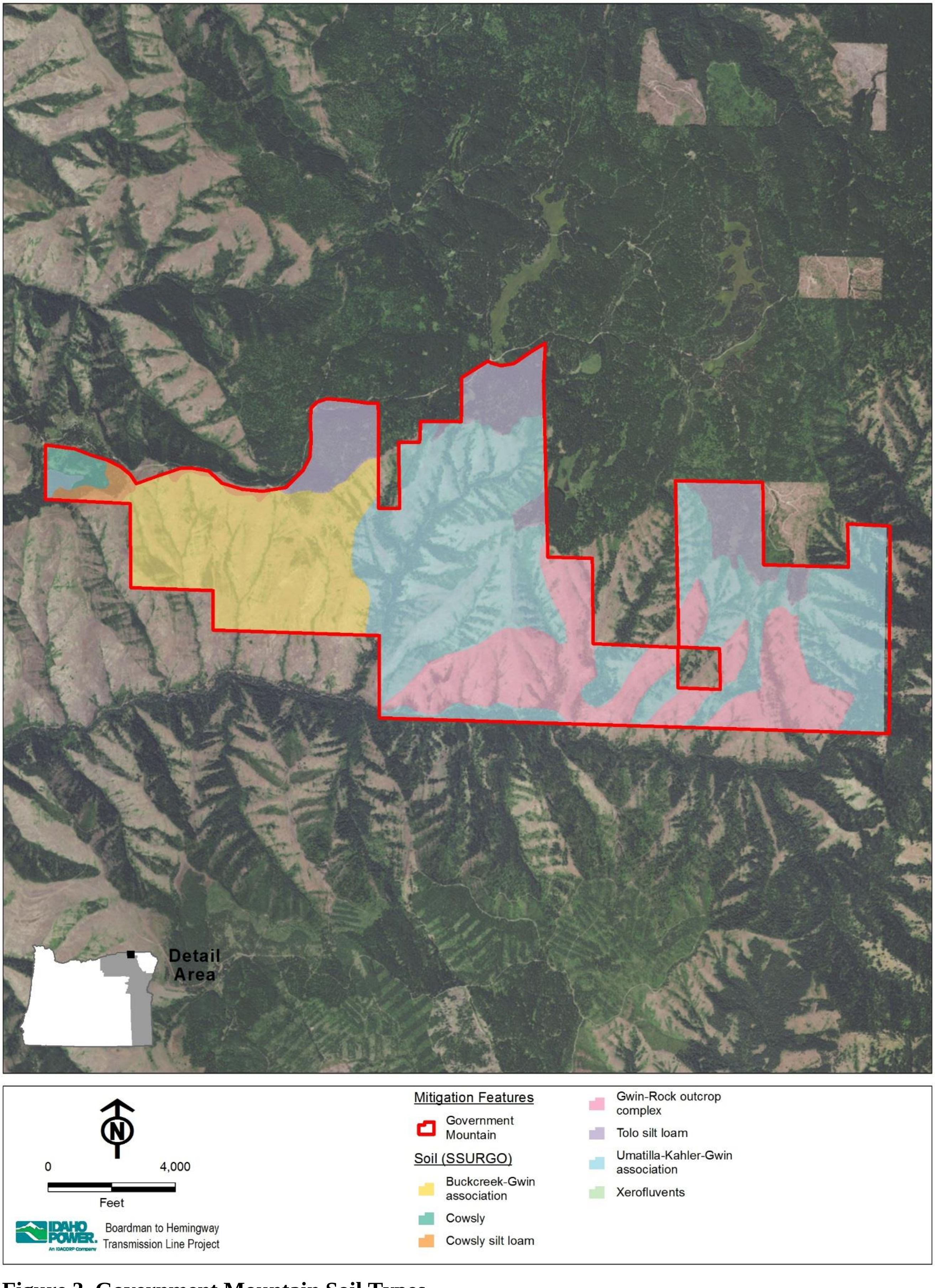

Figure 3. Government Mountain Soil Types

Boardman to Hemingway Transmission Line Project

Desktop Habitat Mitigation Site Assessment Worksheet

Parcel Name:	Ione (**Figure 1**)	**Date of Assessment:**	10/15/2014
Landowner:		**Parcel Elevation (ft):**	1,500 – 1,850
Parcel Size in Acres:	433 (108 acres available)	**Within Mitigation Service Area?:**	No

Location Description
(County, miles and direction from known location, TRS, UTM, other):

Morrow County, 8 miles southwest of Ione.
T2S R23E Sections 8, 9.

Vegetation Cover Classes (GAP[1], **Figure 2**)

HMP Habitat Category[2] and Type	HMP General Vegetation Type	Acres	% of Parcel	Wildlife Habitat[3]
Category 1		**0**	**0**	
Category 2		**425.6**	**98.3**	
Shrub-Steppe with Big Sage	Shrub / Grass	423.9	97.9	
Native Grasslands	Shrub / Grass	1.3	0.3	
Shrub-Steppe without Big Sage	Shrub / Grass	0.4	0.1	
Category 3		**5.8**	**1.3**	-
Agriculture	Agriculture / Developed	5.8	1.3	
Category 4		**0**	**0**	-
Category 5		**1.3**	**0.3**	-
Introduced Upland Vegetation	Shrub / Grass	1.3	0.3	
Category 6		**0**	**0**	-
Total		**432.8**	**100**	**-**
Total Available for Easement		**108[4]**		

[1] USGS Gap Analysis Project (GAP) GIS data using ecological systems. Ecological systems were cross-walked to HMP Habitat Type as shown in the Habitat Categorization Matrix (Attachment P-2 of Exhibit P).
[2] Represents the highest category that the habitat type can be attributed based only on vegetation metrics. Field review of this site would likely warrant modification of categorization.
[3] No wildlife habitat layers used in the Project's habitat categorization model overlap this property.
[4] All 108 acres are identified as shrub-steppe with big sage by GAP. Site visit showed that the 108 acres was made up of native grassland and non-native grasslands with remnant sagebrush stands and shrublands without a sagebrush component.

Soil types	The NRCS Soil Survey Geographic Database (SSURGO) data was reviewed and the following soils were identified on the property (**Figure 3**): *Endersby fine sandy loam* (**1 acre**). Endersby soils consist of deep, somewhat excessively drained soils found on nearly level bottomlands at elevations of 200 to 1,500 feet. Endersby soils are used primarily for forage crops. Other uses are dry and irrigated small grain, range, pasture, wildlife, and water supply. Vegetation consists of bunchgrasses and forbs. *Lickskillet-Rock outcrop complex* (**42 acres**). Lickskillet soils consist of shallow, well drained soils typically found on south-facing canyon and mountain side slopes at elevations of 200 to 4,500 feet. Lickskillet soils are dominantly used for livestock grazing. Other uses include watershed, recreation, and wildlife habitat. Vegetation is bluebunch wheatgrass, Sandberg bluegrass, Thurber needlegrass, western yarrow, and Wyoming big sagebrush. *Lickskillet very stony loam* (**353 acres**). Lickskillet soils consist of shallow, well drained soils typically found on south-facing canyon and mountain side slopes at elevations of 200 to 4,500 feet. Lickskillet soils are dominantly used for livestock grazing. Other uses include watershed, recreation, and wildlife habitat. Vegetation is bluebunch wheatgrass, Sandberg bluegrass, Thurber needlegrass, western yarrow, and Wyoming big sagebrush. *Mikkalo silt loam* (**34 acres**). Mikkalo soils consist of moderately deep, well drained soils found on canyons, hills, plateaus, and ridges at elevations of 300 to 2,800 feet. Mikkalo soils are used for production of small grains and for rangeland. The native vegetation is bluebunch wheatgrass, green rabbitbrush, big sagebrush, balsamroot and yarrow. *Ritzville silt loam* (**2 acres**). Ritzville soils consist of very deep and deep to duripan, well drained soils found on uplands including plateaus, benches, and canyon side slopes at elevations ranging between 700 to 3,000 feet. Ritzville soils are used for dryland wheat production and some livestock grazing. Native vegetation is bluebunch wheatgrass, Sandberg bluegrass, Wyoming big sagebrush, and yarrow.
Hydrologic Features Present (SteamNet, NWI, NHD)	NHD does not show any water within the property. NWI identifies a temporarily flooded streambed.
Adjacent land ownership, use, and condition	All adjacent land is privately held. A majority of adjacent land use is dry land agriculture with some open rangeland.
Infrastructure Density within or Near the Parcel (Qualitative Description)	There does not appear to be any infrastructure within this property, other than boundary fencing. Infrastructure within the adjacent private lands also appears very low; other than dirt farm roads there does not appear to be any significant infrastructure. TOPO maps show a pipeline north of the property.
Summary	The property is outside of the mitigation service area. None of the wildlife habitat layers considered for this assessment overlap the property. It provides non-agriculture and native habitat adjacent to a water source in Eightmile Canyon, so likely provides undisturbed nesting and hiding cover for numerous species.
Pass/Fail Desktop Assessment?	Pass

Boardman to Hemingway Transmission Line Project

Consideration of Property as a Potential Mitigation Site

Mitigation Function	This potential mitigation site could provide mitigation for impacts on the shrub/grass general vegetation type within the Columbia Basin. The mitigation site is outside of Washington ground squirrel modeled habitat (habitat concentration areas [WWHCWG 2012]) and only historical records of squirrel activity occur within 5 miles of the property. This mitigation site provides native habitat features within an agricultural-dominated landscape. Wildlife species, especially migratory birds, that utilize shrub-steppe and grassland habitats would benefit from implementation of mitigation actions that result in ecological uplift.
Mitigation Site Manager	The mitigation site would be established through a conservation easement held and managed by the current landowners.
Mitigation Actions	The following are mitigation actions that may be implemented at this mitigation site in order to satisfy the mitigation policies/guidelines of the permitting agencies. All mitigation actions will follow reliable methods. The mitigation actions presented here are not comprehensive. Implementation will likely be some combination of one or more of the following: • *Livestock grazing restrictions* – the current level of grazing on this property is unknown. Mitigation action could avoid grazing practices that would compete with native wildlife life history needs. Targeted grazing may be considered for habitat enhancement/treatment actions. • *Weed treatment* – the extent of noxious weed invasion on the mitigation site is unknown at this time but it is anticipated that opportunities exist to implement this mitigation action. • *Native revegetation/restoration* – the focus would be sagebrush and bunchgrasses on this mitigation site. • *Fire readiness* – efforts made to make the property more resistant to catastrophic fire and a fire response plan could be developed. • *Fence removal/fence upgrade* – opportunities are unknown at this time, but it is anticipated that some unnecessary fencing may be removed or necessary fencing can be upgraded to more wildlife friendly fencing.
Monitoring	A specific plan for monitoring will be developed, but in general, mitigation progress will be monitored through vegetation plot monitoring and establishment of photo locations. Monitoring will occur annually for the first 3-5 years and an annual report will be produced. During the annual monitoring phase, a longer-term monitoring plan will be developed using similar protocols and methods to monitor the mitigation actions at larger time intervals (i.e., 5 years, 10 years).
Success Criteria	Specific success criteria will be developed once baseline conditions have been determined and potential mitigation actions have been confirmed for the site. Success criteria may include but are not limited to: • Vegetation plots show an increase in native vegetation cover and general trend toward increased habitat quality representing an ecological uplift. • Successful weed control through documentation of a reduction in weeds and non-native invasive plant species. • Mitigation success will not be dependent on documentation of increased use of the mitigation site by wildlife species.

Financial Outline

This financial outline provides estimated figures and data for informational purposes only. These estimates are meant to provide an overview of the potential and reasonable costs of preparing an easement and implementing mitigation on this mitigation site. The financial outline does not guarantee the final easement value and costs for the easement. This desktop assessment cannot be used to infer value (monetary or ecological) of other properties or easements in the region. Unless otherwise stated, cost assumptions come from NRCS EQIP Practice Payment Rate schedules.

- Weed treatment: $20 - $200 per acre
- Native Seeding:
  - Site preparation (mowing/discing) $500 per acre
  - Broadcast/Drill seed: $100 - $250 per acre
- Hydroseeding: $792 per acre

Estimated Budget for the Lone Mitigation Site

Action	Cost per Unit	Units	Years	Expense
One-time Costs				
Easement Value	Unknown	1	-	?
Easement Transaction Costs[1]	$20,000	1		$20,000
Recurring Costs (Annually)				
O&M[2]	$30	433	50	649,500
Total	-			**$?** ($?/acre)[3]

[1] Easement transaction cost is on the high end of the average presented in the 2009 report by Defenders of Wildlife and Trust for Public, titled *Land Conservation Spending in Oregon in Relation to the State Wildlife Conservation Strategy*.

[2] This O&M cost is an estimate of the cost per acre per year (not including acquisition/easement costs) based on the research presented in the Independent Economic Analysis Board's 2007 *Investigation of Wildlife O&M Costs*. The average cost per acre presented in that document was $24 in 2004 dollars, this has been adjusted to reflect 2015 dollars.

[3] Cost per acre here includes cost of acquisition/easement and initial mitigation actions and long-term O&M for 50 years.

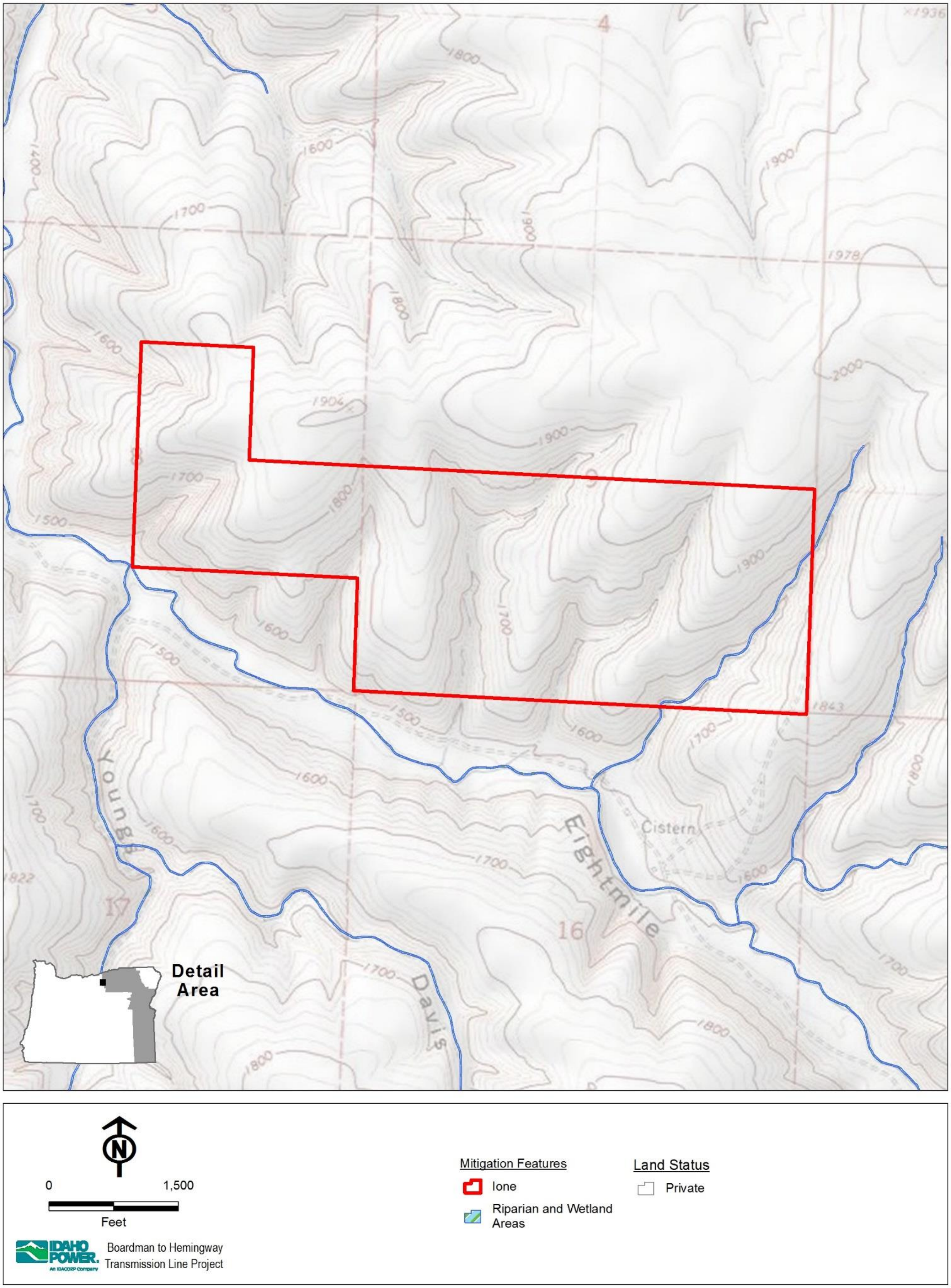

Figure 1. Ione Ownership and Water

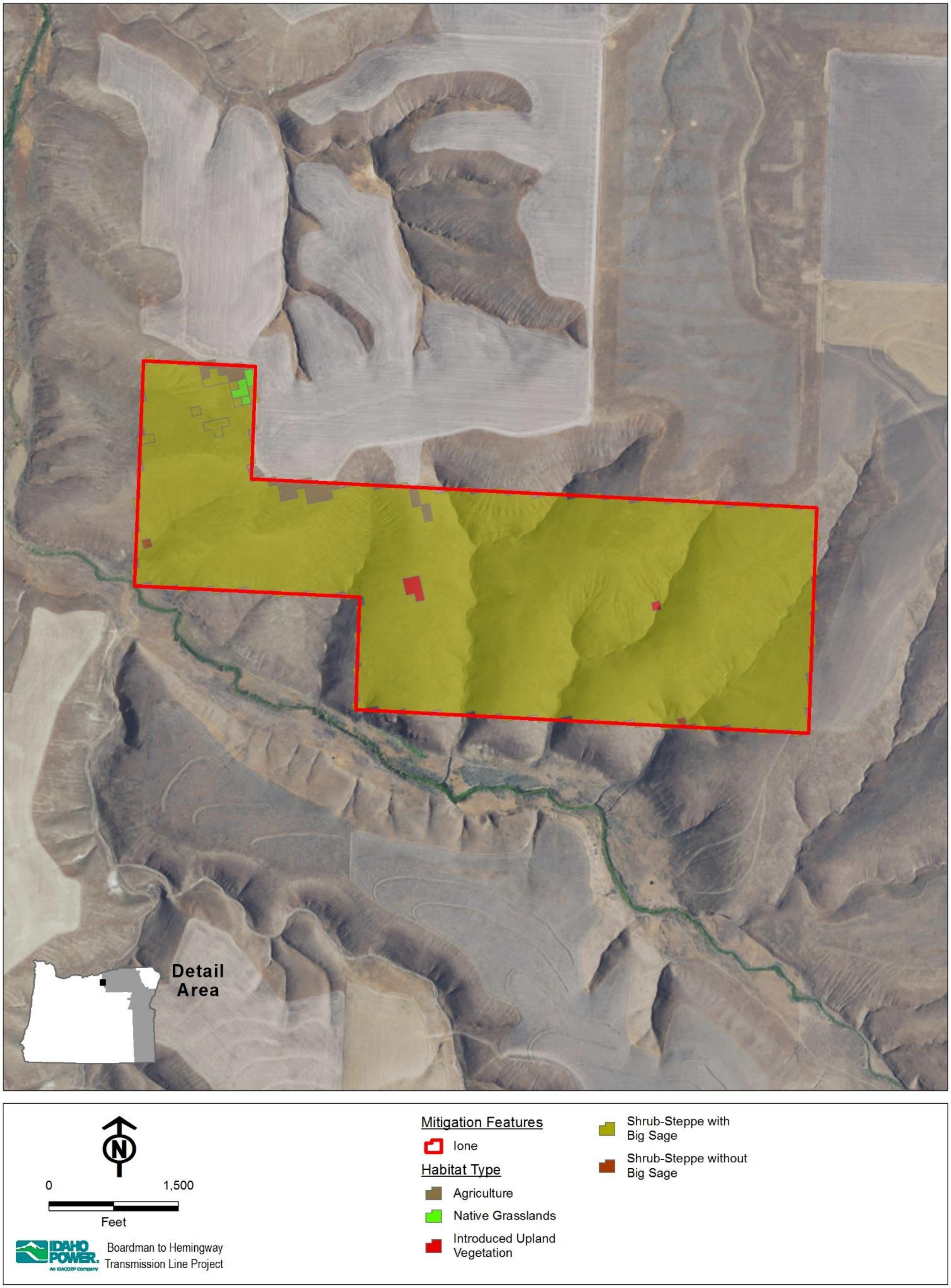

Figure 2. Ione Habitat Types

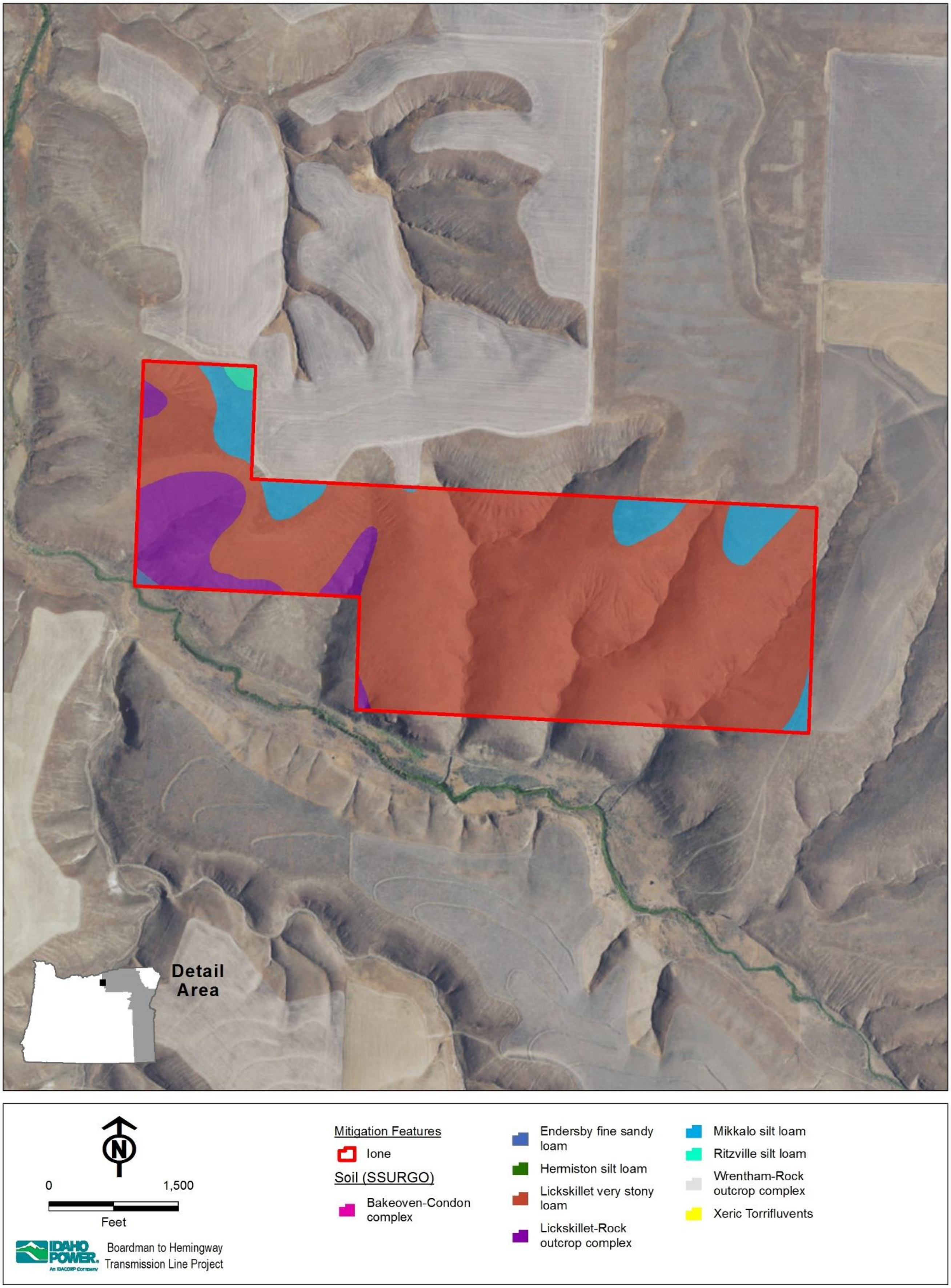

Figure 3. Ione Soil Types

Boardman to Hemingway Transmission Line Project

Desktop Habitat Mitigation Site Assessment Worksheet

Parcel Name:	Olex (**Figure 1**)	**Date of Assessment:**	9/8/2015
Landowner:		**Parcel Elevation (ft):**	1,000 – 1,800
Parcel Size in Acres:	2,067 (1,563 available for easement)	**Within Mitigation Service Area?:**	No

Location Description
(County, miles and direction from known location, TRS, UTM, other):

Gilliam County, 16 miles west of Ione.
T1S R21E Sections 1, 11, 14, 15, 22, 23, 24, 25, 26

Vegetation Cover Classes (Figure 2)

Habitat Category[1] and Habitat Type[2]	HMP General Vegetation Type	Acres	% of Parcel	Wildlife Habitat[3]
Category 1		**418.6**	**20.2**	
Native Grassland	Shrub/Grass	346.0	16.7	WAGS1, MDWR
Perennial Grassland	Shrub/Grass	72.6	3.5	WAGS1, MDWR
Category 2		**1,583.2**	**76.5**	-
Perennial Grassland	Shrub/Grass	556.2	26.9	WAGS2, MDWR
Native Grassland	Shrub/Grass	429.5	20.7	WAGS2, MDWR
Old Field	Shrub/Grass	2.1	0.1	WAGS2, MDWR
Perennial Grassland	Shrub/Grass	198.0	9.6	MDWR
Native Grassland	Shrub/Grass	348.0	16.8	MDWR
Old Field	Shrub/Grass	49.4	2.4	MDWR
Category 3		**0**	**0**	-
Category 4		**0**	**0**	-
Category 5		**0**	**0**	-
Category 6		**68.2**	**3.3**	-
Agriculture	Agriculture/ Developed	61.1	3.3	MDWR
Developed	Agriculture/ Developed	6.3	0.3	MDWR
Cemetery	Agriculture/ Developed	0.8		MDWR
Total	**NA**	**2,069.9**	**100**	**-**

[1] Represents the habitat category based on overlap with wildlife habitat layers. Agriculture and Developed habitat types' categories are not modified by overlap with wildlife habitat.
[2] The Habitat Type for this property was provided by the property owner, and does not exactly follow the Habitat Types defined for the Project and presented in the Habitat Categorization Matrix (see Exhibit P1, Attachment P1-1).
[3] WAGS1 = Category 1 habitat consisting of the active ground squirrel colony which is defined as single or cluster of holes as well as the required habitat for squirrel survival (785 feet from the edge of the extent of active holes). WAGS2 = Category 2 habitat consisting of the area of potential Washington ground squirrel use (1.5km from the edge of the WAGS1 area in similar habitat type and quality). MDWR = Category 2 habitat for ODFW mule deer winter range.
[4] Total acres of habitat type will not match actual parcel size due to resolution of the Gap Analysis Project raster dataset. Pixels of the raster dataset were not simplified or smoothed to match the exact shape of the parcel boundary.

Soil types

The NRCS Soil Survey Geographic Database (SSURGO) data was reviewed and the following soils were identified on the property (**Figure 3**):

	Bakeoven-Condon complex, 2 to 20 percent slopes (**4 acres**). Bakeoven soils consist of very shallow, well drained soils found on mountains, ridgetops, hillslopes, mesas, and benches at elevations of 300 to 4,800 feet. Bakeoven soils are used for livestock grazing and wildlife habitat. Native vegetation is Sandberg bluegrass and stiff sagebrush. Condon soils are moderately deep, well drained soils found in uplands at elevations of 1,100 to 4,000 feet. Typical use is grain crops. Native plants are bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass, and forbs such as yarrow, phlox, and buckwheat. *Hermiston Silt Loam* (**57.5 acres**). Hermiston soils consist of deep, well drained soils found on stream bottomlands (along Rock Creek here) and low terraces. Typical use is production of dry farmed wheat or irrigated small grains, alfalfa, sugar beets, pasture and hay crops. Native vegetation was mainly giant wildrye and bluebunch wheatgrass. *Lickskillet-Rock outcop complex*, 40 to 70 percent slopes (**11 acres**) and *Lickskillet very stony loam*, 7 to 40 percent slopes (**645 acres**). The lickskillet soils consist of shallow, well drained soils typical of south-facing canyon and mountain side slopes from 200 to 4,500 feet. On this property, the rock outcrop complex makes up the south facing canyon wall along Rock Creek just north of Rock Creek Road; the very stony loam occurs along the side slopes of the drainages (Pat's Canyon and others) within the property. Typical use is livestock grazing. Native vegetation is bluebunch wheatgrass, Sandberg bluegrass, Thurber needlegrass, western yarrow, and Wyoming big sagebrush. *Mikkalo silt loam*, 2 to 70 percent slopes (**463 acres**). Mikkalo soils consist of moderately deep, well drained soils on canyons, hills, plateaus, and ridges from 300 to 2,800 feet. These soils are found within the hilltops/plateaus that dominate the property south of Rock Creek. They make up some of the potential WAGS habitat on the property. Typical use is production of small grains and rangeland. The native vegetation is bluebunch wheatgrass, green rabbitbrush, big sagebrush, balsamroot, and yarrow. *Ritzville silt loam*, 2 to 40 percent slopes (**687 acres**). Ritzville soils consist of very deep and deep to duripan, well drained soils typically found on upland plateaus and benches from 700 to 3,000 feet. They make up the majority of the hilltops/plateaus found on the property south of Rock Creek. These soils make up some of the potential WAGS habitat on the property. Typical use is dryland wheat production and livestock grazing. Native vegetation is bluebunch wheatgrass, Sandberg bluegrass, Wyoming big sagebrush, and yarrow. *Wtrentham-Rock outcrop complex*, 35 to 70 percent slopes (**190 acres**). The Wrentham soils consist of moderately deep, well drained soils found on north-facing canyon slopes from 900 to 3,600 feet elevation. They occur on the property along the north facing slopes just south of Rock Creek, including bands of rock outcrops. Typical use is range; native vegetation is Idaho fescue, bluebunch wheatgrass, Sandberg bluegrass, forbs and shrubs. *Xeric torrifluvents*, nearly level (**10 acres**). This is an alluvial fan type of soil and is found along a small portion of Rock Creek.

Hydrologic Features Present (SteamNet, NWI, NHD)	Property contains four intermittent streams per NHD. Rock Creek supports redband trout and ESA listed summer steelhead. Rock Creek supports migrating and spawning steelhead and provides rearing areas for fry and juveniles. NWI did not identify any wetland features outside those associated with riparian areas of NHD streams.

Adjacent land ownership, use, and condition	Adjacent land ownership is private; however, a small BLM parcel is just east of the property on the opposite side of Rock Creek. Majority of adjacent land use is dry land agriculture.
Infrastructure Density within or Near the Parcel (Qualitative Description)	Upper Rock Creek Rd. runs through the property and a couple of residential structures appear along the road in the northern portion of the property. Otherwise, a majority of the property is open habitat. Property is just east of State Route 19 (John Day Highway), Union Pacific RR has a line within 3 miles, and TOPO maps show a transmission line coming into a substation at OLEX.
Summary	Identified as a WAGS habitat concentration area by the Washington Wildlife Habitat Connectivity Working Group (**Figure 1**). Active WAGS colonies are present; therefore the property contains Category 1 and Category 2 WAGS habitat (**Figure 4**). The property is outside of the mitigation service area and is in a county not directly impacted by the project. However, the property was nominated by ODFW and would likely be acceptable mitigation. In addition to WAGS, the property contains Rock Creek which supports an ESA listed steelhead population and the entire property is within ODFW designated mule deer winter range.
Pass/Fail Desktop Assessment?	Pass

Boardman to Hemingway Transmission Line Project
Consideration of Property as a Potential Mitigation Site

Mitigation Function	The property owner has stated that 1,563 acres of the property are available for mitigation through an easement. Most of the potential easement area (1,515 acres) is upland habitat identified as Native Grassland and Perennial Grassland (**Figure 2**). These upland habitats consist of planted perennial, annual, and native bunchgrass grasslands; and patches of shrub-steppe habitat consisting of basin big sagebrush and other shrub species. The remaining 48 acres has recently been planted to native grassland (Seeded/Planted Revegetation; **Figure 2**) and contains approximately 1.25 miles of riparian corridor consisting of alder and willow along Rock Creek. This mitigation site would meet the entire Project need for WAGS habitat mitigation. It contains habitat features important to the species with ample opportunities to provide ecological uplift through implementation of standard mitigation actions. This mitigation site would provide mitigation credit for Project impacts on Category 1 & 2 WAGS habitat within the shrub/grass general vegetation type of the Columbia Basin. Mitigation actions and use restrictions will be consistent with the goal of no net loss of habitat and a net benefit in the quantity and quality of Category 2 habitat. In addition to Category 2 mitigation within the Columbia Basin, this mitigation site provides additional mitigation credit towards impacts on Category 3 and Category 4 shrub/grass habitats occurring within the Columbia Basin. The mitigation actions listed below, upon effective implementation, will provide a net benefit in quantity and quality of habitat available to WAGS (among other species) within the mitigation site and result in an ecological uplift (additionality) on the mitigation site.

Mitigation Site Manager	The mitigation site would be established through a conservation easement held by a non-profit group such as a land trust and would be managed by the current landowners.

Mitigation Actions	The following are mitigation actions that may be implemented at this mitigation site in order to satisfy the mitigation policies/guidelines of the permitting agencies. All mitigation actions will follow reliable methods. The mitigation actions presented here are not comprehensive. Implementation will likely be some combination of one or more of the following: • *Modification of Livestock Grazing* – avoid grazing practices that would compete with native wildlife life history needs. Targeted grazing may be considered for habitat enhancement/treatment actions. • *Weed treatment* – the extent of noxious weed invasion on the mitigation site is unknown at this time but it is anticipated that opportunities exist to implement this mitigation action. Financial outline below assumes an initial effort to treat 75 acres. • *Native revegetation/restoration* – focus of efforts would be to promote establishment of sagebrush and bunchgrasses; opportunities exist but have not been specifically identified at this time. • *Fire readiness* – efforts made to make the property more resistant to catastrophic fire and a fire response plan could be developed. • *Fence removal/fence upgrade* – opportunities are unknown at this time, but it is anticipated that some unnecessary fencing may be removed or necessary fencing can be upgraded to more wildlife friendly fencing.

Monitoring	A specific plan for monitoring will be developed in coordination with ODFW during preparation of the conservation easement.

Success Criteria

Specific success criteria will be developed once baseline conditions have been determined and potential mitigation actions have been confirmed for the site. Success criteria may include but are not limited to:

- Vegetation plots show an increase in native vegetation cover and general trend toward increased habitat quality representing an ecological uplift.
- Successful weed control through documentation of a reduction in weeds and non-native invasive plant species.
- Mitigation success will not be dependent on documentation of increased use of the mitigation site by WAGS or any other wildlife species.

Financial Outline

This financial outline provides estimated figures and data for informational purposes only. These estimates are meant to provide an overview of the potential and reasonable costs of preparing an easement and implementing mitigation on this mitigation site. The financial outline does not guarantee the final easement value and costs for the easement. This desktop assessment cannot be used to infer value (monetary or ecological) of other properties or easements in the region. Unless otherwise stated, cost assumptions come from NRCS EQIP Practice Payment Rate schedules.

- Weed treatment: $20 - $200 per acre
- Native Seeding:
  - Site preparation (mowing/discing) $500 per acre
  - Broadcast/Drill seed: $100 - $250 per acre
- Hydroseeding: $792 per acre
- Wetland/Spring/Riparian Improvement
  - Complex Restoration: $2,400 per acre
  - Riparian Herbacous Cover
    - Broadcast Seeding: $687 per acre
    - Pollinator Cover: $1,303 per acre
    - Plug Planting: $13,730 per acre
    - Combo Seeding and Plug Planting: $6,947 per acre
  - Riparian Forest Buffer
    - Hand Plant, bare root: $768 per acre
    - Cuttings, small to medium: $867 per acre
    - Seeding: $106 per acre

Estimated Budget for the Olex Mitigation Site

Action	Cost per Unit	Units	Years	Expense
One-time Costs				
Easement Value	Unknown	1		Unknown
Easement Transaction Costs[1]	$20,000	1	-	$20,000
Weed Treatment	$200	75	-	$15,000
Native Seeding	$750	300	-	$225,000
Recurring Costs (Annually)				
O&M[3]	$30	1,563	50	$2,344,500
Total	**-**			**$?** ($?/acre)[4]

[1] Easement transaction cost is on the high end of the average presented in the 2009 report by Defenders of Wildlife and Trust for Public, titled *Land Conservation Spending in Oregon in Relation to the State Wildlife Conservation Strategy*.

[2] This O&M cost is an estimate of the cost per acre per year (not including acquisition/easement costs) based on the research presented in the Independent Economic Analysis Board's 2007 *Investigation of Wildlife O&M Costs*. The average cost per acre presented in that document was $24 in 2004 dollars, this has been adjusted to reflect 2015 dollars.

[3] Cost per acre here includes cost of acquisition/easement and initial mitigation actions and long-term O&M for 50 years.

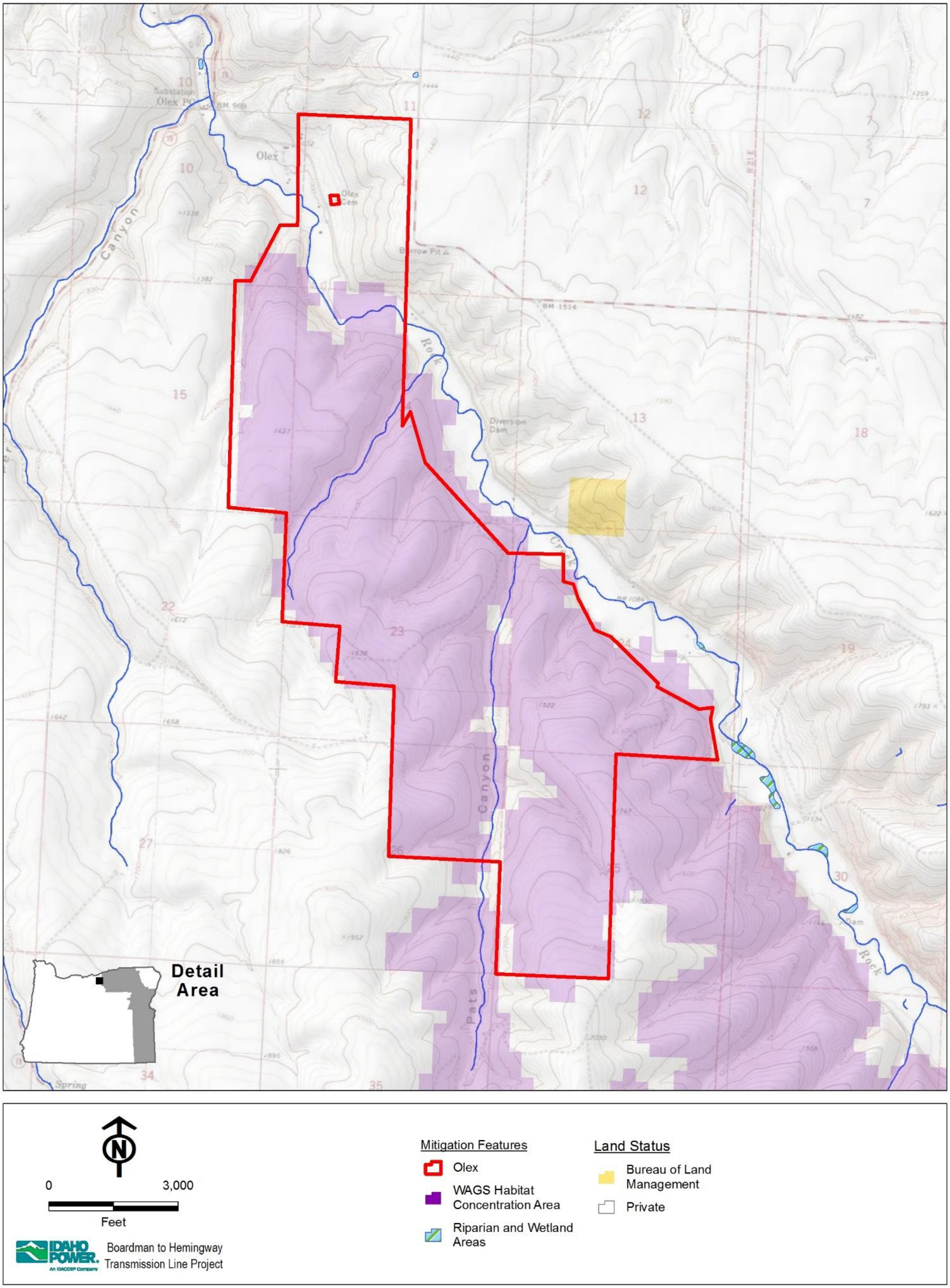

Figure 1. Olex WAGS Habitat Concentration Area, Ownership, and Water

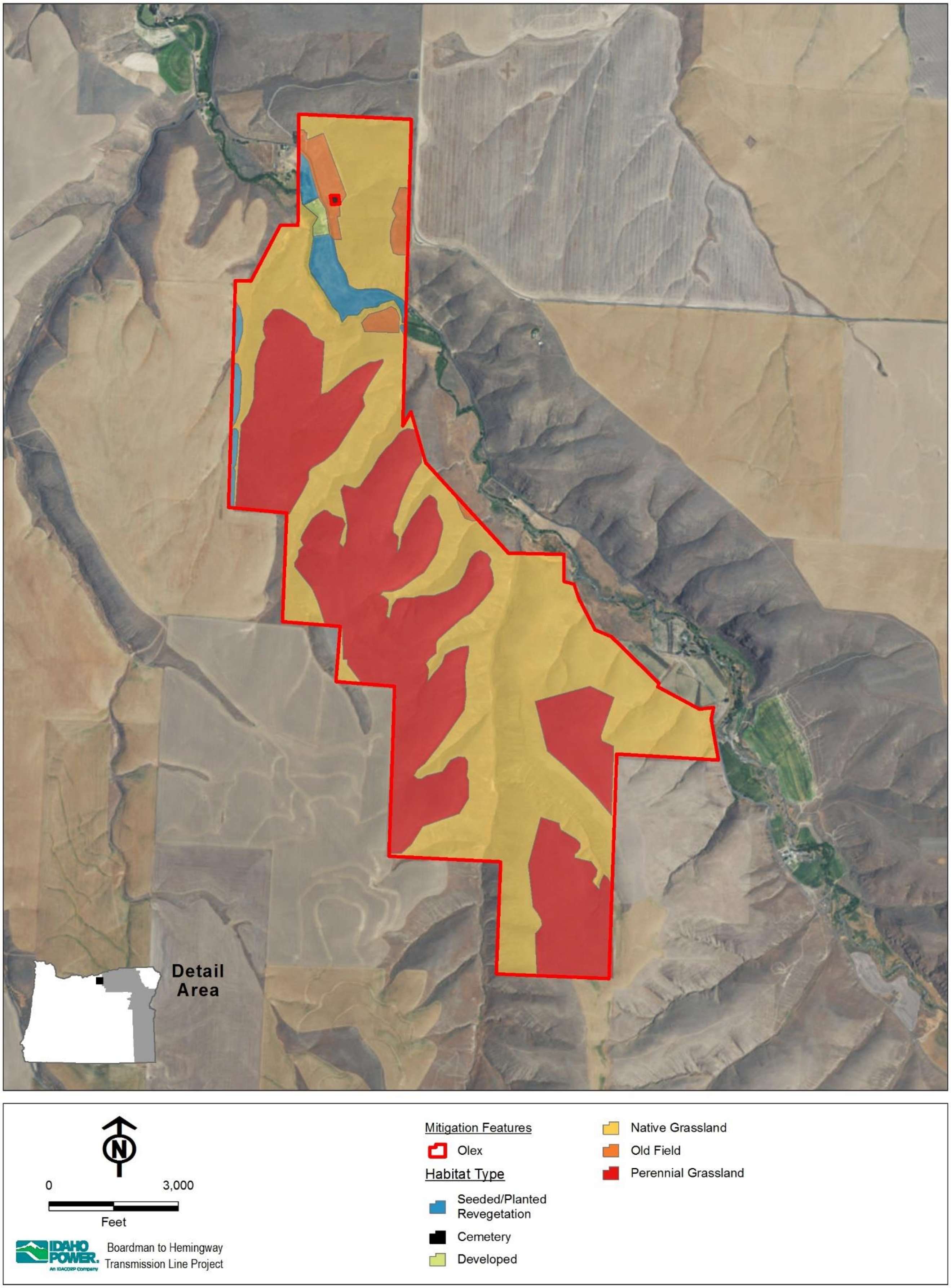

Figure 2. Olex Habitat Types

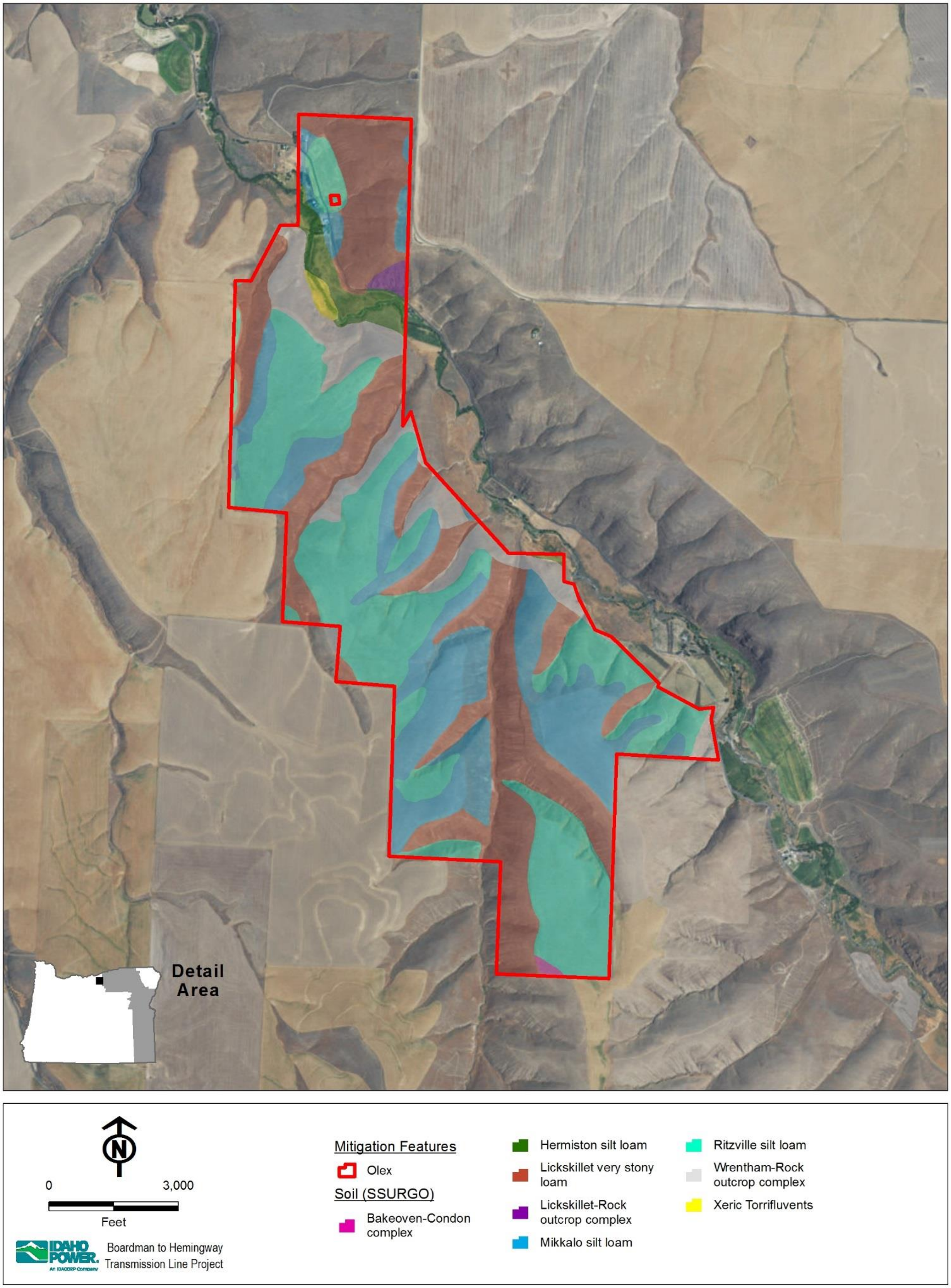

Figure 3. Olex Soil Types

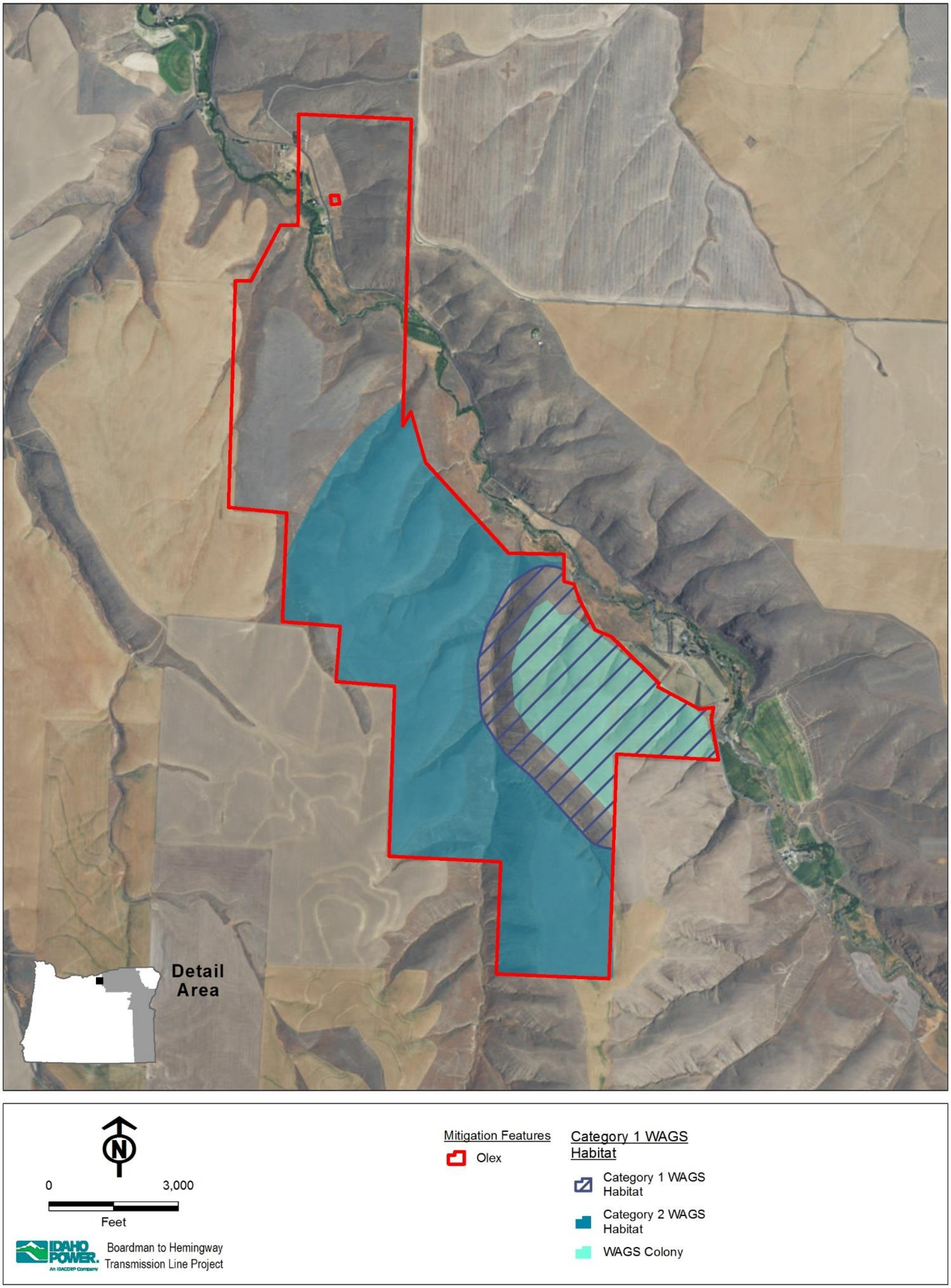

Figure 4. Olex Ground Squirrel Habitat

Boardman to Hemingway Transmission Line Project

Desktop Habitat Mitigation Site Assessment Worksheet

Parcel Name: Eightmile (**Figure 1**)
Landowner:
Parcel Size in Acres: 838

Date of Assessment: 2/12/2016
Parcel Elevation (ft): 1,600 – 2,100
Within Mitigation Service Area?: No

Location Description
(County, miles and direction from known location, TRS, UTM, other):

Morrow County, 10 miles south of Ione.
T2S R23E Sections 25, 26, 36. T2S R24E Section 31.

Vegetation Cover Classes (GAP[1], **Figure 2**)

HMP Habitat Category[2] and Type	HMP General Vegetation Type	Acres	% of Parcel	Wildlife Habitat[3]
Category 1				
Category 2		**799.4**	**95.6**	
CRP	Agriculture / Developed	429.9	51.4	MDWR
Shrub-Steppe with Big Sage	Shrub / Grass	357.8	42.8	MDWR
Native Grasslands	Shrub / Grass	6.2	0.7	MDWR
Shrub-Steppe without Big Sage	Shrub / Grass	3.3	0.4	MDWR
Introduced Upland Vegetation	Shrub / Grass	2.2	0.3	MDWR
Category 3				-
Category 4				-
Category 5				-
Category 6		**36.7**	**4.4**	-
Developed	Agriculture / Developed	4.2	0.5	MDWR
Agriculture	Agriculture / Developed	32.5	3.9	MDWR
Total		**836.1**	**100**	**-**

[1]USGS Gap Analysis Project (GAP) GIS data using ecological systems. Ecological systems were cross-walked to HMP Habitat Type as shown in the Habitat Categorization Matrix (Attachment P-2 of Exhibit P).
[2]Represents the highest category that the habitat type can be attributed based only on vegetation metrics. Field review of this site would likely warrant modification of categorization.
[3]MDWR = Category 2 ODFW mule deer winter range.

Soil types	The NRCS Soil Survey Geographic Database (SSURGO) data was reviewed and the following soils were identified on the property (**Figure 3**): *Lickskillet very stony loam* (**219 acres**). Lickskillet soils consist of shallow, well drained soils typically found on south-facing canyon and mountain side slopes at elevations of 200 to 4,500 feet. Lickskillet soils are dominantely used for livestock grazing. Other uses include watershed, recreation, and wildlife habitat. Vegetation is bluebunch wheatgrass, Sandberg bluegrass, Thurber needlegrass, western yarrow, and Wyoming big sagebrush. *Rhea silt loam* (**22 acres**). Rhea soils consist of deep, well drained soils found on upland slopes at elevations of 1,600 to 3,200 feet. Rhea soils are cultivated or used as rangeland. Small grains, hay and pasture are the principal crops. Native vegetation is mainly bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass and forbs such as yarrow, phlox and buckwheat. *Ritzville silt loam* (**6.6 acres**). Ritzville soils consist of very deep and deep to duripan, well drained soils found on uplands including plateaus, benches, and canyon side slopes at elevations ranging between 700 to 3,000 feet. Ritzville soils are used for dryland wheat production and some livestock grazing. Native vegetation is bluebunch wheatgrass, Sandberg bluegrass, Wyoming big sagebrush, and yarrow. *Valby silt loam* (**590 acres**). Valby soils consist of moderately deep, well drained soils on upland slopes at elevations of 1,600 to 3,000 feet. Valby soils are used for dryfarm small grains, hay, pasture and range. Native vegetation is mainly bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass and forbs such as yarrow, phlox and buckwheat.
Hydrologic Features Present (SteamNet, NWI, NHD)	One intermittent water feature crosses the property, in Lundell Canyon. The property borders Eightmile Canyon for approximately 0.75 mile, which contains an intermittent water feature. The property also borders an intermittent water feature associated with Gooseberry and Lundell Canyon for 1 mile. Wetland features are along the intermittent water features; otherwise the property is dry.
Adjacent land ownership, use, and condition	All adjacent land is privately held. A majority of adjacent land use is dry land agriculture with some open rangeland.
Infrastructure Density within or Near the Parcel (Qualitative Description)	The property contains a 2,400 square foot residence, a feeder barn, shop, additional barn, and four metal grain bins. The Ione-Gooseberry Road borders the northern portion of the property. Rural area is relatively devoid of major infrastructure.
Summary	The property is outside of the mitigation service area. Mule deer winter range completely overlaps the property. It provides non-agriculture and native habitat adjacent to a couple of canyon features, so likely provides relatively undisturbed nesting and hiding cover for numerous species. Aerial photo review shows livestock trailing and congregation areas on the property. The CRP contract expires in September of 2017 (per real estate listing). The property overlaps with a historic WAGS occurrence from ORBIC. The property is outside of modeled habitat, but is within 2.5 miles of a habitat concentration area.
Pass/Fail Desktop Assessment?	Pass

Boardman to Hemingway Transmission Line Project

Consideration of Property as a Potential Mitigation Site

Mitigation Function	This potential mitigation site could provide mitigation for impacts on Category 2 mule deer winter range within the shrub/grass general vegetation type of the Columbia Basin. The mitigation site is outside of Washington ground squirrel modeled habitat (habitat concentration areas [WWHCWG 2012]) and only historical records of squirrel activity occur within the property. This mitigation site provides CRP and native habitat features within an agricultural-dominated landscape. Wildlife species including mule deer and especially migratory birds that utilize shrub-steppe and grassland habitats would benefit from implementation of mitigation actions that result in ecological uplift.
Mitigation Site Manager	Fee title acquisition with transfer of ownership to, State of Oregon, Federal Land Management Agency, approved NPO or Land Trust.
Mitigation Actions	The following are mitigation actions that may be implemented at this mitigation site in order to satisfy the mitigation policies/guidelines of the permitting agencies. All mitigation actions will follow reliable methods. The mitigation actions presented here are not comprehensive. Implementation will likely be some combination of one or more of the following: • *Livestock grazing restrictions* – the current level of grazing on this property is unknown. Mitigation action could avoid grazing practices that would compete with native wildlife life history needs. Targeted grazing may be considered for habitat enhancement/treatment actions. • *Weed treatment* – the extent of noxious weed invasion on the mitigation site is unknown at this time but it is anticipated that opportunities exist to implement this mitigation action. • *Native revegetation/restoration* – the focus would be sagebrush and bunchgrasses on this mitigation site. • *Fire readiness* – efforts made to make the property more resistant to catastrophic fire and a fire response plan could be developed. • *Fence removal/fence upgrade* – opportunities are unknown at this time, but it is anticipated that some unnecessary fencing may be removed or necessary fencing can be upgraded to more wildlife friendly fencing.
Monitoring	A specific plan for monitoring will be developed, but in general, mitigation progress will be monitored through vegetation plot monitoring and establishment of photo locations. Monitoring will occur annually for the first 3-5 years and an annual report will be produced. During the annual monitoring phase, a longer-term monitoring plan will be developed using similar protocols and methods to monitor the mitigation actions at larger time intervals (i.e., 5 years, 10 years).
Success Criteria	Specific success criteria will be developed once baseline conditions have been determined and potential mitigation actions have been confirmed for the site. Success criteria may include but are not limited to: • Vegetation plots show an increase in native vegetation cover and general trend toward increased habitat quality representing an ecological uplift. • Successful weed control through documentation of a reduction in weeds and non-native invasive plant species. • Mitigation success will not be dependent on documentation of increased use of the mitigation site by wildlife species.

Financial Outline

Estimated Budget for the Eightmile Mitigation Site

Action	Cost per Unit	Units	Years	Expense
One-time Costs				
Acquisition	700,000	1		700,000
Recurring Costs (Annually)				
O&M[1]	30	838	50	1,257,000
Total	**-**			**$1,957,000** ($2,335/acre)[2]

[1] This O&M cost is an estimate of the cost per acre per year (not including acquisition/easement costs) based on the research presented in the Independent Economic Analysis Board's 2007 *Investigation of Wildlife O&M Costs*. The average cost per acre presented in that document was $24 in 2004 dollars, this has been adjusted to reflect 2015 dollars.

[2] Cost per acre here includes cost of acquisition/easement and initial mitigation actions and long-term O&M for 50 years.

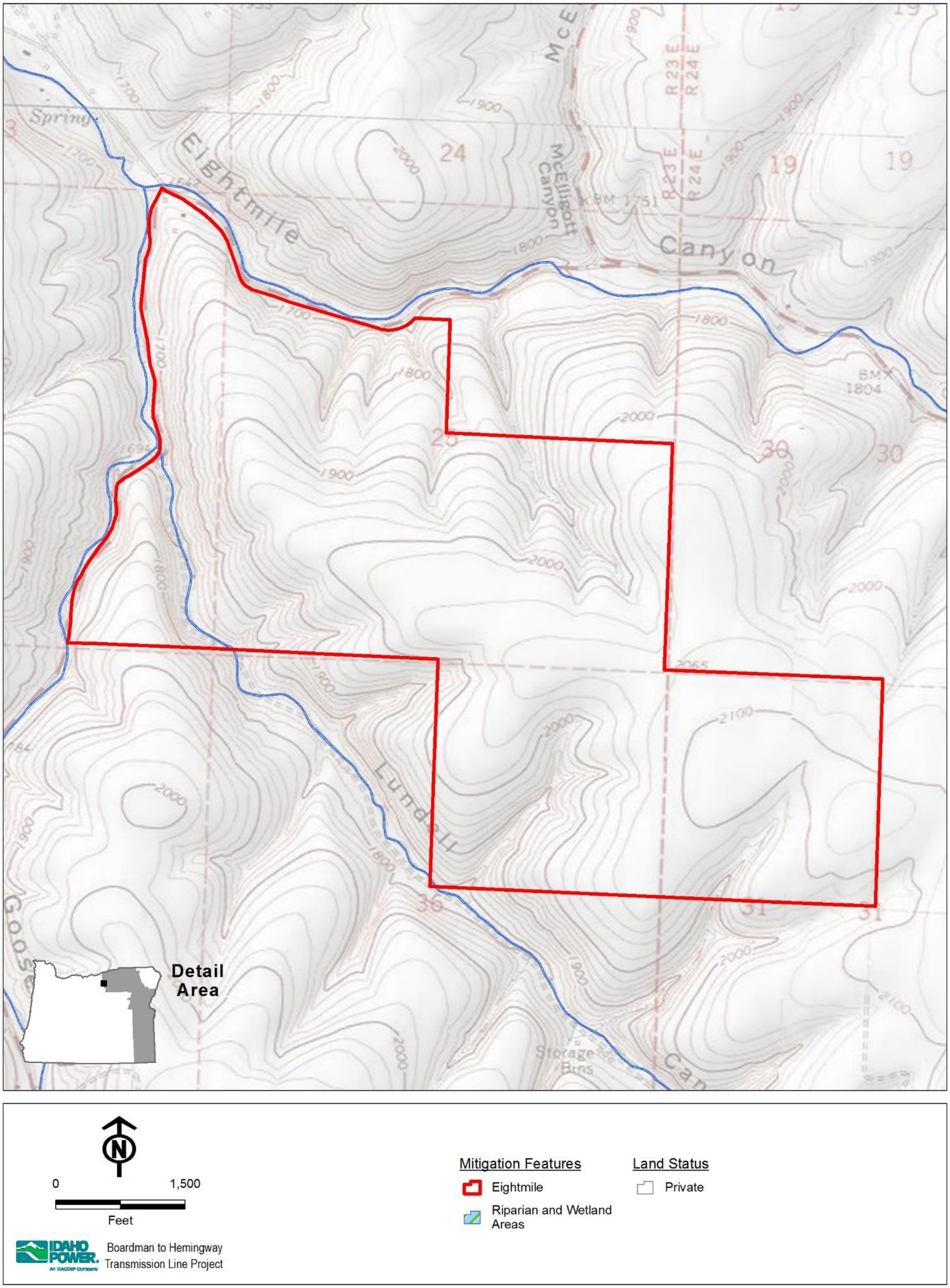

Figure 1. Eightmile Ownership and Water

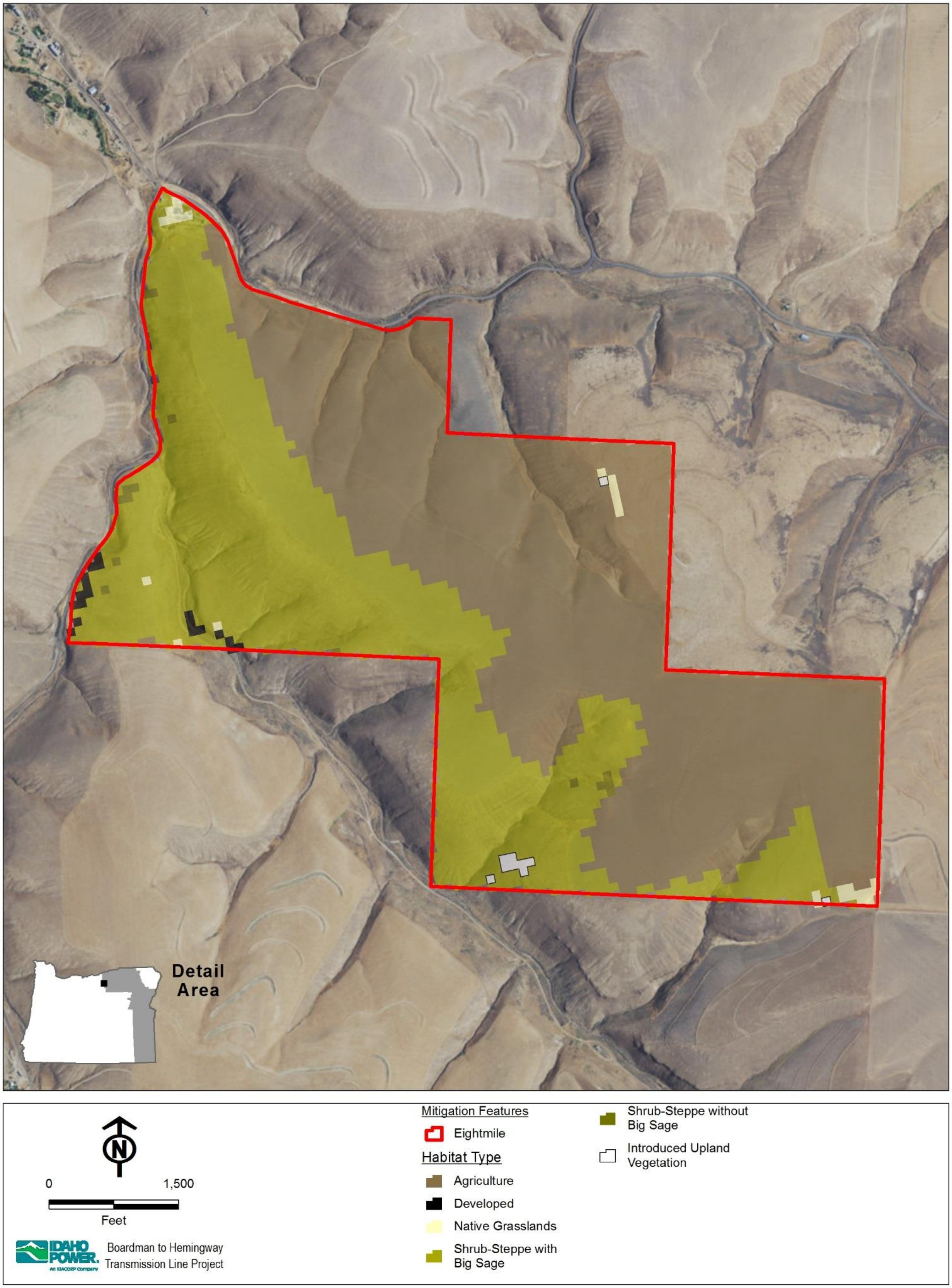

Figure 2. Eightmile Habitat Types

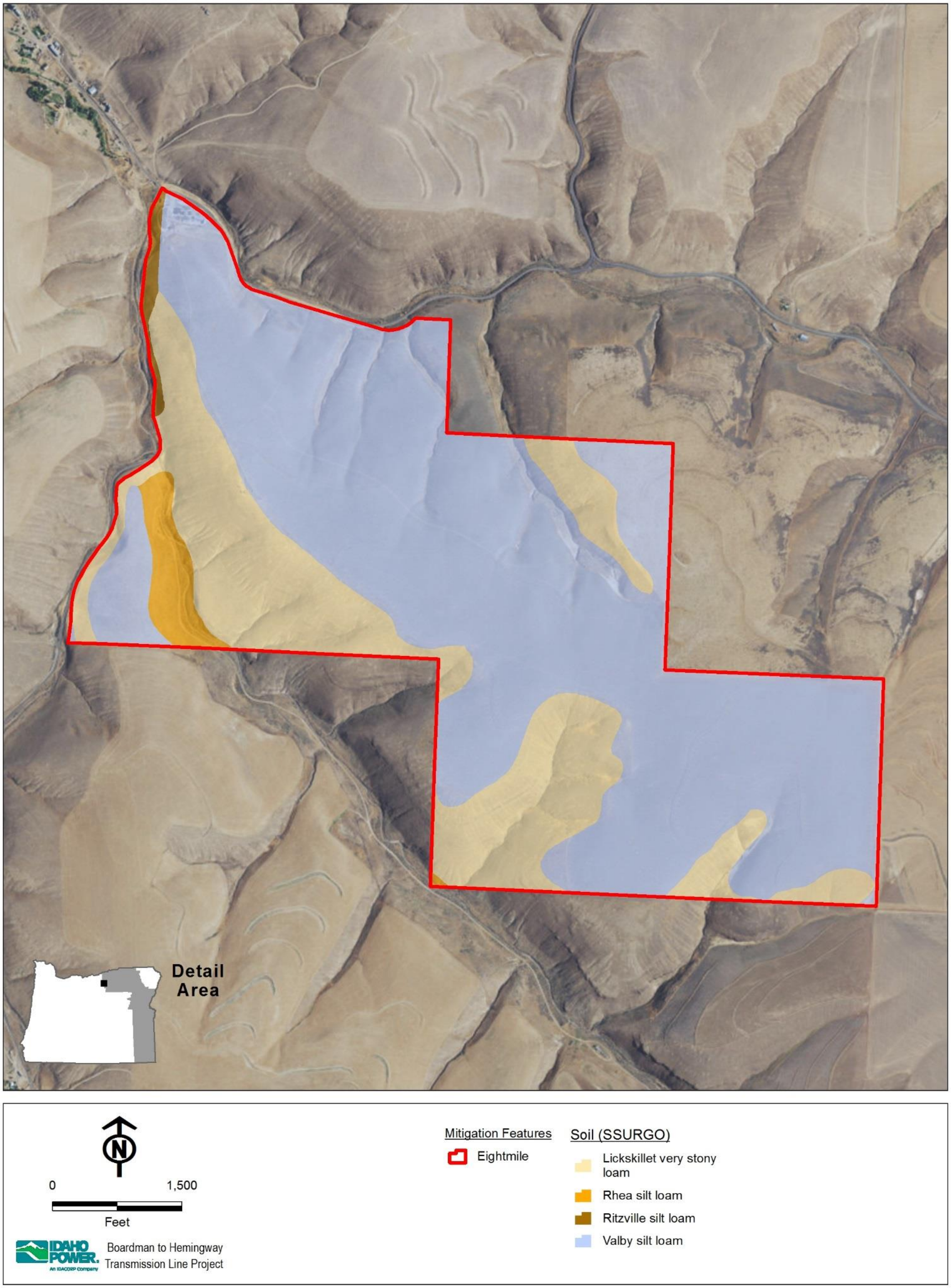

Figure 3. Eightmile Soil Types

Habitat Mitigation Areas with Mitigation Zone 2

- Antelope Mountain
- County Line
- Glass Hill
- High Valley

Boardman to Hemingway Transmission Line Project

Desktop Habitat Mitigation Site Assessment Worksheet

Parcel Name:	Antelope Mountain (**Figure 1**)	**Date of Assessment:**	8/11/2014
Landowner:		**Parcel Elevation (ft):**	3,690 – 5,128
Parcel Size in Acres:	1,623	**Within Mitigation Service Area?:**	Yes

Location Description
(County, miles and direction from known location, TRS, UTM, other):

Baker County, T7S R38E S4, 7 miles southwest of North Powder, OR.
T7S R38E Sections 3, 4, 5, 8, 9, 16, 17

Vegetation Cover Classes (GAP[1], **Figure 2**)

HMP Habitat Category[2] and Type	HMP General Vegetation Type	Acres	% of Parcel	Wildlife Habitat[3]
Category 1, 3, 4, 5, & 6		**0**	**0**	
Category 2[4]		**1,623.4**	**100**	-
Ponderosa Pine	Forest/Woodland	448.3	27.6	RMEWR, MDWR, RMESR
Ponderosa Pine	Forest/Woodland	57.5	3.5	RMEWR, MDWR
Mixed Grand Fir / Douglas Fir	Forest/Woodland	388.7	23.9	RMEWR, MDWR, RMESR
Mixed Grand Fir / Douglas Fir	Forest/Woodland	183.8	11.3	RMEWR, MDWR
Shrub-Steppe without Big Sage	Shrub/Grassland	70.7	4.4	RMEWR, MDWR, RMESR
Shrub-Steppe without Big Sage	Shrub/Grassland	144.6	8.9	RMEWR, MDWR
Rocky Mountain Aspen	Forest/Woodland	58.6	3.6	RMEWR, MDWR, RMESR
Rocky Mountain Aspen	Forest/Woodland	5.1	0.3	RMEWR, MDWR
Western Juniper / Mountain Mahogany Woodland	Forest/Woodland	46.6	2.9	RMEWR, MDWR, RMESR
Western Juniper / Mountain Mahogany Woodland	Forest/Woodland	12.3	0.8	RMEWR, MDWR
Forested Wetland	Open Water/ Wetland	28.7	1.8	RMEWR, MDWR, RMESR
Forested Wetland	Open Water/ Wetland	4.4	0.3	RMEWR, MDWR
Subalpine/Montane Forest	Forest/Woodland	22.2	1.4	RMEWR, MDWR
Shrub-Steppe with Big Sage	Shrub/Grassland	19.9	1.2	RMEWR, MDWR, RMESR
Shrub-Steppe with Big Sage	Shrub/Grassland	90.2	5.6	RMEWR, MDWR
Lodgepole Pine	Forest/Woodland	7.6	0.5	RMEWR, MDWR, RMESR
Lodgepole Pine	Forest/Woodland	2.9	2.9	RMEWR, MDWR
Mixed Tamarack	Forest/Woodland	6.2	0.4	RMEWR, MDWR, RMESR
Scrub-Shrub Wetland	Open Water/ Wetland	4.2	0.3	RMEWR, MDWR, RMESR
Remaining	-			

[1] USGS Gap Analysis Project (GAP) GIS data. Ecological systems were cross-walked to HMP Habitat Type as shown in the Habitat Categorization Matrix (Attachment P1-1 of Exhibit P1).
[2] Represents the habitat category based on overlap with wildlife habitat layers.
[3] MDWR = ODFW mule deer winter range; RMEWR = ODFW Rocky Mountain elk winter range; RMESR = Rocky Mountain Elk Foundation Rocky Mountain elk summer range.
[4] Total acres of habitat type will not match actual parcel size due to resolution of the GAP raster dataset.

Soil types The NRCS Soil Survey Geographic Database (SSURGO) data was reviewed and the following soils were identified on the property (**Figure 3**):

Bouldrock-Kilmerque complex (**25 acres**). Bouldrock soils consist of moderately deep, well drained soils found on south-facing side slopes of mountainous areas at elevations ranging from 4,000 to 6,200 feet. Bouldrock soils are used for rangeland. The native vegetation is bluebunch wheatgrass, mountain big sagebrush, arrowleaf balsamroot and gray rabbitbrush. Kilmerque soils consist of moderately deep, well drained soils on gently rolling bench tops to moderately steep south aspect side slopes in forested mountains at elevations ranging from 3,500 to 6,000 feet. Kilmerque soils are used for woodland. The native vegetation is ponderosa pine, Douglas fir and pinegrass.

Brownlee-Shangland loams (**0.2**). Brownlee soils consist of deep and very deep, well drained soils that are found on nearly level to steep inclines on hill summits, backslopes and footslopes, and fan remnants at elevations of 2,500 to 5,800 feet. Brownlee soils are used mainly for rangeland and wildlife habitat. Native vegetation is bluebunch wheatgrass, Idaho fescue, xeric big sagebrush and antelope bitterbrush. Some areas are used for irrigated or nonirrigated cropland (small grains) and hayland/pasture. Shangland soils consist of moderately deep, well drained soils on hills with slopes of 2 to 35 percent and elevation ranging from 3,600 to 4,000 feet. Shangland soils are used mainly for rangeland. Some small areas are used for nonirrigated small grain, hay and pasture. The native vegetation is mainly mountain big sagebrush, Idaho fescue, bluebunch wheatgrass, needlegrass, buckwheat, antelope bitterbrush, and squaw apple.

Crackler-Rouen gravelly silt loams (**275**). Crackler soils consist of deep, well drained soils found on north-facing side slopes of forested mountains at elevations ranging from 3,800 to 6,200 feet. Crackler soils are used for woodland, watershed and wildlife habitat. The native vegetation is Douglas fir, ponderosa pine, grand fir and western larch with an understory of pinegrass, elk sedge, huckleberry and snowberry. Rouen soils consist of moderately deep, well drained soils on north side slopes of forested areas at elevations of 3,800 to 6,200 feet. Rouen soils are used mainly for timber production. The vegetation is mainly Douglas fir, grand fir, western larch, minor amounts of ponderosa pine and lodgepole pine, common snowberry, princes pine, low Oregon grape, myrtle pachystima, elk sedge, pinegrass, big huckleberry, western rattlesnake plantain, twinflower, and heartleaf arnica.

Dogtown complex (**340**). Dogtown soils consist of deep and very deep, well drained soils on moderately steep and steep metastable and active north-facing side slopes of forested mountains at elevations ranging from 3,800 to 6,200 feet. Dogtown soils are used for woodland, watershed and wildlife habitat. The native vegetation is Douglas fir, grand fir, ponderosa pine and western larch with an understory of pinegrass, elk sedge, huckleberry and snowberry.

Greenscombe loam (**129**). Greenscombe soils consist of moderately deep, well drained soils on low hills at elevations 3,200 to 3,800 feet. Greenscombe soils are Rangeland. The native vegetation is Idaho fescue, bluebunch wheatgrass, Sandberg bluegrass, Thurber needlegrass, and big sagebrush.

Hibbard silt loam (**117**). Hibbard soils consist of moderately deep to a duripan, well drained soils found on fan terraces at elevations of 3,000 to 3,700 feet. Hibbard soils are used for rangeland. The native vegetation is bluebunch wheatgrass, Idaho fescue and big sagebrush.

Soil types (cont.)

Highhorn-Huntrock very gravelly silt loams (**282**). Highhorn soils consist of deep, well drained soils on moderately steep to steep south-facing side slopes of mountains at elevations from 3,800 to 7,200 feet. Highhorn soils are used for timber production, watershed and wildlife habitat. The native vegetation is ponderosa pine, Douglas fir

	and grand fir with an understory of pinegrass and elk sedge. Huntrock soils consist of moderately deep, well drained soils on moderately steep to steep south side slopes of mountains at elevations from 3,800 to 7,200 feet. Huntrock soils are used for woodland, watershed and wildlife habitat. The native vegetation is ponderosa pine, Douglas fir and grand fir with an understory of pinegrass and elk sedge. *Kilmerque loam* (**272**). Kilmerque soils consist of moderately deep, well drained soils on gently rolling bench tops to moderately steep south aspect side slopes in forested mountains at elevations ranging from 3,500 to 6,000 feet. Kilmerque soils are used for woodland. The native vegetation is ponderosa pine, Douglas fir and pinegrass. *Ladd loam* (**24**). Ladd soils consist of deep, well drained soils on alluvial fans, terraces, and colluvial footslopes at elevations ranging from 2,700 to 5,050 feet. Ladd soils are mostly used in irrigated crops of alfalfa, grass and small grain or dryland pasture and hay or range. Vegetation is mainly Idaho fescue, associated forbs, a few ponderosa pine or western juniper, big sagebrush, rabbitbrush, bluebunch wheatgrass, and cheatgrass. *Tolo-Dogtown complex* (**159**). Tolo soils consist of deep and very deep, well drained soils found on nearly level upland plateaus and steep north and east-facing mountain side slopes at elevations of 2,800 to 5,400 feet. Tolo soils used for timber production and livestock grazing with small areas at lower elevations cleared for cultivation. Principal trees include Douglas fir, grand fir, larch, ponderosa pine, and lodgepole pine. Dogtown soils consist of deep and very deep, well drained soils on moderately steep and steep metastable and active north-facing side slopes of forested mountains at elevations ranging from 3,800 to 6,200 feet. Dogtown soils are used for woodland, watershed and wildlife habitat. The native vegetation is Douglas fir, grand fir, ponderosa pine and western larch with an understory of pinegrass, elk sedge, huckleberry and snowberry.

Hydrologic Features Present (SteamNet, NWI, NHD)	A couple of intermittent drainages are identified through NHD, as well as a couple of canal/ditch features. According to the real estate listing, numerous springs occur on site. The North Powder River runs within 0.10 mile along the western border of the parcel.

Adjacent land ownership, use, and condition	One small BLM parcel borders the property; otherwise the entire property is bordered by private landowners. Immediate adjacent land use includes some pasture/ag lands, otherwise a majority appears to be rangeland and wildlife. Large tracts of USFS occur approximately 1.5 miles to the west and the ODFW North Powder Elkhorn Wildlife Management Area is within 0.5 mile, located to the northwest of the parcel. The Rocky Ford campground is located along the North Powder River within 0.25 mile to the west of the parcel.

Infrastructure Density within or Near the Parcel (Qualitative Description)	I-84 is 6.5 miles to the east of the property. Anthony Lakes Hwy is just outside of the parcel to the east, and a few rural homes and rural access roads border the parcel. The parcel itself contains a couple of dirt/gravel access roads. Infrastructure is nearly absent within the parcel and is at minimal densities in the immediate vicinity.

Summary	Parcel is dominated by conifer forest type habitat with secondary habitat of shrub-steppe habitat both with and without big sage species. USFS land and an ODFW WMA are in close proximity; however, there are no shared borders with those lands. The parcel overlaps with the Elkhorn Mountains area of the TNC Portfolio. The parcel

	also overlaps an ODFW Conservation Opportunity Area within the Blue Mountains ecoregion, the Baker Valley. Most of the recommended conservation actions in this area include watershed, riparian, and wetland improvements, along with the protection or enhancement of habitat for ESA listed plants (Howell's spectacular thelopody, Oregon semaphore grass). The parcel is completely with ODFW elk and mule deer winter range and is also identified as summer elk range. The parcel is within an ODFW linkage buffer for elk, which were identified to show areas important to animal movement that cross paved roads.

Pass/Fail Desktop Assessment?	Pass

Boardman to Hemingway Transmission Line Project

Consideration of Property as a Potential Mitigation Site

Mitigation Function	This mitigation site has been identified as in-kind and in-proximity mitigation for impacts on Category 2 elk and mule deer winter habitat within the forest/woodland general vegetation group. This mitigation site could also help meet the Project need for elk summer habitat. It contains important habitat features with opportunities to provide durable ecological uplift through implementation of standard mitigation actions. Opportunities to improve the watershed would be in line with the recommendations of the Oregon Conservation Strategy for the Baker Valley Conservation Opportunity Area. The mitigation actions listed below, upon successful implementation, will increase the quality of habitat available to elk and mule deer (among other species) within the mitigation site and result in an ecological uplift to the mitigation site above what is provided under the current management.
Mitigation Site Manager	Fee title acquisition with transfer of ownership to State of Oregon, Federal Land Management Agency, approved NPO or Land Trust
Mitigation Actions	The following are mitigation actions that may be implemented at this mitigation site in order to satisfy the mitigation policies/guidelines of the permitting agencies. All mitigation actions will follow reliable methods. The mitigation actions presented here are not comprehensive. Implementation will likely be some combination of one or more of the following: • *Livestock grazing restrictions* – avoid grazing practices that would compete with native wildlife life history needs. Targeted grazing may be considered for habitat enhancement/treatment actions. • *Weed treatment* – the extent of noxious weed invasion on the mitigation site is unknown at this time but it is anticipated that opportunities exist to implement this mitigation action. • *Native revegetation/restoration* – the focus would be planting forage shrubs and implementing forest management practices that would create structural diversity and enhance desirable habitat conditions. • *Fire readiness* – efforts made to make the property more resistant to catastrophic fire and a fire response plan could be developed. • *Fence removal/fence upgrade* – opportunities are unknown at this time, but it is anticipated that some unnecessary fencing may be removed or necessary fencing can be upgraded to more wildlife friendly fencing.
Monitoring	A specific plan for monitoring will be developed, but in general, mitigation progress will be monitored through vegetation plot monitoring and establishment of photo locations. Monitoring will occur annually for the first 3-5 years and an annual report will be produced. During the annual monitoring phase, a longer-term monitoring plan will be developed using similar protocols and methods to monitor the mitigation actions at larger time intervals (i.e., 5 years, 10 years).

Success Criteria

Specific success criteria will be developed once baseline conditions have been determined and potential mitigation actions have been confirmed for the site. Success criteria may include but are not limited to:

- Vegetation plots show an increase in native vegetation cover and general trend toward increased habitat quality representing an ecological uplift.
- Successful weed control through documentation of a reduction in weeds and non-native invasive plant species.
- Mitigation success will not be dependent on documentation of increased use of the mitigation site by WAGS or any other wildlife species.

Financial Outline

Estimated Budget for the Antelope Mountain Mitigation Site

Action	Cost per Unit	Units	Years	Expense
One-time Costs				
Acquisition (from listing)	$3,000,000	1	-	$3,000,000
Recurring Costs (Annually)				
O&M[1]	$53.75	1,623	50	$4,361,813
Total	-			$7,361,813 ($4,536/acre)[2]

[1] This O&M cost is an estimate of the cost per acre per year (not including acquisition/easement costs) based on the research presented in the Independent Economic Analysis Board's 2007 *Investigation of Wildlife O&M Costs*. The cost per acre identified in that study for the Elkhorn Wildlife Management Area (which this mitigation site will be modeled after) was $43 in 2004 dollars, this has been adjusted to reflect 2015 dollars.

[2] Cost per acre here includes cost of acquisition/easement and long-term O&M for 50 years.

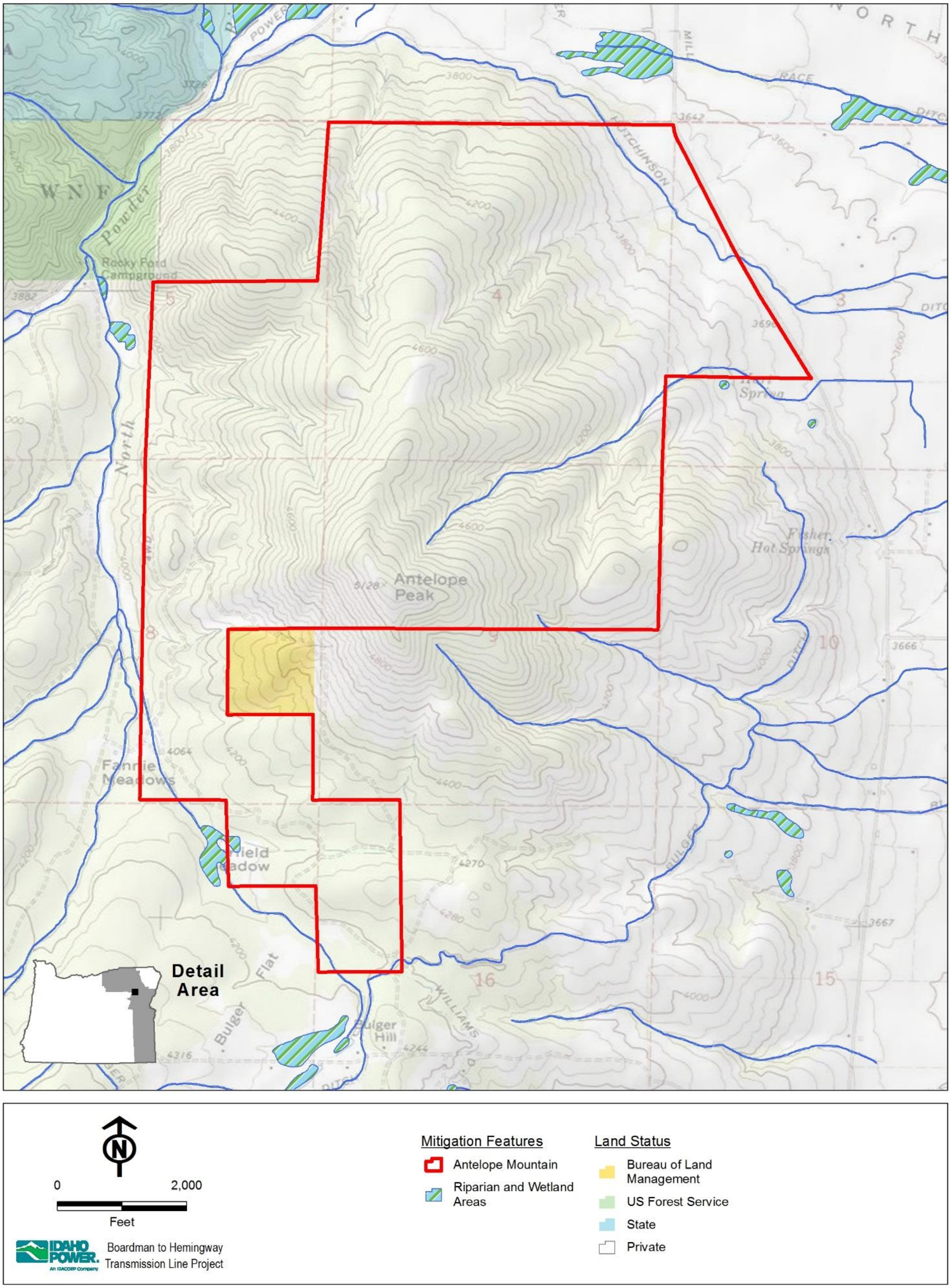

Figure 1. Antelope Mountain Ownership and Water

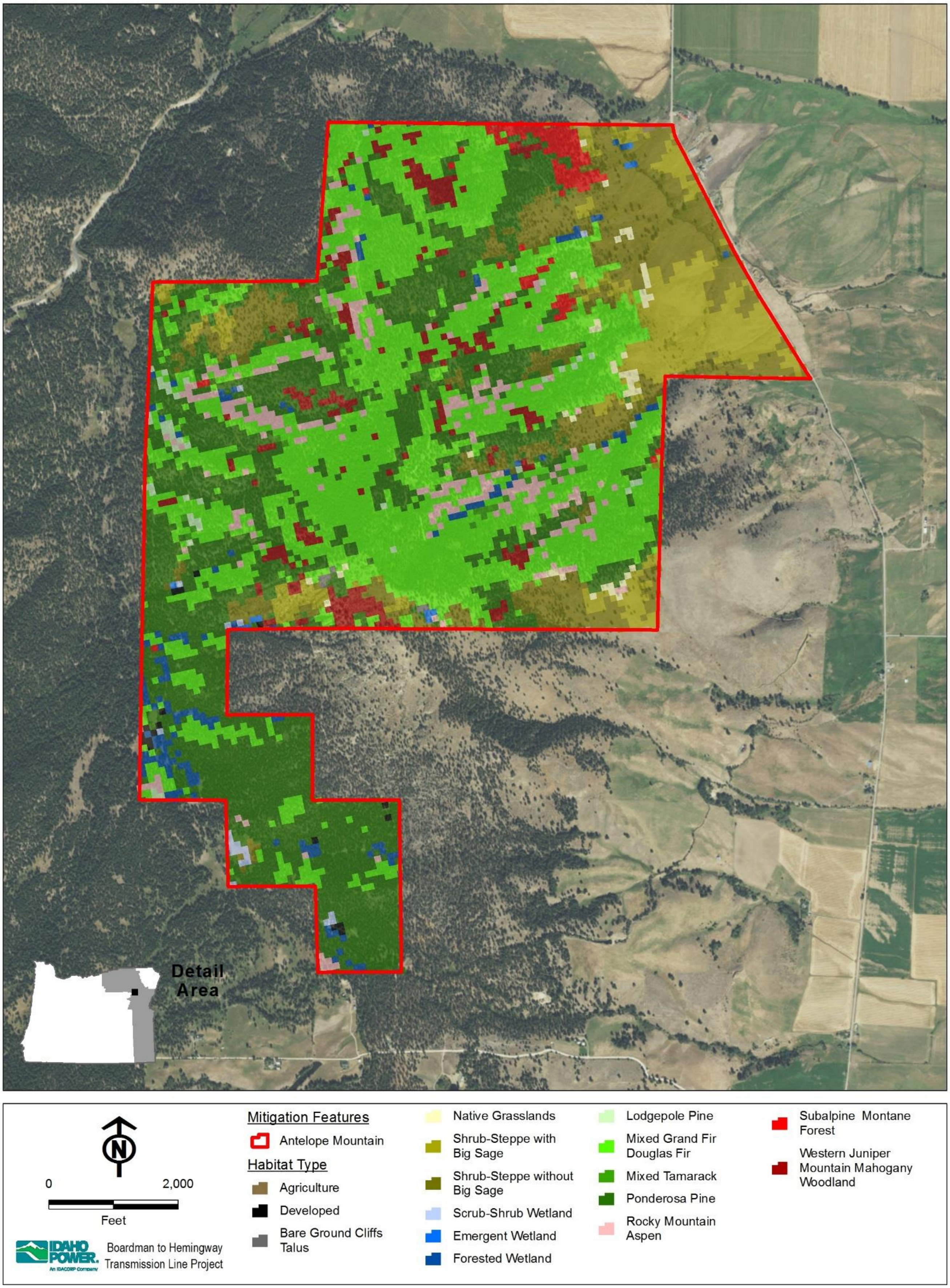

Figure 2. Antelope Mountain Habitat Types

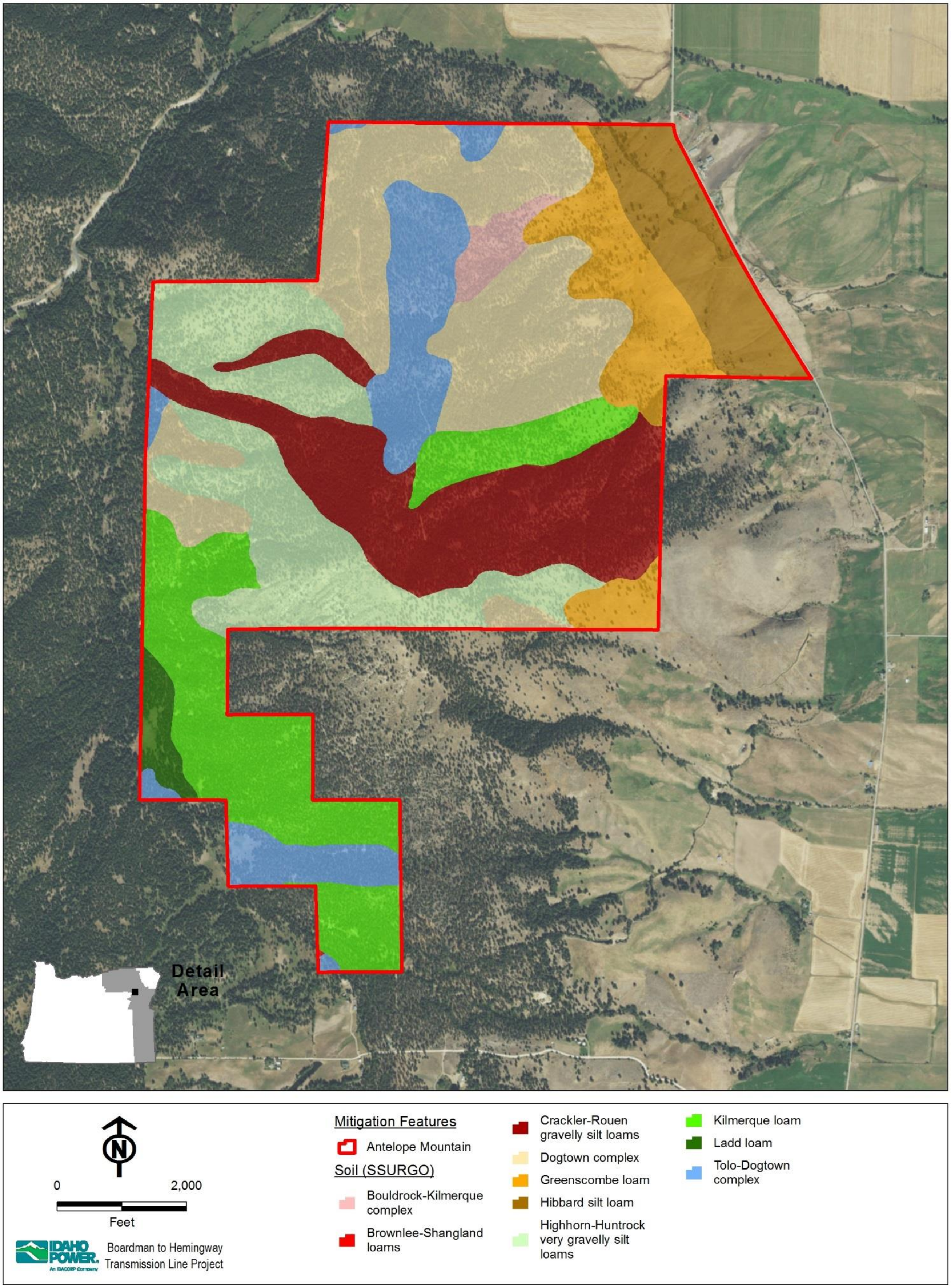

Figure 3. Antelope Mountain Soil Types

Boardman to Hemingway Transmission Line Project

Desktop Habitat Mitigation Site Assessment Worksheet

Parcel Name:	County Line (**Figure 1**)	**Date of Assessment:**	10/15/2014
Landowner:		**Parcel Elevation (ft):**	4,000 – 4,800
Parcel Size in Acres:	792	**Within Mitigation Service Area?:**	Yes

Location Description
(County, miles and direction from known location, TRS, UTM, other):

Baker and Union County, 9 miles west of North Powder.
T6S R38E Sections 7, 18, 19.

Vegetation Cover Classes (GAP[1], **Figure 2**)

HMP Habitat Category[2] and Type	HMP General Vegetation Type	Acres	% of Parcel	Wildlife Habitat[3]
Category 1		**-**	**-**	-
Category 2		**775.5**	**100**	-
Mixed Grand Fir / Douglas Fir	Forest/Woodland	305.4	39.4	RMEWR, RMESR, MDWR, MDSR
Ponderosa Pine	Forest/Woodland	244.7	31.6	
Rocky Mountain Aspen	Forest/Woodland	97.8	12.6	
Shrub-Steppe without Big Sage	Shrub/Grass	31.3	4.0	
Lodgepole Pine	Forest/Woodland	30.7	4.0	
Forested Wetland	Wetland	24.9	3.2	
Mixed Tamarack	Forest/Woodland	13.1	1.7	
Western Juniper / Mountain Mahogany Woodland	Forest/Woodland	11.3	1.5	
Shrub-Steppe with Big Sage	Shrub/Grass	6.0	0.8	
Subalpine / Montane Forest	Forest/Woodland	4.0	0.5	
Native Grasslands	Shrub/Grass	2.7	0.3	
Remaining (**Figure 2**)	-	3.6	0.5	
Category 3		**-**	**-**	-
Category 4		**-**	**-**	-
Category 5		**-**	**-**	-
Category 6		**-**	**-**	-
Total		**775.5**	**100**	**-**

[1] USGS Gap Analysis Project (GAP) GIS data using ecological systems. Ecological systems were cross-walked to HMP Habitat Type as shown in the Habitat Categorization Matrix (Attachment P1-1 of Exhibit P1).

[2] Represents the habitat category based on overlap with wildlife habitat layers. Agriculture and Developed habitat types' categories are not modified by overlap with wildlife habitat.

[3] MDWR = Category 2 habitat for ODFW mule deer winter range; RMEWR = Category 2 habitat for ODFW Rocky Mountain elk winter range; RMESR = Category 3 habitat for Rocky Mountain Elk Foundation Rocky Mountain elk summer range; MDSR = Category 3 habitat for WAFWA mule deer summer range.

[4] Total acres of habitat type may not match actual parcel size due to resolution of the GAP raster dataset. Pixels of the raster dataset were not simplified or smoothed to match the exact shape of the parcel boundary.

Soil types The NRCS Soil Survey Geographic Database (SSURGO) data was reviewed and the following soils were identified on the property (**Figure 3**):

Hudspeth very stony clay loam (**9 acres**). Hudspeth soils consist of moderately deep, well drained soils found on side slopes of forested areas at elevations ranging from 4,000 to 5,700 feet. Hudspeth soils are used mainly for rangeland and wildlife habitat. The vegetation is mainly curlleaf mountainmahogany, western juniper, scattered ponderosa pine, mountain big sagebrush, bitterbrush, squaw apple, wax currant, bluebunch wheatgrass, Sandberg bluegrass, along with minor amounts of elk sedge, pinegrass, Idaho fescue and arrowleaf balsamroot.

Klicker-Anatone complex (**45 acres**). Klicker soils consist of moderately deep, well drained soils on mountains, plateaus, and benches at elevations from 2,500 to 6,200 feet. Klicker soils are used mainly for timber production and wildlife habitat. Native vegetation is an open stand of ponderosa pine and Douglas-fir with an understory of bluebunch wheatgrass, slender wheatgrass, brome grass, elk sedge, Oregon-grape, common snowberry, Saskatoon serviceberry, creambush oceanspray, mallow ninebark and wild rose. Anatone soils consist of shallow, well drained soils found on mountain side slopes, ridgetops, hills, and plateaus at elevations of 2,000 to 6,200 feet. Anatone soils are mostly used for livestock grazing, wildlife habitat, and recreation. Native vegetation is mainly bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass, mossy stonecrop, curlleaf mountain mahogany and stiff sagebrush.

Klicker stony silt loam (**269 acres**). Klicker soils consist of moderately deep, well drained soils on mountains, plateaus, and benches at elevations from 2,500 to 6,200 feet. Klicker soils are used mainly for timber production and wildlife habitat. Native vegetation is an open stand of ponderosa pine and Douglas-fir with an understory of bluebunch wheatgrass, slender wheatgrass, brome grass, elk sedge, Oregon-grape, common snowberry, Saskatoon serviceberry, creambush oceanspray, mallow ninebark and wild rose.

Lookingglass silt loam (**4 acres**) and *Lookingglass very stony silt loam* (**2 acres**). Lookingglass soils consist of very deep, moderately well drained soils found on uplands at elevations of 1,800 to 4,000 feet. Lookingglass soils are used mainly for timber production. Cleared areas are cropped to small grains, hay, pasture, and peas. The native vegetation is ponderosa pine and Douglas fir with an understory of spirea, oceanspray, Idaho fescue, pinegrass and elksedge.

Tolo silt loam (**47 acres**). Top soils consist of deep and very deep, well drained soils found on mountains at elevations ranging from 3,000 to 5,400 feet. Top soils are used mainly for timber production and cropland. Most areas with slopes of less than 15 percent have been cleared and are used for production for dryland grain and hay. Native vegetation is ponderosa pine, Douglas fir, white fir, pinegrass and elksedge. This series is in what is called the Douglas-fir forest plant community.

Top-McGarr complex (**238 acres**). Top soils consist of deep and very deep, well drained soils found on mountains at elevations ranging from 3,000 to 5,400 feet. Top soils are used mainly for timber production and cropland. Most areas with slopes of less than 15 percent have been cleared and are used for production for dryland grain and hay. Native vegetation is ponderosa pine, Douglas fir, white fir, pinegrass and elksedge. This series is in what is called the Douglas-fir forest plant community. McGarr soils consist of moderately deep, well drained soils found on mountains and hills at elevations of 3,000 to 5,800 feet. McGarr soils are used for timber production with some grazing. Vegetation is mainly Douglas fir and ponderosa pine with an understory of pinegrass and elk sedge.

Top silt loam (**160 acres**). Top soils consist of deep and very deep, well drained soils found on mountains at elevations ranging from 3,000 to 5,400 feet. Top soils are used mainly for timber production and cropland. Most areas with slopes of less than 15 percent have been cleared and are used for production for dryland grain and hay. Native vegetation is ponderosa pine, Douglas fir, white fir, pinegrass and elksedge. This series is in what is called the Douglas-fir forest plant community.

Hydrologic Features Present (SteamNet, NWI, NHD)	Property contains one intermittent stream, one perennial stream, and two canals/ditches (NHD). The perennial stream is Anthony Creek, which is designated critical habitat for bull trout. NWI identifies an emergent wetland not associated with the NHD streams.

Adjacent land ownership, use, and condition	Property is located between USFS land and the ODFW Elkhorn WMA. Some private parcels are located around the northern portion of the property. The property has been logged recently, as well as adjacent private parcels. Land use in the area is timber production, wildlife conservation, and rangelands.

Infrastructure Density within or Near the Parcel (Qualitative Description)	Property contains canals/ditches, logging roads throughout, and a small shack, otherwise devoid of development. Some WMA buildings, a gravel pit, Pilcher Creek reservoir, and well-maintained Tucker Flat Rd are within 0.5 mile of the property.

Summary	This property borders another property considered during desktop assessments (Cantrell). Property is within The Nature Conservancy's Elkhorn Mountains priority conservation area. It is immediately adjacent to ODFW's Elkhorn WMA. Contains critical habitat for bull trout and is completely within Rocky Mountain elk winter and summer range and mule deer winter and summer range. Property was recommended by ODFW.

Pass/Fail Desktop Assessment?	Pass

Boardman to Hemingway Transmission Line Project

Consideration of Property as a Potential Mitigation Site

Mitigation Function	This mitigation site has been identified as in-kind and in-proximity mitigation for impacts on Category 2 elk and mule deer winter range within the forest/woodland general vegetation type. This mitigation site could help meet the Project need for elk and mule deer summer habitat as well. It contains important habitat features with opportunities to provide durable ecological uplift through implementation of standard mitigation actions. Opportunities to improve the watershed would benefit bull trout and their designated critical habitat. The mitigation actions listed below, upon successful implementation, will increase the quality of habitat available to elk and mule deer (among other species) within the mitigation site and result in an ecological uplift to the mitigation site above what is provided under the current management.
Mitigation Site Manager	Fee title acquisition with transfer of ownership to State of Oregon, Federal Land Management Agency, approved NPO or Land Trust
Mitigation Actions	The following are mitigation actions that may be implemented at this mitigation site in order to satisfy the mitigation policies/guidelines of the permitting agencies. All mitigation actions will follow reliable methods. The mitigation actions presented here are not comprehensive. Implementation will likely be some combination of one or more of the following: • *Livestock grazing restrictions* – historic grazing practices at this property are unknown. However, the objective would be to avoid grazing practices that would compete with native wildlife life history needs. Targeted grazing may be considered for habitat enhancement/treatment actions. • *Weed treatment* – the extent of noxious weed invasion on the mitigation site is unknown at this time but it is anticipated that opportunities exist to implement this mitigation action. • *Native revegetation/restoration* – forest management practices would be implemented to create structural diversity and enhance desirable habitat conditions. • *Road closure* – restrict motor vehicle use to just those roads that are necessary; seasonally close access based on use by elk and mule deer. • *Fire readiness* – efforts made to make the property more resistant to catastrophic fire and a fire response plan could be developed. • *Fence removal/fence upgrade* – opportunities are unknown at this time, but it is anticipated that some unnecessary fencing may be removed or necessary fencing can be upgraded to more wildlife friendly fencing.
Monitoring	A specific plan for monitoring will be developed, but in general, mitigation progress will be monitored through vegetation plot monitoring and establishment of photo locations. Monitoring will occur annually for the first 3-5 years and an annual report will be produced. During the annual monitoring phase, a longer-term monitoring plan will be developed using similar protocols and methods to monitor the mitigation actions at larger time intervals (i.e., 5 years, 10 years).

Success Criteria	Specific success criteria will be developed once baseline conditions have been determined and potential mitigation actions have been confirmed for the site. Success criteria may include but are not limited to: • Vegetation plots show an increase in native vegetation cover and general trend toward increased habitat quality representing an ecological uplift. • Successful weed control through documentation of a reduction in weeds and non-native invasive plant species. • Mitigation success will not be dependent on documentation of increased use of the mitigation site by wildlife species.

Financial Outline

Estimated Budget for the County Line Mitigation Site

Action	Cost per Unit	Units	Years	Expense
One-time Costs				
Acquisition (from 2009 listing attached to ODFW nomination form)	$1,200,000	1		$1,200,000
50-year Operation and Management Costs				
O&M[1]	$53.75	792	50	$2,128,500
Total	-			**$3,328,500** ($4,202/acre)[2]

[1] This O&M cost is an estimate of the cost per acre per year (not including acquisition/easement costs) based on the research presented in the Independent Economic Analysis Board's 2007 *Investigation of Wildlife O&M Costs*. The cost per acre identified in that study for the Elkhorn Wildlife Management Area (which this mitigation site will be modeled after) was $43 in 2004 dollars, this has been adjusted to reflect 2015 dollars.

[2] Cost per acre here includes cost of acquisition/easement and long-term O&M for 50 years.

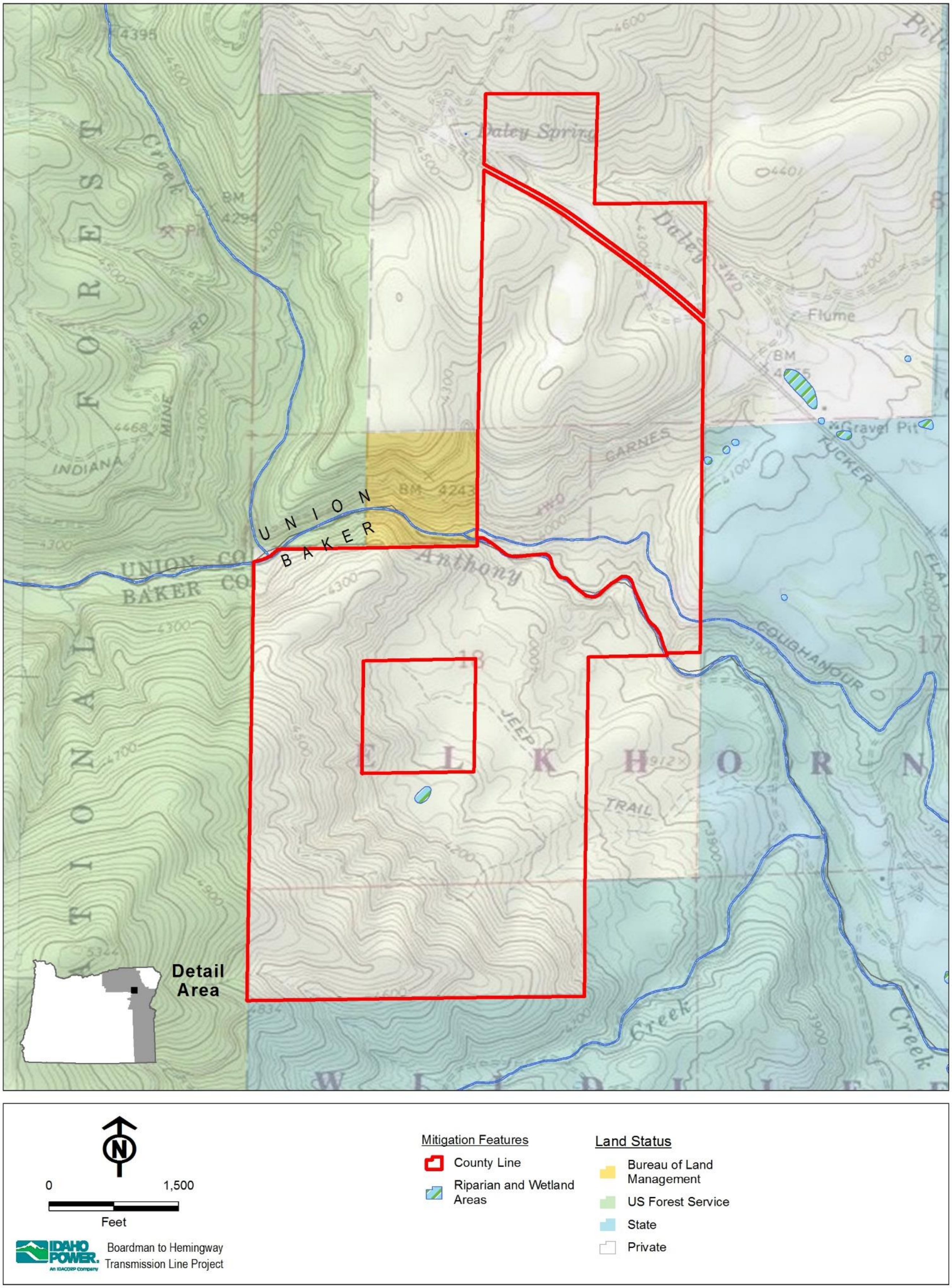

Figure 1. County Line Ownership and Water

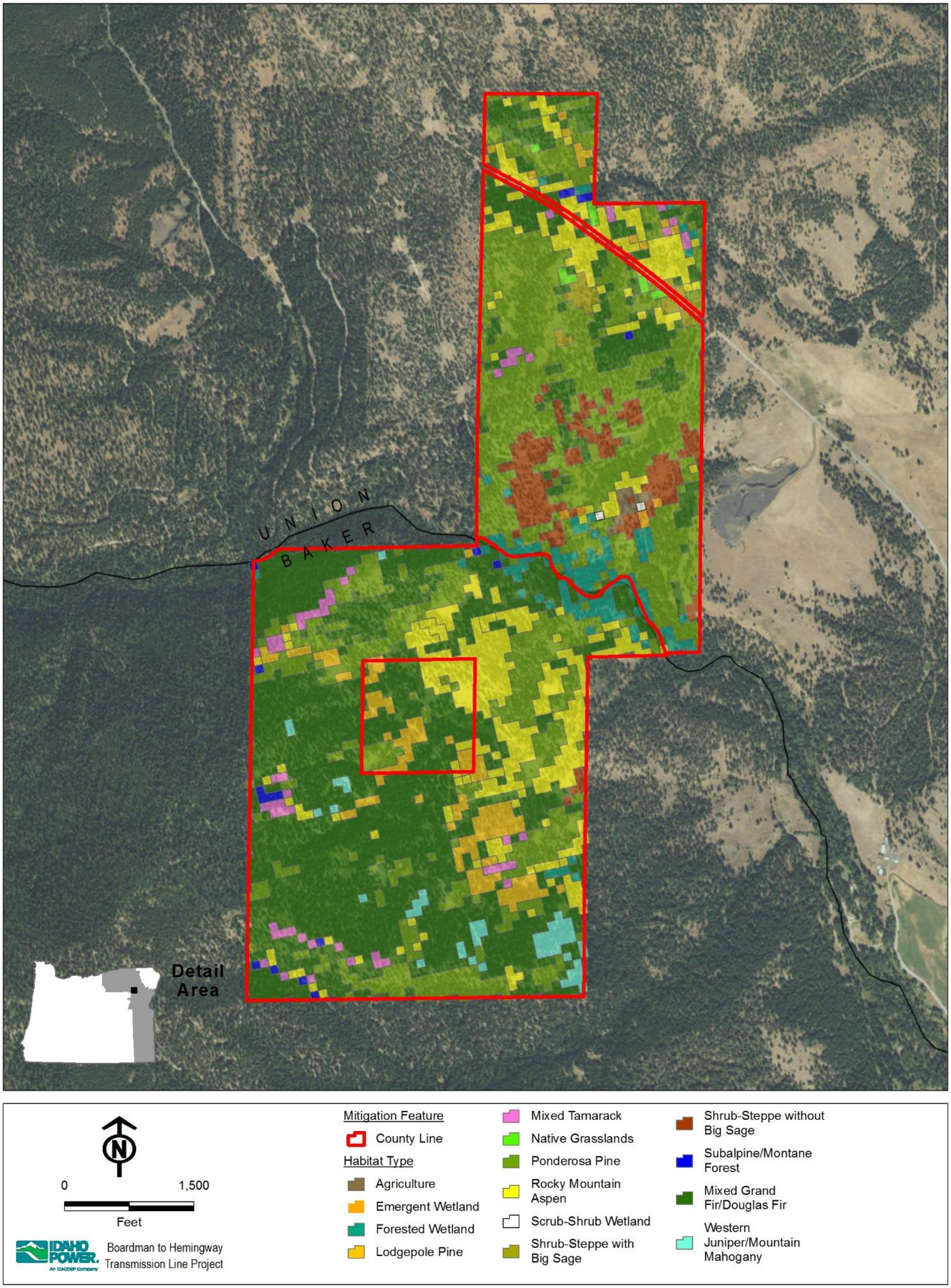

Figure 2. County Line Habitat Types

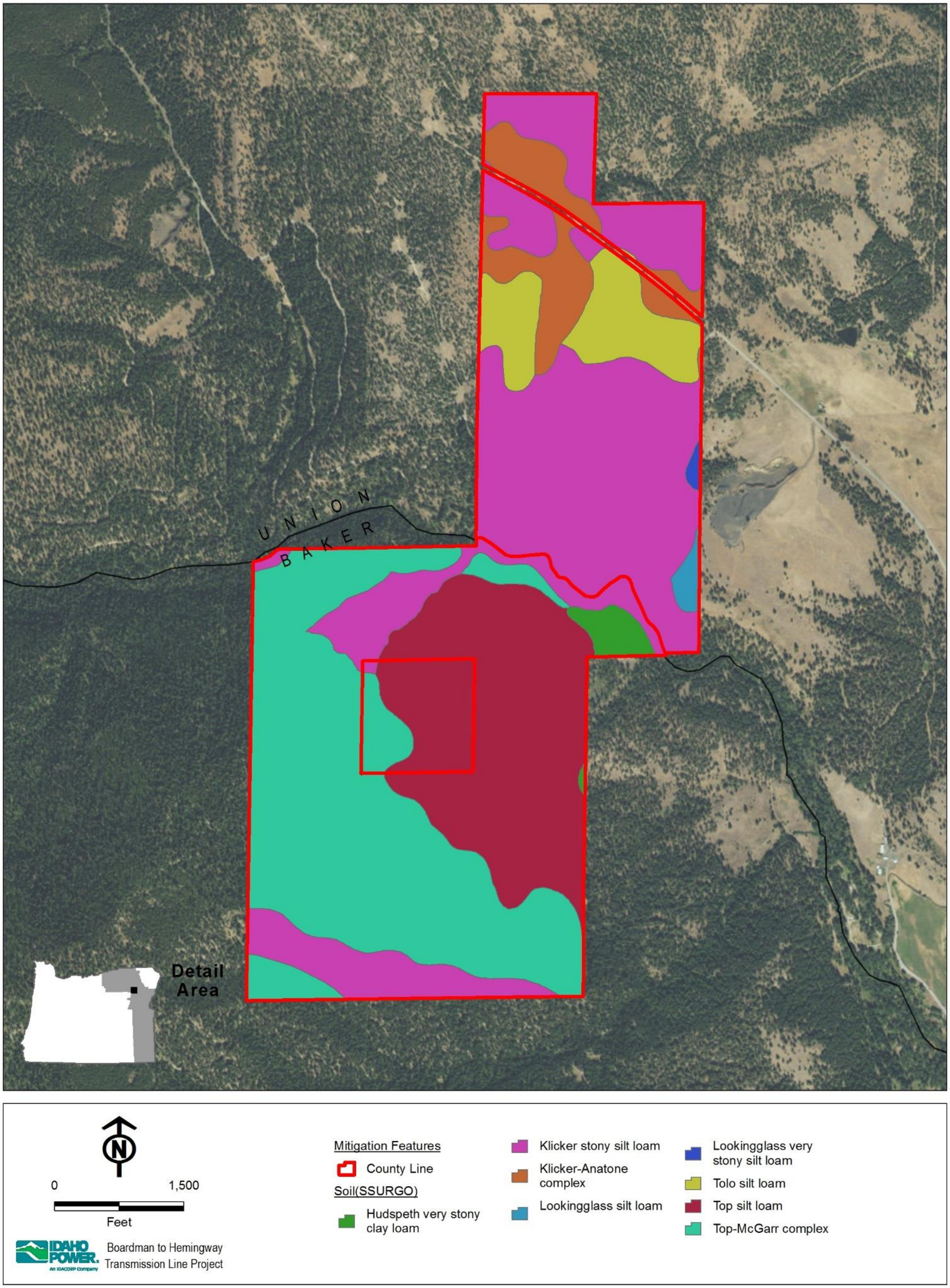

Figure 3. County Line Soil Types

Boardman to Hemingway Transmission Line Project

Desktop Habitat Mitigation Site Assessment Worksheet

Parcel Name: High Valley (**Figure 1**)
Date of Assessment: 10/21/2015
Landowner:
Parcel Elevation (ft):
Parcel Size in Acres: Approx. 14,886 acres
Within Mitigation Service Area?: Yes

Location Description
(County, miles and direction from known location, TRS, UTM, other):

Union County, just west of I-84 at Ladd Canyon.
T4S R38E Sections 4, 5, 8, 9, 10, 14, 15, 16, 17, 19, 20, 21, 22, 23, 26, 27, 28, 29, 30, 32, 33, 34, 35, 36
T5S R38E Sections 1, 2, 3, 4, 10, 11, 12, 13, 14, 15, 18, 19, 21, 22, 23, 24, 25, 26, 27, 28, 30, 34, 35

Vegetation Cover Classes (GAP[1], **Figure 2**)

HMP Habitat Category[2] and Type	HMP General Vegetation Type	Acres	% of Total	Wildlife Habitat[3]
Category 1		**0**	**0**	-
Category 2		**7,455**	**50.1**	-
Mixed Grand Fir/Douglas Fir	Forest/Woodland	3,158	21.2	RMEWR, RMESR, MDSR
Mixed Grand Fir/Douglas Fir	Forest/Woodland	58	0.4	RMEWR, MDWR, MDSR
Mixed Grand Fir/Douglas Fir	Forest/Woodland	111	0.7	RMEWR, MDWR
Mixed Grand Fir/Douglas Fir	Forest/Woodland	474	3.2	RMEWR, MDSR
Ponderosa Pine	Forest/Woodland	671	4.5	RMEWR, RMESR, MDSR
Ponderosa Pine	Forest/Woodland	256	1.7	RMEWR, MDWR, MDSR
Ponderosa Pine	Forest/Woodland	119	0.8	RMEWR, MDWR
Ponderosa Pine	Forest/Woodland	823	5.5	RMEWR, MDSR
Subalpine/Montane Forest	Forest/Woodland	445	3.0	RMEWR, RMESR, MDSR
Subalpine/Montane Forest	Forest/Woodland	14	0.1	RMEWR, MDSR
Mixed Tamarack	Forest/Woodland	424	2.9	RMEWR, RMESR, MDSR
Mixed Tamarack	Forest/Woodland	8	0.1	RMEWR, MDWR
Mixed Tamarack	Forest/Woodland	60	0.4	RMEWR, MDSR
Forested Wetland	Wetland	151	1.0	RMEWR, RMESR, MDSR
Forested Wetland	Wetland	21	0.1	RMEWR, MDWR, MDSR
Forested Wetland	Wetland	9	0.1	RMEWR, MDWR
Forested Wetland	Wetland	87	0.6	RMEWR, MDSR
Lodgepole Pine	Forest/Woodland	175	1.2	RMEWR, RMESR, MDSR
Lodgepole Pine	Forest/Woodland	10	0.1	RMEWR, MDSR
Native Grasslands	Shrub/Grass	34	0.2	RMEWR, RMESR, MDSR
Native Grasslands	Shrub/Grass	45	0.3	RMEWR, MDWR
Native Grasslands	Shrub/Grass	9	0.1	RMEWR, MDSR
Rocky Mountain Aspen	Forest/Woodland	47	0.3	RMEWR, RMESR, MDSR
Rocky Mountain Aspen	Forest/Woodland	68	0.5	RMEWR, MDWR, MDSR
Rocky Mountain Aspen	Forest/Woodland	13	0.1	RMEWR, MDSR

[1] USGS Gap Analysis Project (GAP) GIS data using ecological systems. Ecological systems were cross-walked to HMP Habitat Type as shown in the Habitat Categorization Matrix (Attachment P1--1 of Exhibit P1).
[2] Represents the habitat category based on overlap with wildlife habitat layers. Agriculture and Developed habitat types' categories are not modified by overlap with wildlife habitat.
[3] MDWR = Category 2 habitat for ODFW mule deer winter range; RMEWR = Category 2 habitat for ODFW Rocky Mountain elk winter range; RMESR = Category 3 habitat for Rocky Mountain Elk Foundation Rocky Mountain elk summer range; MDSR = Category 3 habitat for WAFWA mule deer summer range.
[4] Total acres of habitat type will not match actual parcel size due to resolution of the GAP raster dataset. Pixels of the dataset were not simplified or smoothed to match the exact shape of the parcel boundary.

Boardman to Hemingway Transmission Line Project

Desktop Habitat Mitigation Site Assessment Worksheet

Parcel Name:	Glass Hill (**Figure 1**)	**Date of Assessment:**	10/21/2015
Landowner:		**Parcel Elevation (ft):**	3,200 – 5,300
Parcel Size in Acres:	Appx. 14,000 acres	**Within Mitigation Service Area?:**	Yes

Location Description
(County, miles and direction from known location, TRS, UTM, other):

Union County, just west of I-84 at Ladd Canyon.
T4S R38E Sections 4, 5, 8, 9, 10, 14, 15, 16, 17, 19, 20, 21, 22, 23, 26, 27, 28, 29, 30, 32, 33, 34, 35, 36
T5S R38E Sections 1, 2, 3, 4, 10, 11, 12, 13, 14, 15, 18, 19, 21, 22, 23, 24, 25, 26, 27, 28, 30, 34, 35

Vegetation Cover Classes (GAP[1], **Figure 2**)

HMP Habitat Category[2] and Type	HMP General Vegetation Type	Acres	% of Parcel	Wildlife Habitat[3]
Category 1, 4, 5, & 6		**0**	**0**	-
Category 2		**10,038**	**72**	-
Mixed Grand Fir/Douglas Fir	Forest/Woodland	2,551	18.3	RMEWR, RMESR, MDSR
Mixed Grand Fir/Douglas Fir	Forest/Woodland	2,446	17.5	RMEWR, RMESR, MDWR, MDSR
Mixed Grand Fir/Douglas Fir	Forest/Woodland	226	1.6	RMEWR, MDWR, MDSR
Mixed Grand Fir/Douglas Fir	Forest/Woodland	30	0.2	RMEWR, MDWR
Ponderosa Pine	Forest/Woodland	334	2.4	RMEWR, RMESR, MDSR
Ponderosa Pine	Forest/Woodland	751	5.4	RMEWR, RMESR, MDWR, MDSR
Ponderosa Pine	Forest/Woodland	147	1.1	RMEWR, MDWR, MDSR
Ponderosa Pine	Forest/Woodland	8	0.1	RMEWR, MDWR
Shrub-Steppe without Big Sage	Shrub/Grass	109	0.8	RMEWR, RMESR, MDSR
Shrub-Steppe without Big Sage	Shrub/Grass	433	3.1	RMEWR, RMESR, MDWR, MDSR
Shrub-Steppe without Big Sage	Shrub/Grass	147	1.1	RMEWR, MDWR, MDSR
Shrub-Steppe without Big Sage	Shrub/Grass	20	0.1	RMEWR, MDWR
Shrub-Steppe with Big Sage	Shrub/Grass	153	1.1	RMEWR, RMESR, MDSR
Shrub-Steppe with Big Sage	Shrub/Grass	269	1.9	RMEWR, RMESR, MDWR, MDSR
Shrub-Steppe with Big Sage	Shrub/Grass	82	0.6	RMEWR, MDWR, MDSR
Shrub-Steppe with Big Sage	Shrub/Grass	7	0.0	RMEWR, MDWR

[1]USGS Gap Analysis Project (GAP) GIS data. Ecological systems were cross-walked to HMP Habitat Type as shown in the Habitat Categorization Matrix (Attachment P1--1 of Exhibit P1).
[2]Represents the habitat category based on overlap with wildlife habitat layers. Agriculture and Developed habitat types' categories are not modified by overlap with wildlife habitat.
[3]MDWR = Category 2 habitat for ODFW mule deer winter range; RMEWR = Category 2 habitat for ODFW Rocky Mountain elk winter range; RMESR = Category 3 habitat for Rocky Mountain Elk Foundation Rocky Mountain elk summer range; MDSR = Category 3 habitat for WAFWA mule deer summer range.
[4]Total acres of habitat type will not match actual parcel size due to resolution of the GAP raster dataset. Pixels of the dataset were not simplified or smoothed to match the exact shape of the parcel boundary.

Vegetation Cover Classes cont.

HMP Habitat Category[2] and Type	HMP General Vegetation Type	Acres	% of Total	Wildlife Habitat[3]
Category 2 cont				
Mixed Tamarack	Forest/Woodland	338	2.4	RMEWR, RMESR, MDSR
Mixed Tamarack	Forest/Woodland	233	1.7	RMEWR, RMESR, MDWR, MDSR
Mixed Tamarack	Forest/Woodland	12	0.1	RMEWR, MDWR, MDSR
Subalpine/Montane Forest	Forest/Woodland	502	3.6	RMEWR, RMESR, MDSR
Subalpine/Montane Forest	Forest/Woodland	240	1.7	RMEWR, RMESR, MDWR, MDSR
Western Juniper/Mountain Mahogany Woodland	Forest/Woodland	207	1.5	RMEWR, RMESR, MDSR
Western Juniper/Mountain Mahogany Woodland	Forest/Woodland	175	1.3	RMEWR, RMESR, MDWR, MDSR
Forested Wetland	Wetland	81	0.6	RMEWR, RMESR, MDSR
Forested Wetland	Wetland	125	0.9	RMEWR, RMESR, MDWR, MDSR
Native Grasslands	Shrub/Grass	17	0.1	RMEWR, RMESR, MDSR
Native Grasslands	Shrub/Grass	63	0.5	RMEWR, RMESR, MDWR, MDSR
Native Grasslands	Shrub/Grass	6	0.0	RMEWR, MDWR, MDSR
Lodgepole Pine	Forest/Woodland	151	1.1	RMEWR, RMESR, MDSR
Lodgepole Pine	Forest/Woodland	59	0.4	RMEWR, RMESR, MDWR, MDSR
Rocky Mountain Aspen	Forest/Woodland	22	0.2	RMEWR, RMESR, MDSR
Rocky Mountain Aspen	Forest/Woodland	26	0.2	RMEWR, RMESR, MDWR, MDSR
Emergent Wetland	Wetland	5	0.0	RMEWR, RMESR, MDWR, MDSR
Remaining	-	63	0.5	-
Category 3		**3,913**	**28**	-
Mixed Grand Fir/Douglas Fir	Forest/Woodland	1,826	13.1	RMESR, MDSR
Subalpine/Montane Forest	Forest/Woodland	658	4.7	RMESR, MDSR
Ponderosa Pine	Forest/Woodland	467	3.3	RMESR, MDSR
Mixed Tamarack	Forest/Woodland	364	2.6	RMESR, MDSR
Lodgepole Pine	Forest/Woodland	266	1.9	RMESR, MDSR
Western Juniper/Mountain Mahogany Woodland	Forest/Woodland	119	**0.9**	RMESR, MDSR
Forested Wetland	Wetland	70	**0.5**	RMESR, MDSR
Shrub-Steppe without Big Sage	Shrub/Grass	51	**0.4**	RMESR, MDSR
Rocky Mountain Aspen	Forest/Woodland	34	**0.2**	RMESR, MDSR
Shrub-Steppe with Big Sage	Shrub/Grass	27	**0.2**	RMESR, MDSR
Native Grasslands	Shrub/Grass	18	**0.1**	RMESR, MDSR
Emergent Wetland	Wetland	10	**0.1**	RMESR, MDSR
Remaining	-	3	**0.0**	-
Total		**13,952**	**100**	**-**

[1]USGS Regional Gap Analysis Project (GAP) GIS data. Ecological systems were cross-walked to HMP Habitat Type as shown in the Habitat Categorization Matrix (Attachment P1--1 of Exhibit P1).
[2]Represents the habitat category based on overlap with wildlife habitat layers. Agriculture and Developed habitat types' categories are not modified by overlap with wildlife habitat.
[3]MDWR = Category 2 habitat for ODFW mule deer winter range; RMEWR = Category 2 habitat for ODFW Rocky Mountain elk winter range; RMESR = Category 3 habitat for Rocky Mountain Elk Foundation Rocky Mountain elk summer range; MDSR = Category 3 habitat for WAFWA mule deer summer range.
[4]Total acres of habitat type will not match actual parcel size due to resolution of the GAP raster dataset. Pixels of the dataset were not simplified or smoothed to match the exact shape of the parcel boundary.

Soil Types	The NRCS Soil Survey Geographic Database (SSURGO) data was reviewed and the following soils were identified on the property (**Figure 3**): *Anatone-Bocker complex* (**34 acres**). Anatone soils consist of shallow, well drained soils found on mountain side slopes, ridgetops, hills, and plateaus at elevations of 2,000 to 6,200 feet. Anatone soils are mostly used for livestock grazing, wildlife habitat, and recreation. Native vegetation is mainly bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass, mossy stonecrop, curlleaf mountain mahogany and stiff sagebrush. Bocker soils consist of very shallow, well drained soils found on hills, plateaus and mountains at elevations of 2,800 to 6,600 feet. Bocker soils are used for livestock grazing and recreation. The native vegetation is buckwheat, Sandberg bluegrass, Idaho fescue, bluebunch wheatgrass, bottlebrush squirreltail, stiff sagebrush and low sagebrush. *Anatone-Klicker complex* (**991 acres**). Anatone soils consist of shallow, well drained soils found on mountain side slopes, ridgetops, hills, and plateaus at elevations of 2,000 to 6,200 feet. Anatone soils are mostly used for livestock grazing, wildlife habitat, and recreation. Native vegetation is mainly bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass, mossy stonecrop, curlleaf mountain mahogany and stiff sagebrush. Klicker soils consist of moderately deep, well drained soils on mountains, plateaus, and benches at elevations from 2,500 to 6,200 feet. Klicker soils are used mainly for timber production and wildlife habitat. Native vegetation is an open stand of ponderosa pine and Douglas-fir with an understory of bluebunch wheatgrass, slender wheatgrass, brome grass, elk sedge, Oregon-grape, common snowberry, Saskatoon serviceberry, creambush oceanspray, mallow ninebark and wild rose. *Anatone extremely stony loam* (**665 acres**). Anatone soils consist of shallow, well drained soils found on mountain side slopes, ridgetops, hills, and plateaus at elevations of 2,000 to 6,200 feet. Anatone soils are mostly used for livestock grazing, wildlife habitat, and recreation. Native vegetation is mainly bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass, mossy stonecrop, curlleaf mountain mahogany and stiff sagebrush. *Cowsly silt loam* (**81 acres**) and *Cowsly very stony silt loam* (**164 acres**). Cowsly soils consist of deep or very deep, moderately well drained soils found on plateaus at elevations from 2800 to 5000 feet. Cowsly soils are used primarily for timber production. Other uses are dryland small grain, pasture, wildlife habitat and water supply. Native vegetation is ponderosa pine and Douglas fir with an understory of spirea, ocean spray, snowberry, Idaho fescue, pinegrass and elksedge. *Gwinly-Rockly* (**429 acres**). The Gwinly soils consist of shallow, well drained soils found on hills, plateaus, structural benches, mountains, and canyons at elevations from 1,400 to 4,600 feet. Used for livestock grazing and wildlife habitat. Potential native vegetation is dominantly bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass and low sagebrush. Rockly soils consist of shallow and very shallow, well drained soils found on mesas, ridges, plateaus, structural benches, canyon walls, and nearly level to very steep south and west slopes on uplands at elevations of 300 to 5,000 feet. Rockly soils are used for livestock grazing, wildlife habitat, and water supply purposes. Native vegetation is mostly stiff sagebrush, lomatium, bluebunch wheatgrass, and Sandberg bluegrass. *Gwinly very cobbly silt loam* (**202 acres**). The Gwinly soils consist of shallow, well drained soils found on hills, plateaus, structural benches, mountains, and canyons at elevations from 1,400 to 4,600 feet. Used for livestock grazing and wildlife habitat. Potential native vegetation is dominantly bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass and low sagebrush. *Kamela very stony silt loam* (**2,379 acres**). Kamela soils consist of moderately deep, well drained soils found on ridgetops and side slopes of mountains at elevations of 3,000 to 6,200 feet. Kamela soils are used primarily for timber production. They are used also for wildlife habitat. Native vegetation dominantly is grand fir, Douglas fir,

	ponderosa pine and some western larch. Understory vegetation is willow, oceanspray, rocky mountain maple, ninebark, false Solomons seal, snowberry, elk sedge, pinegrass, heartleaf arnica and princes pine. *Klicker-Anatone complex* (**1,447 acres**). Klicker soils consist of moderately deep, well drained soils on mountains, plateaus, and benches at elevations from 2,500 to 6,200 feet. Klicker soils are used mainly for timber production and wildlife habitat. Native vegetation is an open stand of ponderosa pine and Douglas-fir with an understory of bluebunch wheatgrass, slender wheatgrass, brome grass, elk sedge, Oregon-grape, common snowberry, Saskatoon serviceberry, creambush oceanspray, mallow ninebark and wild rose. Anatone soils consist of shallow, well drained soils found on mountain side slopes, ridgetops, hills, and plateaus at elevations of 2,000 to 6,200 feet. Anatone soils are mostly used for livestock grazing, wildlife habitat, and recreation. Native vegetation is mainly bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass, mossy stonecrop, curlleaf mountain mahogany and stiff sagebrush. *Klicker stony silt loam* (**3,213 acres**). Klicker soils consist of moderately deep, well drained soils on mountains, plateaus, and benches at elevations from 2,500 to 6,200 feet. Klicker soils are used mainly for timber production and wildlife habitat. Native vegetation is an open stand of ponderosa pine and Douglas-fir with an understory of bluebunch wheatgrass, slender wheatgrass, brome grass, elk sedge, Oregon-grape, common snowberry, Saskatoon serviceberry, creambush oceanspray, mallow ninebark and wild rose. *Loneridge stony silt loam* (**337 acres**). Loneridge soils consist of very deep, well drained soils found on mountain side slopes, plateaus and benches at elevations of 2,400 to 5,400 feet. Loneridge soils are used for timber production, livestock grazing, recreation, wildlife habitat, and watershed. Native vegetation is mainly Douglas-fir, ponderosa pine, grand fir, and western larch, with an understory of pinegrass, elk sedge, Oregon-grape, ceanothus, creambush oceanspray, lupine, common snowberry and pinemat manzanita. *Lookingglass silt loam* (**108 acres**) and *Lookingglass very stony silt loam* (**0.1 acres**). Lookingglass soils consist of very deep, moderately well drained soils found on uplands at elevations of 1,800 to 4,000 feet. Lookingglass soils are used mainly for timber production. Cleared areas are cropped to small grains, hay, pasture, and peas. The native vegetation is ponderosa pine and Douglas fir with an understory of spirea, oceanspray, Idaho fescue, pinegrass and elksedge. *Olot silt loam* (**200 acres**) and *Olot stony silt loam* (**2,001 acres**). Olot soils consist of moderately deep, well drained soils found on plateaus, canyons, mountains and structural benches at elevations typically between 2,800 to 5,000 feet. Olot soils are used mainly for timber production. Also used for wildlife habitat. Vegetation is western larch, Douglas fir, willow, mountain alder, common snowberry, elk sedge, and pinegrass. *Pits, gravel* (**7 acres**). *Ramo very stony silty clay loam* (**34 acres**). Ramo soils consist of very deep, well drained soils found on concave foot slopes at elevations of 2,800 to 3,800 feet. Ramo soils are used for hay, pasture, small grain and livestock grazing. Potential native vegetation is mainly Idaho fescue and bluebunch wheatgrass.

Hydrologic Features Present (SteamNet, NWI, NHD)	Four perennial streams flow through the property. This includes Ladd Creek and three of its tributaries. Seven intermittent streams also cross the project, all but one are tributaries to Ladd Creek. Wetland features include several emergent wetlands, springs, and at least two impoundments.

Adjacent land ownership, use, and condition	Most of adjacent landowners are private; however the property does border a large tract of USFS lands and smaller BLM holdings. The northern tip of the property borders the ODFW Ladd Marsh WMA.
Infrastructure Density within or Near the Parcel (Qualitative Description)	The property borders I84 through Ladd Canyon. The Quartz to La Grande 230kV transmission line is within 1 mile of a portion of the eastern border of the property. Access roads occur throughout the property. A different landowner maintains an inholding of approximately 1.7 acres that includes a residential structure/cabin and a couple of out buildings.
Summary	The property is currently used for timber production. The property is within elk and mule deer winter range and borders some USFS and BLM lands as well as ODFW Ladd Marsh WMA. The recent (2015) removal and replacement of an impassable culvert at I84 in Ladd Canyon opens several miles of spawning and rearing habitat within the property to listed runs of Chinook salmon and steelhead. The proposed B2H Project (winter 2015) would cross the northern portion of the property (**Figure 1**).
Pass/Fail Desktop Assessment?	Pass

Boardman to Hemingway Transmission Line Project

Consideration of Property as a Potential Mitigation Site

Mitigation Function	This mitigation site has been identified as in-kind and in-proximity mitigation for impacts on Category 2 elk and mule deer winter range within the forest/woodland general vegetation type. This mitigation site could help meet the Project need for elk and mule deer summer habitat as well. The property has some shrub/grass general vegetation communities that could be considered for mitigation for impacts to Category 3 & 4 shrub-steppe and grassland habitat types. It contains important habitat features with opportunities to provide durable ecological uplift through implementation of standard mitigation actions. Opportunities to improve the watershed would benefit Chinook salmon and steelhead (no critical habitat on the property). The mitigation actions listed below, upon successful implementation, will increase the quality of habitat available to elk and mule deer (among other species) within the mitigation site and result in an ecological uplift to the mitigation site above what is provided under the current management.
Mitigation Site Manager	Fee title acquisition with transfer of ownership to State of Oregon, Federal Land Management Agency, approved NPO or Land Trust
Mitigation Actions	The following are mitigation actions that may be implemented at this mitigation site in order to satisfy the mitigation policies/guidelines of the permitting agencies. All mitigation actions will follow reliable methods. The mitigation actions presented here are not comprehensive. Implementation will likely be some combination of one or more of the following: • *Livestock grazing restrictions* – historic grazing practices at this property are unknown. However, the objective would be to avoid grazing practices that would compete with native wildlife life history needs. Targeted grazing may be considered for habitat enhancement/treatment actions. • *Weed treatment* – the extent of noxious weed invasion on the mitigation site is unknown at this time but it is anticipated that opportunities exist to implement this mitigation action. • *Native revegetation/restoration* – the focus would be planting forage shrubs and bunchgrasses; forest management practices would be implemented to create structural diversity and enhance desirable habitat conditions. • *Fire readiness* – efforts made to make the property more resistant to catastrophic fire and a fire response plan could be developed. • *Fence removal/fence upgrade* – opportunities are unknown at this time, but it is anticipated that some unnecessary fencing may be removed or necessary fencing can be upgraded to more wildlife friendly fencing, such as lay down fencing.
Monitoring	A specific plan for monitoring will be developed, but in general, mitigation progress will be monitored through vegetation plot monitoring and establishment of photo locations. Monitoring will occur annually for the first 3-5 years and an annual report will be produced. During the annual monitoring phase, a longer-term monitoring plan will be developed using similar protocols and methods to monitor the mitigation actions at larger time intervals (i.e., 5 years, 10 years).

Success Criteria

Specific success criteria will be developed once baseline conditions have been determined and potential mitigation actions have been confirmed for the site. Success criteria may include but are not limited to:

- Vegetation plots show an increase in native vegetation cover and general trend toward increased habitat quality representing an ecological uplift.
- Successful weed control through documentation of a reduction in weeds and non-native invasive plant species.
- Mitigation success will not be dependent on documentation of increased use of the mitigation site by any wildlife species.

Financial Outline

Estimated Budget for the Glass Hill Mitigation Site

Action	Cost per Unit	Units	Years	Expense
One-time Costs				
Acquisition	?			?
Recurring Costs (Annually)				
O&M[1]	$53.75	13,868	50	
Total	**-**			**$37,270,250** ($?/acre)[2]

[1] This O&M cost is an estimate of the cost per acre per year (not including acquisition/easement costs) based on the research presented in the Independent Economic Analysis Board's 2007 *Investigation of Wildlife O&M Costs*. The cost per acre identified in that study for the Elkhorn Wildlife Management Area (which this mitigation site will be modeled after) was $43 in 2004 dollars, this has been adjusted to reflect 2015 dollars.

[2] Cost per acre here includes cost of acquisition/easement and initial mitigation actions and long-term O&M for 50 years.

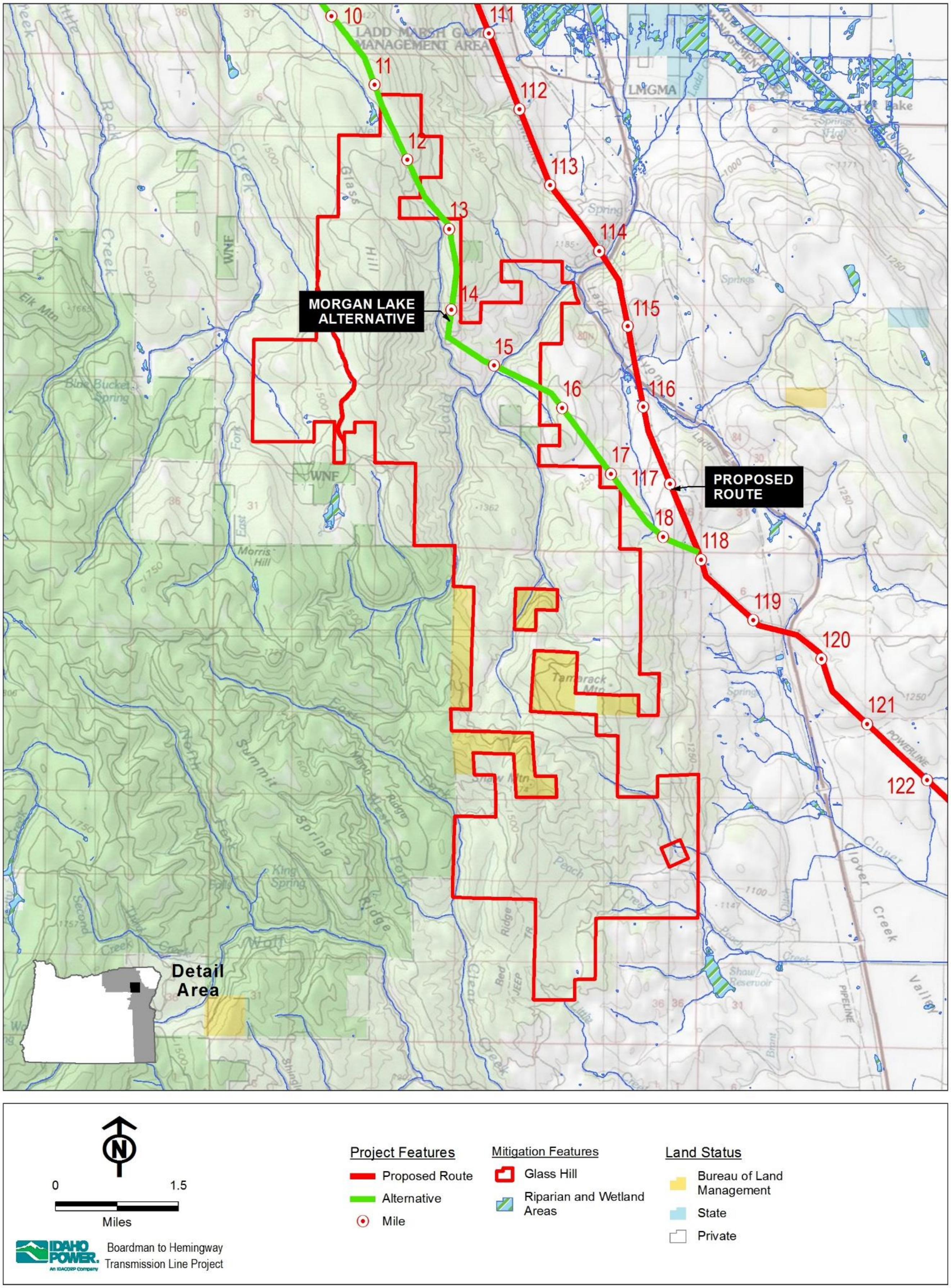

Figure 1. Glass Hill Ownership and Water

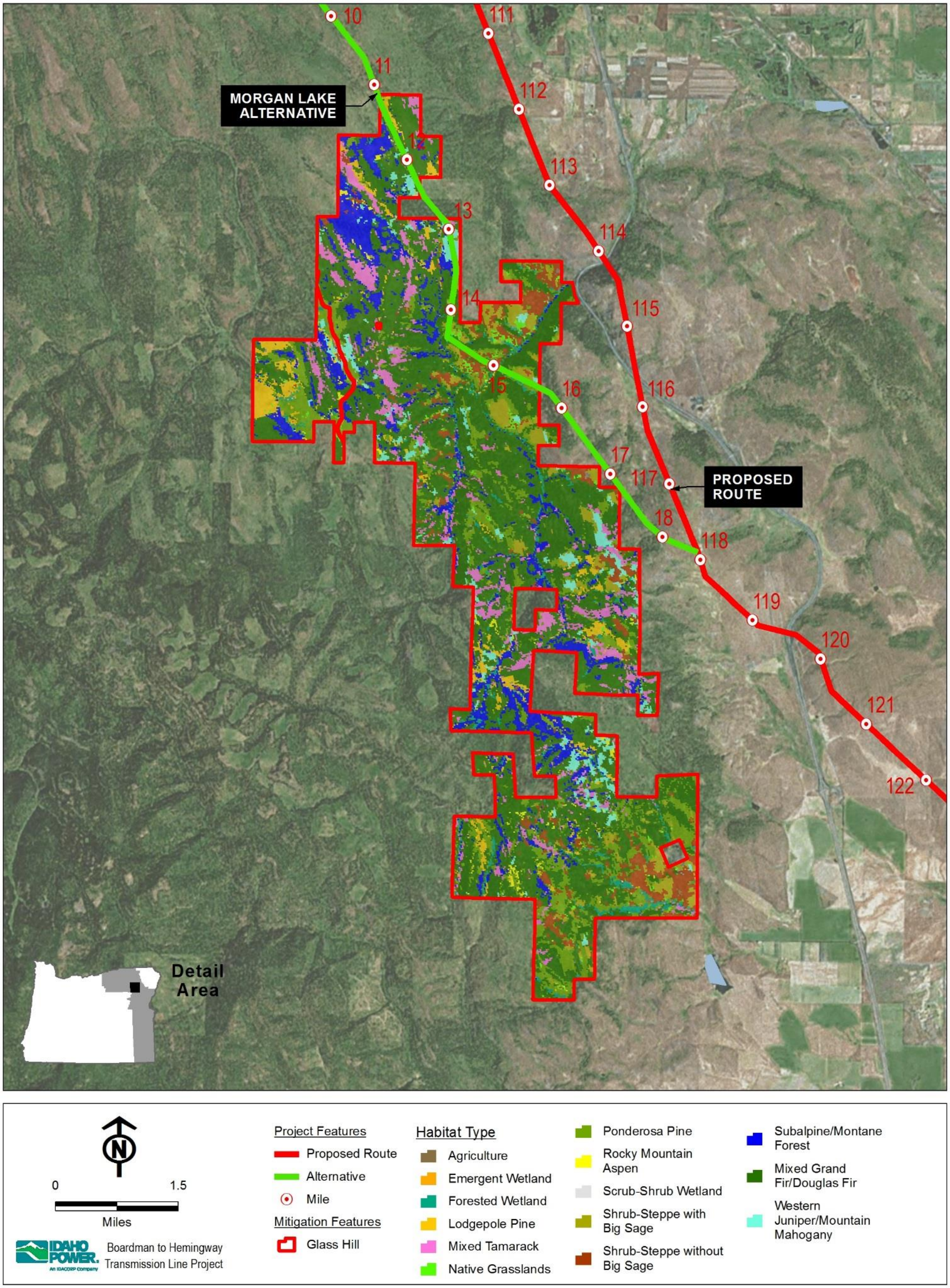

Figure 2. Glass Hill Habitat Types

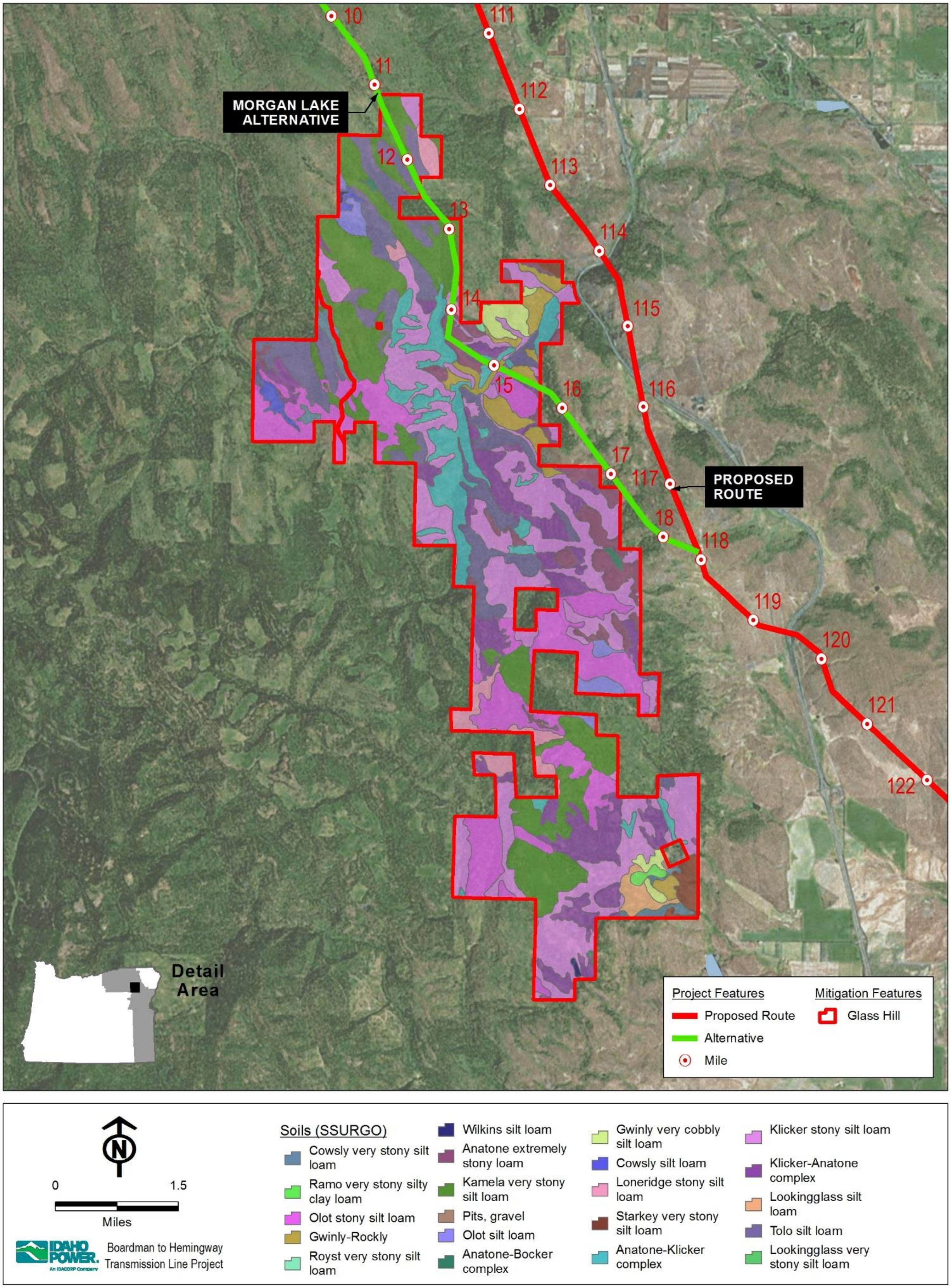

Figure 3. Glass Hill Soil Types

Vegetation Cover Classes cont. (GAP[1])

HMP Habitat Category[2] and Type	HMP General Vegetation Type	Acres	% of Total	Wildlife Habitat[3]
Category 2 cont.				
Shrub-Steppe without Big Sage	Shrub/Grass	28	0.2	RMEWR, MDWR, MDSR
Shrub-Steppe without Big Sage	Shrub/Grass	52	0.3	RMEWR, MDSR
Shrub-Steppe with Big Sage	Shrub/Grass	13	0.1	RMEWR, RMESR, MDSR
Shrub-Steppe with Big Sage	Shrub/Grass	11	0.1	RMEWR, MDWR
Shrub-Steppe with Big Sage	Shrub/Grass	20	0.1	RMEWR, MDSR
Remaining	-	44	0.3	-
Category 3		**7,411**	**49.8**	-
Mixed Grand Fir / Douglas Fir	Forest/Woodland	3,757	25.2	RMESR, MDSR
Mixed Grand Fir / Douglas Fir	Forest/Woodland	520	3.5	MDSR
Subalpine / Montane Forest	Forest/Woodland	1,519	10.2	RMESR, MDSR
Subalpine / Montane Forest	Forest/Woodland	16	0.1	MDSR
Mixed Tamarack	Forest/Woodland	431	2.9	RMESR, MDSR
Mixed Tamarack	Forest/Woodland	3	0.0	MDSR
Ponderosa Pine	Forest/Woodland	397	2.7	RMESR, MDSR
Ponderosa Pine	Forest/Woodland	126	0.8	MDSR
Lodgepole Pine	Forest/Woodland	252	1.7	RMESR, MDSR
Forested Wetland	Wetland	185	1.2	RMESR, MDSR
Forested Wetland	Wetland	6	0.0	MDSR
Native Grasslands	Shrub/Grass	100	0.7	RMESR, MDSR
Native Grasslands	Shrub/Grass	1	0.0	MDSR
Rocky Mountain Aspen	Forest/Woodland	38	0.3	RMESR, MDSR
Western Juniper / Mountain Mahogany Woodland	Forest/Woodland	24	0.2	RMESR, MDSR
Shrub-Steppe without Big Sage	Shrub/Grass	21	0.1	RMESR, MDSR
Emergent Wetland	Wetland	4	0.0	RMESR, MDSR
Emergent Wetland	Wetland	1	0.0	MDSR
Shrub-Steppe with Big Sage	Shrub/Grass	4	0.0	RMESR, MDSR
Remaining	-	6	0.0	RMESR, MDSR
Category 4				-
Category 5				-
Category 6				-
Developed	Agriculture / Developed	1	0.0	RMEWR
Developed	Agriculture / Developed	11	0.1	RMEWR, MDWR
Total		**14,879**	**100**	**-**

[1] USGS Gap Analysis Project (GAP) GIS data using ecological systems. Ecological systems were cross-walked to HMP Habitat Type as shown in the Habitat Categorization Matrix (Attachment P1--1 of Exhibit P1).

[2] Represents the habitat category based on overlap with wildlife habitat layers. Agriculture and Developed habitat types' categories are not modified by overlap with wildlife habitat.

[3] MDWR = Category 2 habitat for ODFW mule deer winter range; RMEWR = Category 2 habitat for ODFW Rocky Mountain elk winter range; RMESR = Category 3 habitat for Rocky Mountain Elk Foundation Rocky Mountain elk summer range; MDSR = Category 3 habitat for WAFWA mule deer summer range.

[4] Total acres of habitat type will not match actual parcel size due to resolution of the GAP raster dataset. Pixels of the dataset were not simplified or smoothed to match the exact shape of the parcel boundary.

Soil types	The NRCS Soil Survey Geographic Database (SSURGO) data was reviewed and the following soils were identified on the property (**Figure 3**): *Anatone-Bocker complex* (**122 acres**). Anatone soils consist of shallow, well drained soils found on mountain side slopes, ridgetops, hills, and plateaus at elevations of 2,000 to 6,200 feet. Anatone soils are mostly used for livestock grazing, wildlife habitat, and recreation. Native vegetation is mainly bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass, mossy stonecrop, curlleaf mountain mahogany and stiff sagebrush. Bocker soils consist of very shallow, well drained soils found on hills, plateaus and mountains at elevations of 2,800 to 6,600 feet. Bocker soils are used for livestock grazing and recreation. The native vegetation is buckwheat, Sandberg bluegrass, Idaho fescue, bluebunch wheatgrass, bottlebrush squirreltail, stiff sagebrush and low sagebrush. *Anatone-Klicker-McCartycreek complex* (**3 acres**). Anatone soils consist of shallow, well drained soils found on mountain side slopes, ridgetops, hills, and plateaus at elevations of 2,000 to 6,200 feet. Anatone soils are mostly used for livestock grazing, wildlife habitat, and recreation. Native vegetation is mainly bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass, mossy stonecrop, curlleaf mountain mahogany and stiff sagebrush. Klicker soils consist of moderately deep, well drained soils on mountains, plateaus, and benches at elevations from 2,500 to 6,200 feet. Klicker soils are used mainly for timber production and wildlife habitat. Native vegetation is an open stand of ponderosa pine and Douglas-fir with an understory of bluebunch wheatgrass, slender wheatgrass, brome grass, elk sedge, Oregon-grape, common snowberry, Saskatoon serviceberry, creambush oceanspray, mallow ninebark and wild rose. McCartycreek soils consist of moderately deep, well-drained soils found on mountain backslopes and footslopes at elevations from 3,000 to 5,500 feet. McCartycreek soils are used for watershed, wildlife habitat, livestock grazing and recreation. Native vegetation is mountain big sagebrush, western serviceberry, bitter cherry, chokecherry, creamy buckwheat, low Oregon grape, mountain snowberry, scouler's willow, common yarrow, arrowleaf balsamroot, Gray's desert parsley, mint, Brown's peony, showy aster, bluebunch wheatgrass, and mountain brome. *Anatone-Klicker complex* (**203 acres**). Anatone soils consist of shallow, well drained soils found on mountain side slopes, ridgetops, hills, and plateaus at elevations of 2,000 to 6,200 feet. Anatone soils are mostly used for livestock grazing, wildlife habitat, and recreation. Native vegetation is mainly bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass, mossy stonecrop, curlleaf mountain mahogany and stiff sagebrush. Klicker soils consist of moderately deep, well drained soils on mountains, plateaus, and benches at elevations from 2,500 to 6,200 feet. Klicker soils are used mainly for timber production and wildlife habitat. Native vegetation is an open stand of ponderosa pine and Douglas-fir with an understory of bluebunch wheatgrass, slender wheatgrass, brome grass, elk sedge, Oregon-grape, common snowberry, Saskatoon serviceberry, creambush oceanspray, mallow ninebark and wild rose. *Anatone extremely stony loam* (**117 acres**). Anatone soils consist of shallow, well drained soils found on mountain side slopes, ridgetops, hills, and plateaus at elevations of 2,000 to 6,200 feet. Anatone soils are mostly used for livestock grazing, wildlife habitat, and recreation. Native vegetation is mainly bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass, mossy stonecrop, curlleaf mountain mahogany and stiff sagebrush. *Cowsly silt loam* (**58 acres**) *and Cowsly very stony silt loam* (**0.1 acre**). Cowsly soils consist of deep or very deep, moderately well drained soils found on plateaus at elevations from 2800 to 5000 feet. Cowsly soils are used primarily for timber production. Other uses are dryland small grain, pasture, wildlife habitat and water supply. Native vegetation is ponderosa pine and Douglas fir with an understory of spirea, ocean spray, snowberry, Idaho fescue, pinegrass and elksedge. *Gwinly very cobbly silt loam* (**174**). The Gwinly soils consist of shallow, well drained soils found on hills, plateaus, structural benches, mountains, and canyons at elevations from 1,400 to 4,600 feet. Used for livestock grazing and wildlife habitat. Potential native vegetation is dominantly bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass and

low sagebrush.

Hall Ranch stony loam (**6,836**). Hall Ranch soils consist of moderately deep, well drained soils found on mountainous areas at elevations of 3,000 to 5,400 feet. Hall Ranch soils are used for timber production and rangeland. Native vegetation is ponderosa pine and Douglas fir with an understory of pinegrass and elk sedge.

Limberjim-Getaway-Rock Outcrop complex (**7**). Limberjim soils consist of deep, well drained soils on stable slopes of mountains, plateaus, canyons, and structural benches at elevations from 2,800 to 5,800 feet. Limberjim soils are used for timber production, watershed, recreation and wildlife habitat. Native vegetation is grand fir, western larch, lodgepole pine, Douglas fir, Rocky Mountain maple, twinflower, princes pine, big huckleberry, round-leaved violet, meadowrue, fragrant bedstraw, and fairybells. Getaway soils consist of deep, well drained soils found on mountain side slopes and canyon walls at elevations from 2,800 to 5,000 feet.

Olot-Crackercreek-Lowerbluff complex (**4**). Olot soils consist of moderately deep, well drained soils found on plateaus, canyons, mountains and structural benches at elevations typically between 2,800 to 5,000 feet. Olot soils are used mainly for timber production. Also used for wildlife habitat. Vegetation is western larch, Douglas fir, willow, mountain alder, common snowberry, elk sedge, and pinegrass. Crackercreek soils consist of deep, well drained soils on north- facing mountainsides and canyon walls at elevations from 3,200 to 4,800 feet. Crackercreek soils are used for woodland, watershed and wildlife habitat. The native vegetation is Douglas-fir, ponderosa pine, grand fir and western larch with an understory of pine grass, elk sedge, huckleberry and common snowberry. Lowerbluff soils consist of shallow, well drained soils usually found on summits of plateaus or structural benches at elevations of 2,800 to 5,700 feet. Lowerbuff soils are used for timber production, watershed, recreation, livestock grazing, and wildlife habitat. The native vegetation is Douglas fir, ponderosa pine, grand fir, common snowberry, spiraea, pinegrass, elk sedge, heartleaf arnica, strawberry, yarrow, and lupine.

Olot silt loam (**350**) and *Olot stony silt loam* (**3297**). Olot soils consist of moderately deep, well drained soils found on plateaus, canyons, mountains and structural benches at elevations typically between 2,800 to 5,000 feet. Olot soils are used mainly for timber production. Also used for wildlife habitat. Vegetation is western larch, Douglas fir, willow, mountain alder, common snowberry, elk sedge, and pinegrass.

Tolo silt loam (**1555**). Top soils consist of deep and very deep, well drained soils found on mountains at elevations ranging from 3,000 to 5,400 feet. Top soils are used mainly for timber production and cropland. Most areas with slopes of less than 15 percent have been cleared and are used for production for dryland grain and hay. Native vegetation is ponderosa pine, Douglas fir, white fir, pinegrass and elksedge. This series is in what is called the Douglas-fir forest plant community.

Veazie-Voats complex (**1**). Veazie soils consist of very deep, well drained soils found on flood plains broken by old stream channels at elevations of 750 to 4,000 feet. Veazie soils are used mainly for irrigated hay and pasture. Other uses are livestock grazing and wildlife. Native vegetation is bluebunch wheatgrass, basin wildrye, sedges, rushes and willows. Voats soils consist of very deep, well drained soils found on flood plains broken by old stream channels and occur at elevations of 1,600 to 4,000 feet. Voats soils are used mainly for pasture. Other uses are livestock grazing and wildlife habitat. Potential native vegetation is bluebunch wheatgrass, basin wildrye, timothy, Kentucky bluegrass, sedges, rushes, and scattered willow, alder, hawthorne, and rose.

Ramo silty clay loam (**3**). Ramo soils consist of very deep, well drained soils found on concave foot slopes at elevations of 2,800 to 3,800 feet. Ramo soils are used for hay, pasture, small grain and livestock grazing. Potential native vegetation is mainly Idaho fescue and bluebunch wheatgrass.

Hydrologic Features Present (SteamNet, NWI, NHD)	Property contains four intermittent streams per NHD. Rock Creek supports redband trout and ESA listed summer steelhead. Rock Creek supports migrating and spawning steelhead and provides rearing areas for fry and juveniles. NWI did not identify any wetland features outside those associated with riparian areas of NHD streams.
Adjacent land ownership, use, and condition	The entire eastern boundary of the property borders USFS lands and ranges from 1-3 miles from the Eagle Cap Wilderness. To the west are foothills dominated by dryland farming and open rangeland. The towns of Union and Cove are approximately 2 to 5 miles west of the property.
Infrastructure Density within or Near the Parcel (Qualitative Description)	The property contains roads that provide access throughout. The towns of Union and Cove are nearby to the west, with rural infrastructure development. The property and most lands to the north, south, and east are forested with no development other than access roads.
Summary	The property contains winter range for both elk and mule deer, as well as summer range for both species. The property is immediately north of Catherine Creek State Park. Little Catherine Creek crosses the property and is identified as critical habitat for Chinook salmon. Little Creek (critical habitat for steelhead downstream from the property) and its tributaries originate on or cross through the property. Timber harvest is the main use of the property today.
Pass/Fail Desktop Assessment?	Pass

Boardman to Hemingway Transmission Line Project

Consideration of Property as a Potential Mitigation Site

Mitigation Function	Given the size of the property, mitigation opportunities would likely be considered for smaller portions of the property. This mitigation site has been identified as in-kind and in-proximity mitigation for impacts on Category 2 elk and mule deer winter range within the forest/woodland general vegetation type. This mitigation site could help meet the Project need for elk and mule deer summer habitat as well. It contains important habitat features with opportunities to provide durable ecological uplift through implementation of standard mitigation actions. Opportunities to improve the watershed would benefit Chinook salmon and steelhead (Chinook salmon critical habitat occurs on the property). The mitigation actions listed below, upon successful implementation, will increase the quality of habitat available to elk and mule deer (among other species) within the mitigation site and result in an ecological uplift to the mitigation site above what is provided under the current management.
Mitigation Site Manager	Fee title acquisition with transfer of ownership to State of Oregon, Federal Land Management Agency, approved NPO or Land Trust
Mitigation Actions	The following are mitigation actions that may be implemented at this mitigation site in order to satisfy the mitigation policies/guidelines of the permitting agencies. All mitigation actions will follow reliable methods. The mitigation actions presented here are not comprehensive. Implementation will likely be some combination of one or more of the following: • *Livestock grazing restrictions* – historic grazing practices at this property are unknown. However, the objective would be to avoid grazing practices that would compete with native wildlife life history needs. Targeted grazing may be considered for habitat enhancement/treatment actions. • *Weed treatment* – the extent of noxious weed invasion on the mitigation site is unknown at this time but it is anticipated that opportunities exist to implement this mitigation action. • *Native revegetation/restoration* – the focus would be planting forage shrubs and bunchgrasses; forest management practices would be implemented to create structural diversity and enhance desirable habitat conditions. • *Road closure* – restrict motor vehicle use to just those roads that are necessary; seasonally close access based on use by elk and mule deer. • *Fire readiness* – efforts made to make the property more resistant to catastrophic fire and a fire response plan could be developed. • *Fence removal/fence upgrade* – opportunities are unknown at this time, but it is anticipated that some unnecessary fencing may be removed or necessary fencing can be upgraded to more wildlife friendly fencing, such as lay down fencing.
Monitoring	A specific plan for monitoring will be developed, but in general, mitigation progress will be monitored through vegetation plot monitoring and establishment of photo locations. Monitoring will occur annually for the first 3-5 years and an annual report will be produced. During the annual monitoring phase, a longer-term monitoring plan will be developed using similar protocols and methods to monitor the mitigation.

Success Criteria	Specific success criteria will be developed once baseline conditions have been determined and potential mitigation actions have been confirmed for the site. Success criteria may include but are not limited to: • Vegetation plots show an increase in native vegetation cover and general trend toward increased habitat quality representing an ecological uplift. • Successful weed control through documentation of a reduction in weeds and non-native invasive plant species. • Mitigation success will not be dependent on documentation of increased use of the mitigation site by any wildlife species.

Financial Outline

Estimated Budget for the Mitigation Site

Action	Cost per Unit	Units	Years	Expense
One-time Costs				
Acquisition	?	1		?
50-year Operation and Management Costs				
O&M[1]	$53.75	14,886	50	$40,006,125
Total	**-**			**$?** (?/acre)[2]

[1] This O&M cost is an estimate of the cost per acre per year (not including acquisition/easement costs) based on the research presented in the Independent Economic Analysis Board's 2007 *Investigation of Wildlife O&M Costs*. The cost per acre identified in that study for the Elkhorn Wildlife Management Area (which this mitigation site will be modeled after) was $43 in 2004 dollars, this has been adjusted to reflect 2015 dollars.

[2] Cost per acre here includes cost of acquisition/easement and initial mitigation actions and long-term O&M for 50 years.

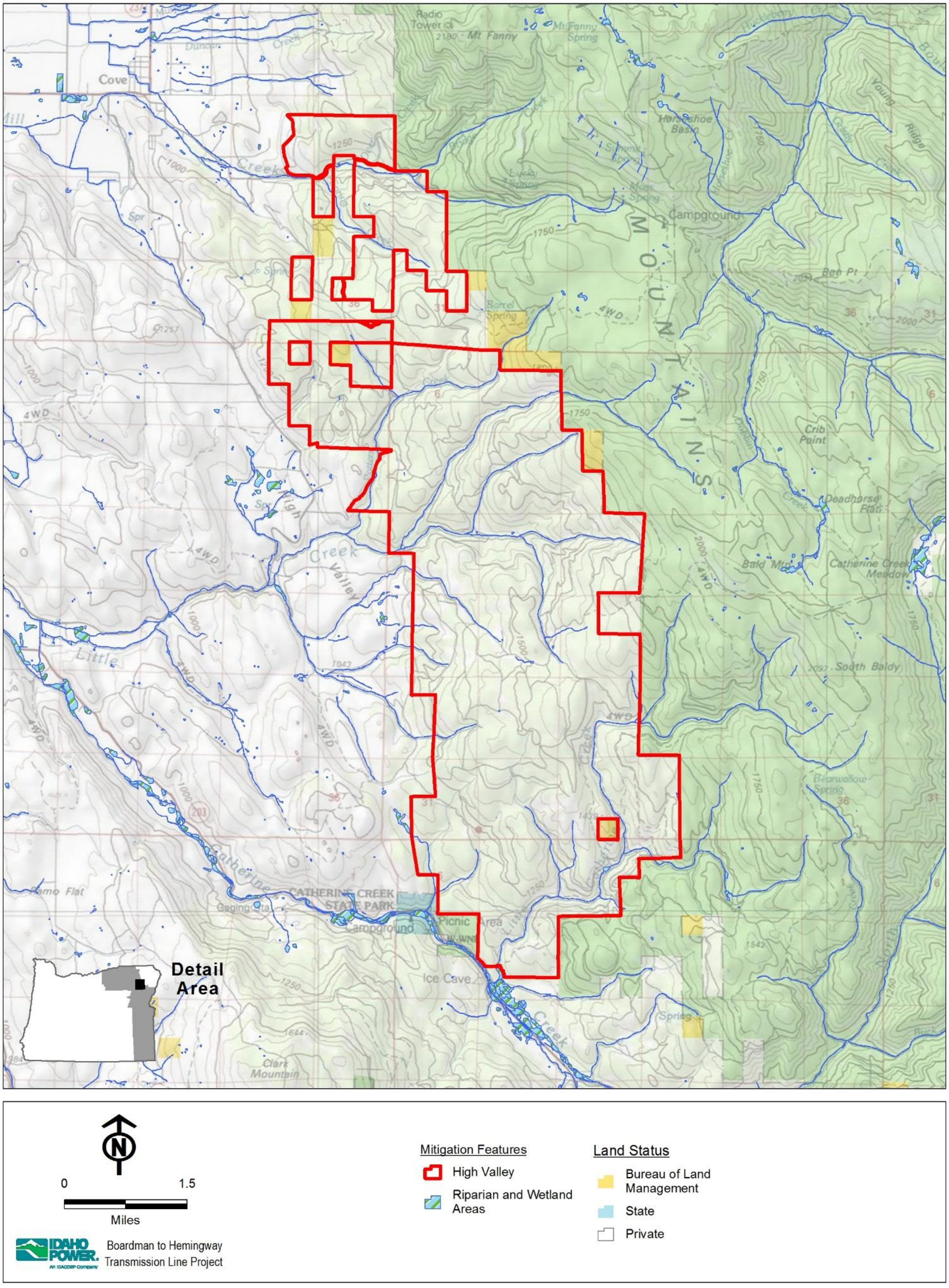

Figure 1. High Valley Ownership and Water

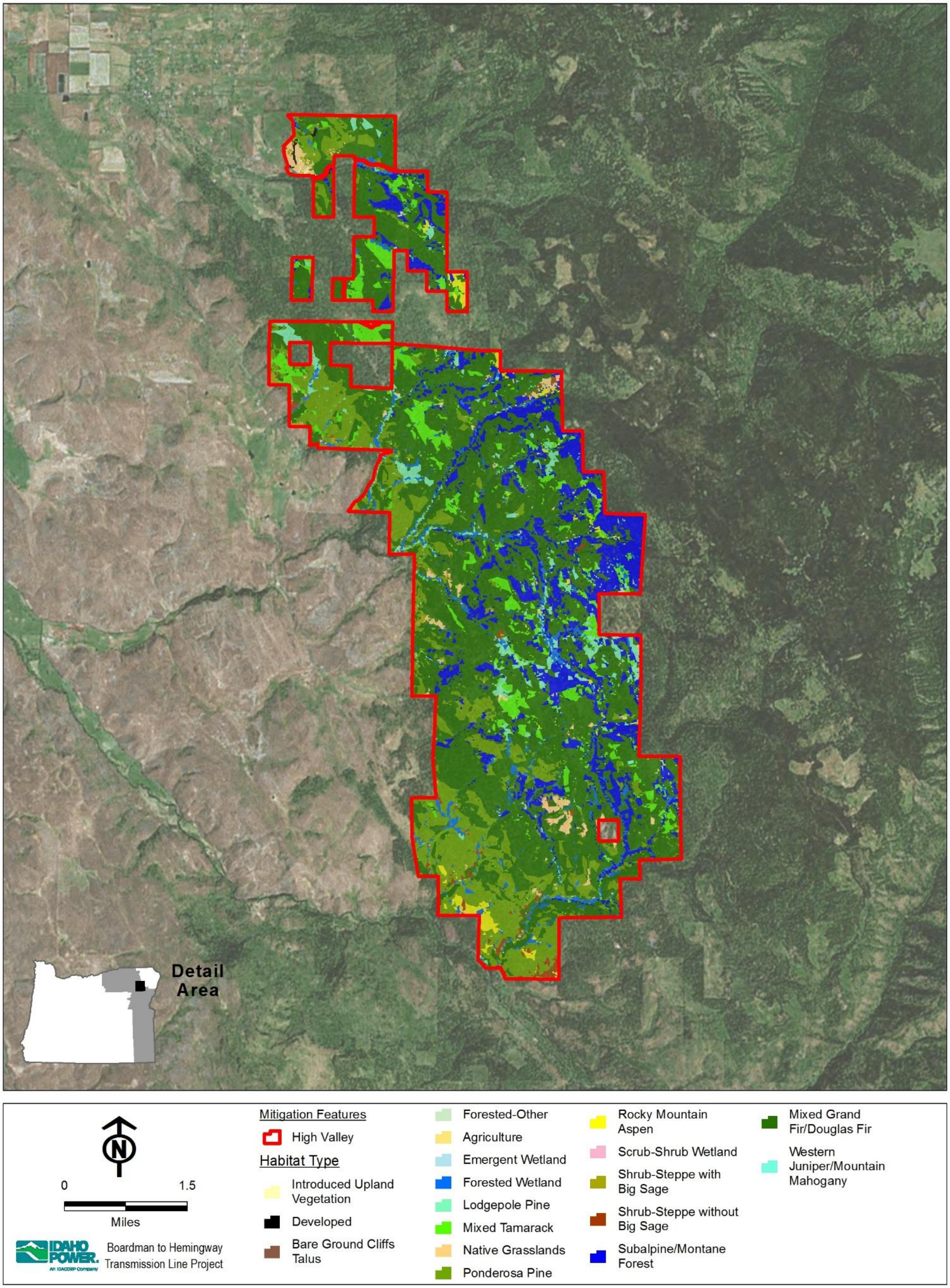

Figure 2. High Valley Habitat Types

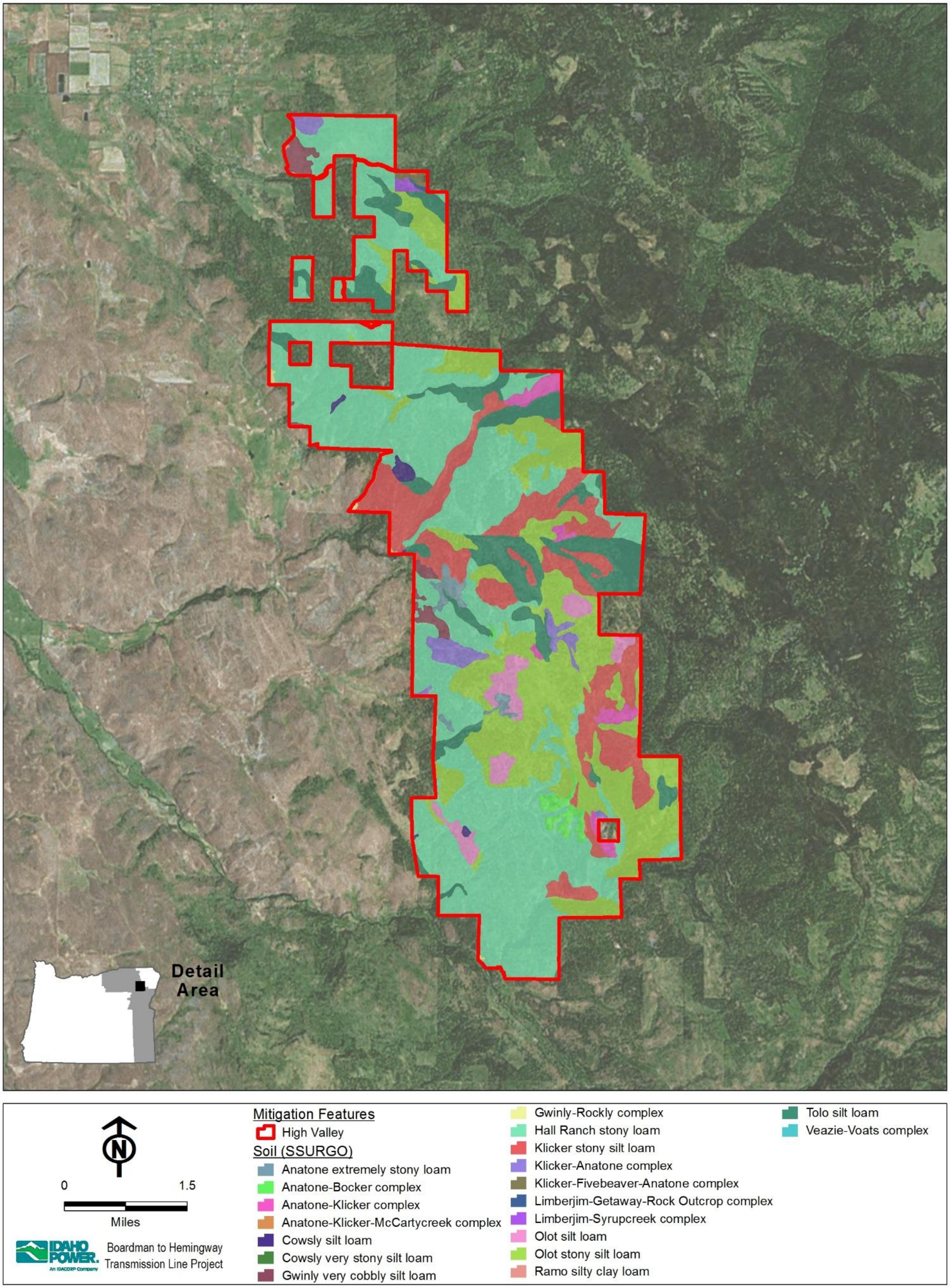

Figure 3. High Valley Soil Types

Habitat Mitigation Areas with Mitigation Zone 3

- Pole Creek
- Alder Creek
- Glasgow
- Trail Creek
- Upper Timber

Boardman to Hemingway Transmission Line Project

Desktop Habitat Mitigation Site Assessment Worksheet

Parcel Name:	Pole Creek (**Figure 1**)	**Date of Assessment:**	2/10/2016
Landowner:		**Parcel Elevation (ft):**	4,100 – 5,100
Parcel Size in Acres:	3,233	**Within Mitigation Service Area?:**	Yes

Location Description
(County, miles and direction from known location, TRS, UTM, other):

Baker County, 3 miles west of Unity, OR.
T12S R36E Section 34, T13S R36E Sections 1, 2, 3, 10, 11, 12, & 15.

Vegetation Cover Classes (GAP[1], **Figure 2**)

HMP Habitat Category[2] and Type	HMP General Vegetation Type	Acres	% of Parcel	Wildlife Habitat[3]
Category 1				
Category 2		**3,233.2**	**100**	**-**
Shrub-Steppe with Big Sage	Shrub/Grassland	644.4	19.9	MDWR, MDSR, RMESR
Shrub-Steppe with Big Sage	Shrub/Grassland	685.7	21.2	MDWR, MDSR
Shrub-Steppe with Big Sage	Shrub/Grassland	43.3	1.3	MDWR
Mixed Grand Fir/Douglas Fir	Forest/Woodland	488.8	15.1	MDWR, MDSR, RMESR
Western Juniper/Mountain Mahogany Woodland	Forest/Woodland	432.0	13.4	MDWR, MDSR, RMESR
Western Juniper/Mountain Mahogany Woodland	Forest/Woodland	117.9	3.6	MDWR, MDSR
Ponderosa Pine	Forest/Woodland	380.7	11.8	MDWR, MDSR, RMESR
Ponderosa Pine	Forest/Woodland	3.4	0.1	MDWR, MDSR
Shrub-Steppe without Big Sage	Shrub/Grassland	172.8	5.3	MDWR, MDSR, RMESR
Shrub-Steppe without Big Sage	Shrub/Grassland	15.2	0.5	MDWR, MDSR
Shrub-Steppe without Big Sage	Shrub/Grassland	5.6	0.2	MDWR
Rocky Mountain Aspen	Forest/Woodland	89.8	2.8	MDWR, MDSR, RMESR
Rocky Mountain Aspen	Forest/Woodland	3.6	0.1	MDWR, MDSR
Forested Wetland	Open Water/Wetland	27.6	0.9	MDWR, MDSR, RMESR
Introduced Upland Vegetation	Shrub/Grassland	10.2	0.3	MDWR, MDSR, RMESR
Introduced Upland Vegetation	Shrub/Grassland	20.4	0.6	MDWR, MDSR

[1] USGS Gap Analysis Project (GAP) GIS data using ecological systems. Ecological systems were cross-walked to HMP Habitat Type as shown in the Habitat Categorization Matrix (Attachment P-2 of Exhibit P).
[2] Represents the habitat category based on overlap with wildlife habitat layers. Agriculture and Developed habitat types' categories are not modified by overlap with wildlife habitat.
[3] WAGS1 = Category 1 habitat consisting of the active ground squirrel colony which is defined as single or cluster of holes as well as the required habitat for squirrel survival (785 feet from the edge of the extent of active holes). WAGS2 = Category 2 habitat consisting of the area of potential Washington ground squirrel use (1.5km from the edge of the WAGS1 area in similar habitat type and quality). MDWR = Category 2 habitat for ODFW mule deer winter range.
[4] Total acres of habitat type will not match actual parcel size due to resolution of the GAP raster dataset.

Vegetation Cover Classes cont. (GAP[1])

HMP Habitat Category[2] and Type	HMP General Vegetation Type	Acres	% of Parcel	Wildlife Habitat[3]
Category 2 cont.				
Emergent Wetland	Open Water/Wetland	10.0	0.3	MDWR, MDSR, RMESR
Native Grasslands	Shrub/Grassland	9.9	0.3	MDWR, MDSR, RMESR
Native Grasslands	Shrub/Grassland	44.6	1.4	MDWR, MDSR
Scrub-Shrub Wetland	Open Water/Wetland	9.8	0.3	MDWR, MDSR, RMESR
Lodgepole Pine	Forest/Woodland	7.3	0.2	MDWR, MDSR, RMESR
Subalpine/Montane Forest	Forest/Woodland	4.4	0.1	MDWR, MDSR, RMESR
Remaining	-	5.8	0.2	-
Category 3				-
Category 4				-
Category 5				-
Category 6				-
Total		**3,233.2**	**100**	**-**

[1] USGS Gap Analysis Project (GAP) GIS data using ecological systems. Ecological systems were cross-walked to HMP Habitat Type as shown in the Habitat Categorization Matrix (Attachment P-2 of Exhibit P).

[2] Represents the habitat category based on overlap with wildlife habitat layers. Agriculture and Developed habitat types' categories are not modified by overlap with wildlife habitat.

[3] MDWR = Category 2 habitat for ODFW mule deer winter range; RMESR = Category 3 habitat for Rocky Mountain Elk Foundation Rocky Mountain elk summer range; MDSR = Category 3 habitat for WAFWA mule deer summer range.

Soil types

The NRCS Soil Survey Geographic Database (SSURGO) data was reviewed and the following soils were identified on the property (**Figure 3**):

Ateron-Roostercomb extremely gravelly clay loams (**718 acres**). Ateron soils consist of shallow, well drained soils found on ridge tops and side slopes of hills and mountains at elevations of 3,600 to 5,800 feet. Ateron soils are used for livestock grazing. The native vegetation is mountain big sagebrush, Idaho fescue, bluebunch wheatgrass, and Sandberg bluegrass. Roostercomb soils consist of moderately deep, well drained soils found on stable to meta-stable side slopes of hills with elevations ranging from 3,800 to 5,700 feet. Roostercomb soils are used for rangeland and wildlife habitat. The native vegetation is mainly mountain big sagebrush, threetip sagebrush, squaw apple, antelope bitterbrush, Idaho fescue, bluebunch wheatgrass and Sandberg bluegrass.

Ateron very stony loam (**505 acres**). Ateron soils consist of shallow, well drained soils found on ridge tops and side slopes of hills and mountains at elevations of 3,600 to 5,800 feet. Ateron soils are used for livestock grazing. The native vegetation is mountain big sagebrush, Idaho fescue, bluebunch wheatgrass, and Sandberg bluegrass.

Damore-Silvies silt loams (**0.1 acre**). Damore soils consist of deep, somewhat poorly drained soils found on flood plains with elevations ranging from 3,700 to 5,000 feet. Damore soils are mostly used for meadow hay production and pasture. The native vegetation is mainly tufted hairgrass, sedge, and Baltic rush. Silvies soils consist of very deep, poorly drained soils found on flood plains and in basins at elevations of 3,300 to 5,000 feet. Silvies soils are mostly used for meadow hay production and pasture. The native vegetation is sedges and rushes.

Soil types (cont.)

Hall Ranch stony loam (**151 acres**). Hall Ranch soils consist of moderately deep, well drained soils found in mountainous areas at elevations of 3,000 to 5,400 feet. Hall

Ranch soils are used as timber production and rangeland. Native vegetation is ponderosa pine and Douglas fir with an understory of pinegrass and elk sedge.

Klicker-Fivebit complex (**473 acres**). Klicker soils consist of moderately deep, well drained soils on mountains, plateaus, and benches at elevations from 2,500 to 6,200 feet. Klicker soils are used mainly for timber production and wildlife habitat. Native vegetation is an open stand of ponderosa pine and Douglas-fir with an understory of bluebunch wheatgrass, slender wheatgrass, brome grass, elk sedge, Oregon-grape, common snowberry, Saskatoon serviceberry, creambush oceanspray, mallow ninebark and wild rose. Fivebit soils consist of shallow, well drained soils found on ridgetops and side slopes of mountains, plateaus, canyons, and structural benches at elevations from 2,800 to 6,200 feet. Fivebit soils are used for livestock grazing, recreation, water supply, and wildlife habitat. The vegetation is mainly curlleaf mountain mahogany, western juniper, scattered ponderosa pine, mountain big sagebrush, bitterbrush, squaw apple, wax currant, bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass, some elk sedge and pinegrass, and arrowleaf balsamroot.

Marack-Badland complex (**58 acres**). Marack soils consist of deep, well drained soils found on old terraces at elevations ranging from 3,800 to 4,400 feet. Marack soils are used for rangeland. The native vegetation is Idaho fescue, bluebunch wheatgrass, Mountain big sagebrush, basin big sagebrush, and prairie junegrass. Badlands are a type of dry terrain where softer sedimentary rocks and clay-rich soils have been extensively eroded by wind and water. They are characterized by steep slopes, minimal vegetation, lack of a substantial regolith, and high drainage density. They can resemble malpaís, a terrain of volcanic rock. Canyons, ravines, gullies, buttes, mesas, hoodoos and other such geological forms are common in badlands.

Marack gravelly silty clay loam (**186 acres**). Marack soils consist of deep, well drained soils found on old terraces at elevations ranging from 3,800 to 4,400 feet. Marack soils are used for rangeland. The native vegetation is Idaho fescue, bluebunch wheatgrass, Mountain big sagebrush, basin big sagebrush, and prairie junegrass.

Marack silt loam (**51 acres**). Marack soils consist of deep, well drained soils found on old terraces at elevations ranging from 3,800 to 4,400 feet. Marack soils are used for rangeland. The native vegetation is Idaho fescue, bluebunch wheatgrass, Mountain big sagebrush, basin big sagebrush, and prairie junegrass.

Marack very gravelly silty clay loam (**25 acres**). Marack soils consist of deep, well drained soils found on old terraces at elevations ranging from 3,800 to 4,400 feet. Marack soils are used for rangeland. The native vegetation is Idaho fescue, bluebunch wheatgrass, Mountain big sagebrush, basin big sagebrush, and prairie junegrass.

McGarr-Kahler complex (**497 acres**). Marack soils consist of deep, well drained soils found on old terraces at elevations ranging from 3,800 to 4,400 feet. Marack soils are used for rangeland. The native vegetation is Idaho fescue, bluebunch wheatgrass, Mountain big sagebrush, basin big sagebrush, and prairie junegrass. Kahler soils consist of deep and very deep, well drained soils found on back slopes of plateaus, canyons, hills, and mountains at elevations ranging from 2,000 to 6,000 feet. Kahler soils are used for timber production, limited cropland, livestock grazing, watershed, recreation, and wildlife habitat. Many areas with slopes of less than 15 percent have been cleared and produce dryland hay and grain, or irrigated crops. The native vegetation is mainly ponderosa pine, Douglas fir, pinegrass and elk sedge.

Soil types (cont.)	*Roostercomb-Longbranch complex* (**492 acres**). Roostercomb soils consist of moderately deep, well drained soils found on stable to meta-stable side slopes of hills with elevations ranging from 3,800 to 5,700 feet. Roostercomb soils are used for rangeland and wildlife habitat. The native vegetation is mainly mountain big sagebrush, threetip sagebrush, squaw apple, antelope bitterbrush, Idaho fescue, bluebunch wheatgrass and Sandberg bluegrass. Longbranch soils consist of deep, well drained soils found on stable to meta-stable north-facing side slopes of hills with elevations ranging from 3,800 to 5,700 feet. Longbranch soils are used for rangeland and wildlife habitat. The native vegetation is mainly mountain big sagebrush, wax currant, Idaho fescue and basin wildrye with minor amounts of prairie junegrass and green rabbitbrush. *Snell-Ateron complex* (**74 acres**). Snell soils consists of moderately deep, well drained soils on hills, plateaus, mountains and on canyon walls at elevations of 2,000 to 6,800 feet, mainly on north and east exposures and on south exposures at higher elevations. Snell soils are used for livestock grazing and wildlife habitat. Potential native vegetation is bluebunch wheatgrass, Idaho fescue, and Sandberg bluegrass. Ateron soils consist of shallow, well drained soils found on ridge tops and side slopes of hills and mountains at elevations of 3,600 to 5,800 feet. Ateron soils are used for livestock grazing. The native vegetation is mountain big sagebrush, Idaho fescue, bluebunch wheatgrass, and Sandberg bluegrass. *Xeric Torriorthents* (**2 acres**). Torriorthents are the dry Orthents of cool to hot, arid regions. They have an aridic (or torric) moisture regime. Orthents are primarily Entisols on recent erosional surfaces. The erosion may be geologic or may have been induced by cultivation, mining, or other factors. Any former soil that was on the landscape has been completely removed or so truncated that the diagnostic horizons for all other orders do not occur.
Hydrologic Features Present (SteamNet, NWI, NHD)	Property contains a perennial stream, Pole Creek, and an unnamed intermittent tributary. Powell Gulch also contains an intermittent stream feature. The southeast corner of the property crosses over the South Fork Burnt River just below Whited Reservoir. Wetland features exist along the streams, including some man made impoundments.
Adjacent land ownership, use, and condition	The property borders USFS lands to the west, with a small BLM in holding also sharing a boundary. The remainder of the property borders private lands, which appear to be mostly open rangeland in the foothills west of Unity, OR. Agriculture and pastures also occur west of the property around Unity.
Infrastructure Density within or Near the Parcel (Qualitative Description)	Property has a 4,000 square foot log home and a large 5,000 square foot shop. A transmission line is located just west of the property and a substation is less than 2 miles west of the property. A well maintained county road, Cemetery Road, runs along the western border and HWY 26 is within 1 mile of the property.
Summary	Property is within The Nature Conservancy Ecoregional Assessment (Monument Rock Area). An ODFW Conservation Opportunity Area (North Fork Malheur-Monument Rock area) overlaps a very small portion of the property near Buck Mountain. This conservation actions listed in the Oregon Conservation Strategy for this area include: 1) Initiate or continue wet meadow conservation and restoration efforts; 2) Maintain and enhance aspen stands; 3) Maintain or restore riparian habitat and ecological function; 4) Ensure sufficient habitat complexity for wildlife; 5) Restore and maintain complex, continuous sage habitat; 6) Restore and maintain grassland habitat; and 7) Restore and maintain ponderosa pine habitats. Property contains mule deer winter and summer range and elk summer range.
Pass/Fail Desktop Assessment?	Pass

Boardman to Hemingway Transmission Line Project

Consideration of Property as a Potential Mitigation Site

Mitigation Function	This mitigation site has been identified as in-kind and in-proximity mitigation for impacts on Category 2 mule deer winter range within the shrub/grass general vegetation type. It also provides opportunity for shrub/grass and forest/woodland mitigation of Category 3, 4, & 5 habitats. It contains important habitat features that could be preserved and has some uplift opportunities that could be achieved through implementation of standard mitigation actions. The mitigation actions listed below, upon successful implementation, will increase the quality of habitat available to sage-grouse, elk, and deer (among other species) within the mitigation site and result in an ecological uplift to the mitigation site above what is provided under the current management.
Mitigation Site Manager	Fee title acquisition with transfer of ownership to, State of Oregon, Federal Land Management Agency, approved NPO or Land Trust.
Mitigation Actions	The following are mitigation actions that may be implemented at this mitigation site in order to satisfy the mitigation policies/guidelines of the permitting agencies. All mitigation actions will follow reliable methods. The mitigation actions presented here are not comprehensive. Implementation will likely be some combination of one or more of the following: • *Livestock grazing restrictions* – avoid grazing practices that would compete with native wildlife life history needs. Targeted grazing may be considered for habitat enhancement/treatment actions. • *Fence Removal/Marking* – opportunities are unknown at this time, but it is anticipated that some unnecessary fencing may be removed or necessary fencing can be upgraded to more wildlife friendly fencing. • *Weed treatment* – the extent of noxious weed invasion on the mitigation site is unknown at this time but it is anticipated that opportunities exist to implement this mitigation action. • *Native revegetation/restoration* – focus of efforts would be to promote establishment of forage shrubs and bunchgrasses; opportunities exist but have not been specifically identified at this time. • *Fire readiness* – efforts made to make the property more resistant to catastrophic fire and a fire response plan could be developed. • *Juniper removal* – review of aerial photography shows juniper/conifer encroachment into sagebrush habitat, some opportunity may exists for long-term maintenance of encroachment.
Monitoring	A specific plan for monitoring will be developed, but in general, mitigation progress will be monitored through vegetation plot monitoring and establishment of photo locations. Monitoring will occur annually for the first 3-5 years and an annual report will be produced. During the annual monitoring phase, a longer-term monitoring plan will be developed using similar protocols and methods to monitor the mitigation actions at larger time intervals (i.e., 5 years, 10 years).

Success Criteria

Specific success criteria will be developed once baseline conditions have been determined and potential mitigation actions have been confirmed for the site. Success criteria may include but are not limited to:

- Vegetation plots show an increase in native vegetation cover and general trend toward increased habitat quality representing an ecological uplift.
- Successful weed control through documentation of a reduction in weeds and non-native invasive plant species.
- Mitigation success will not be dependent on documentation of increased use of the mitigation site by WAGS or any other wildlife species.

Financial Outline

Estimated Budget for the Pole Creek Mitigation Site

Action	Cost per Unit	Units	Years	Expense
One-time Costs				
Acquisition	1,400,000	1		1,400,000
Recurring Costs (Annually)				
O&M[1]	30	3,233	50	4,849,500
Total	**-**			**$6,249,500** ($1,933/acre)[2]

[1] This O&M cost is an estimate of the cost per acre per year (not including acquisition/easement costs) based on the research presented in the Independent Economic Analysis Board's 2007 *Investigation of Wildlife O&M Costs*. The average cost per acre presented in that document was $24 in 2004 dollars, this has been adjusted to reflect 2015 dollars.

[2] Cost per acre here includes cost of acquisition/easement and initial mitigation actions and long-term O&M for 50 years.

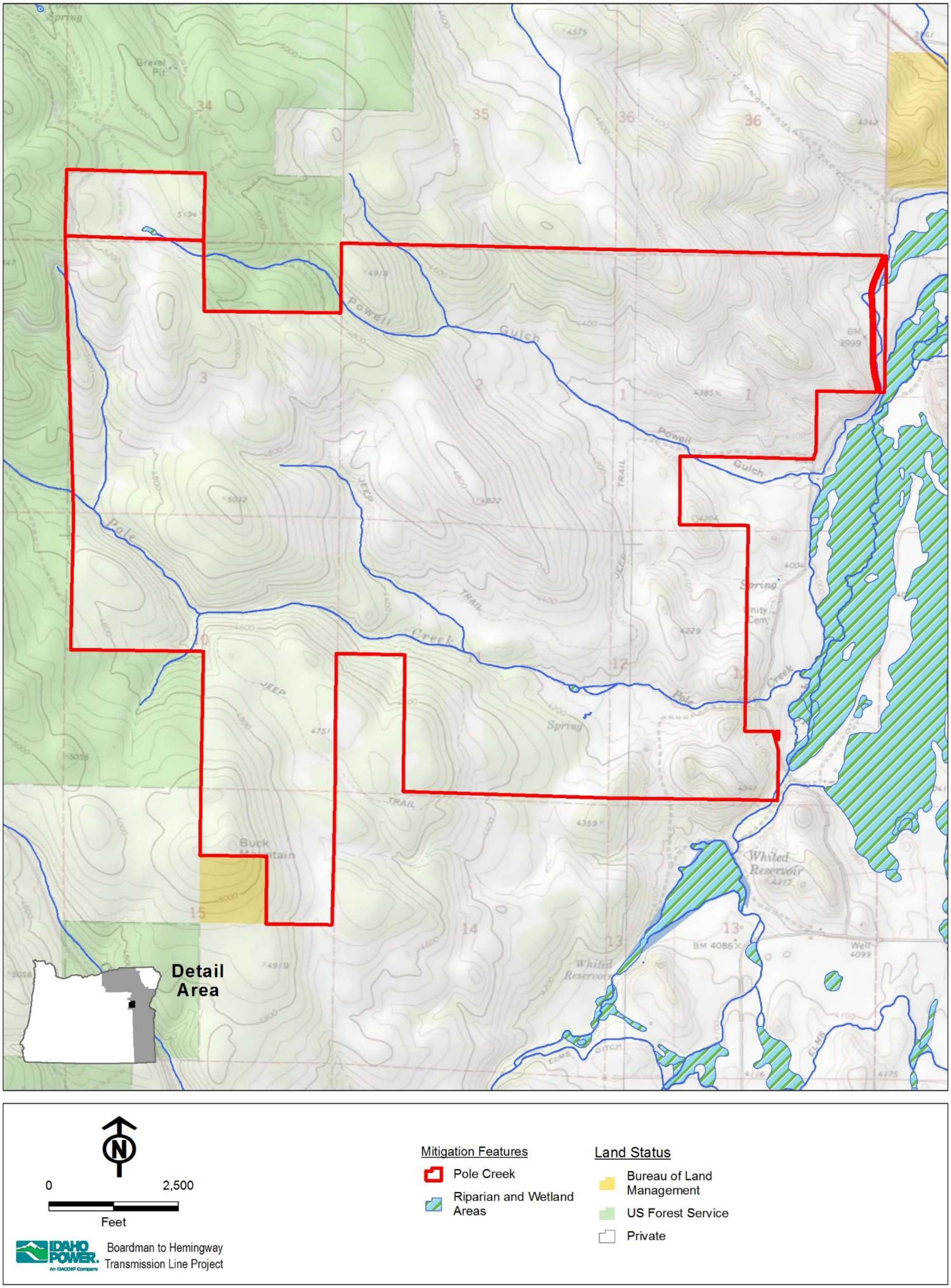

Figure 1. Pole Creek Ownership and Water

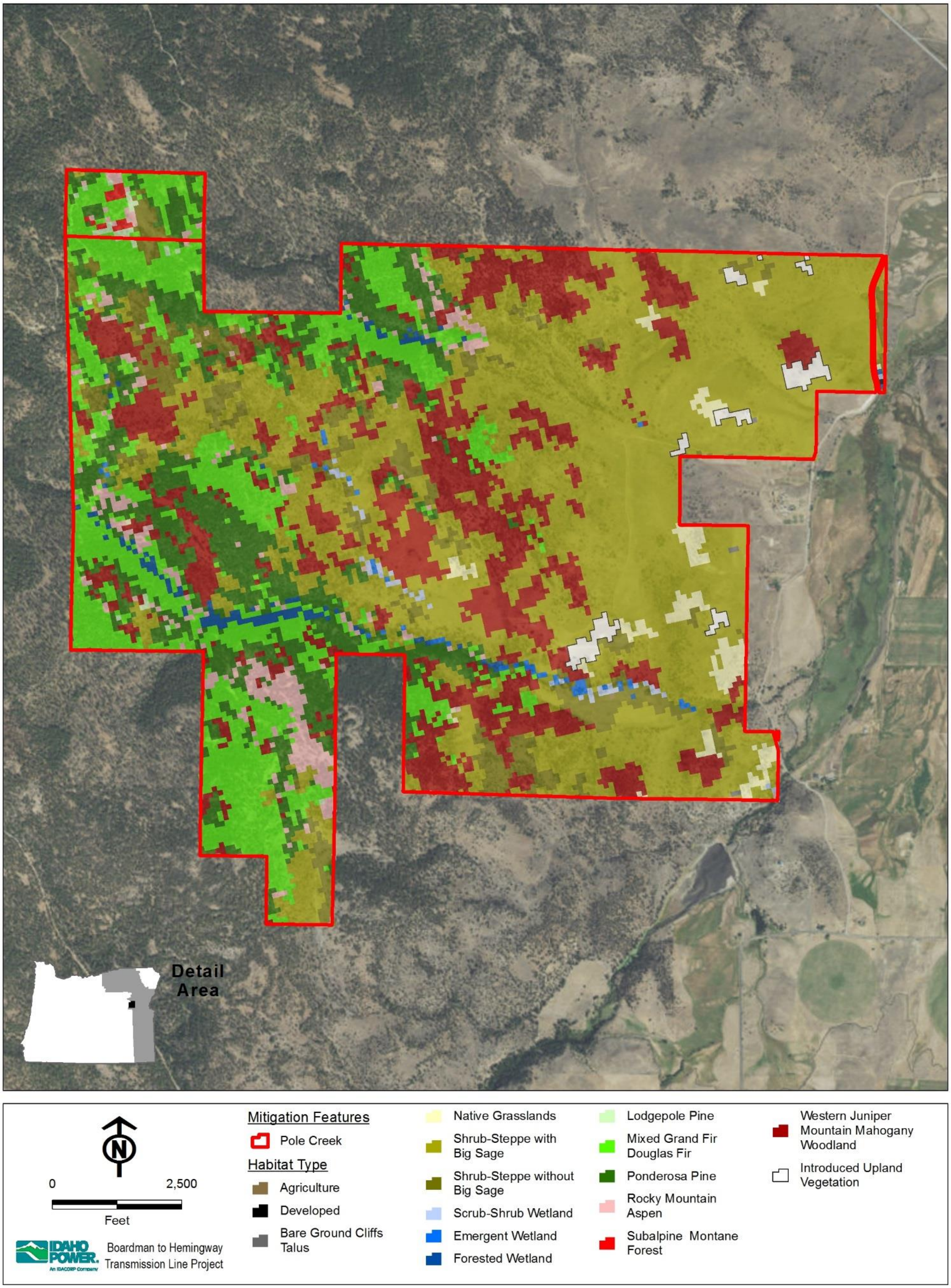

Figure 2. Pole Creek Habitat Types

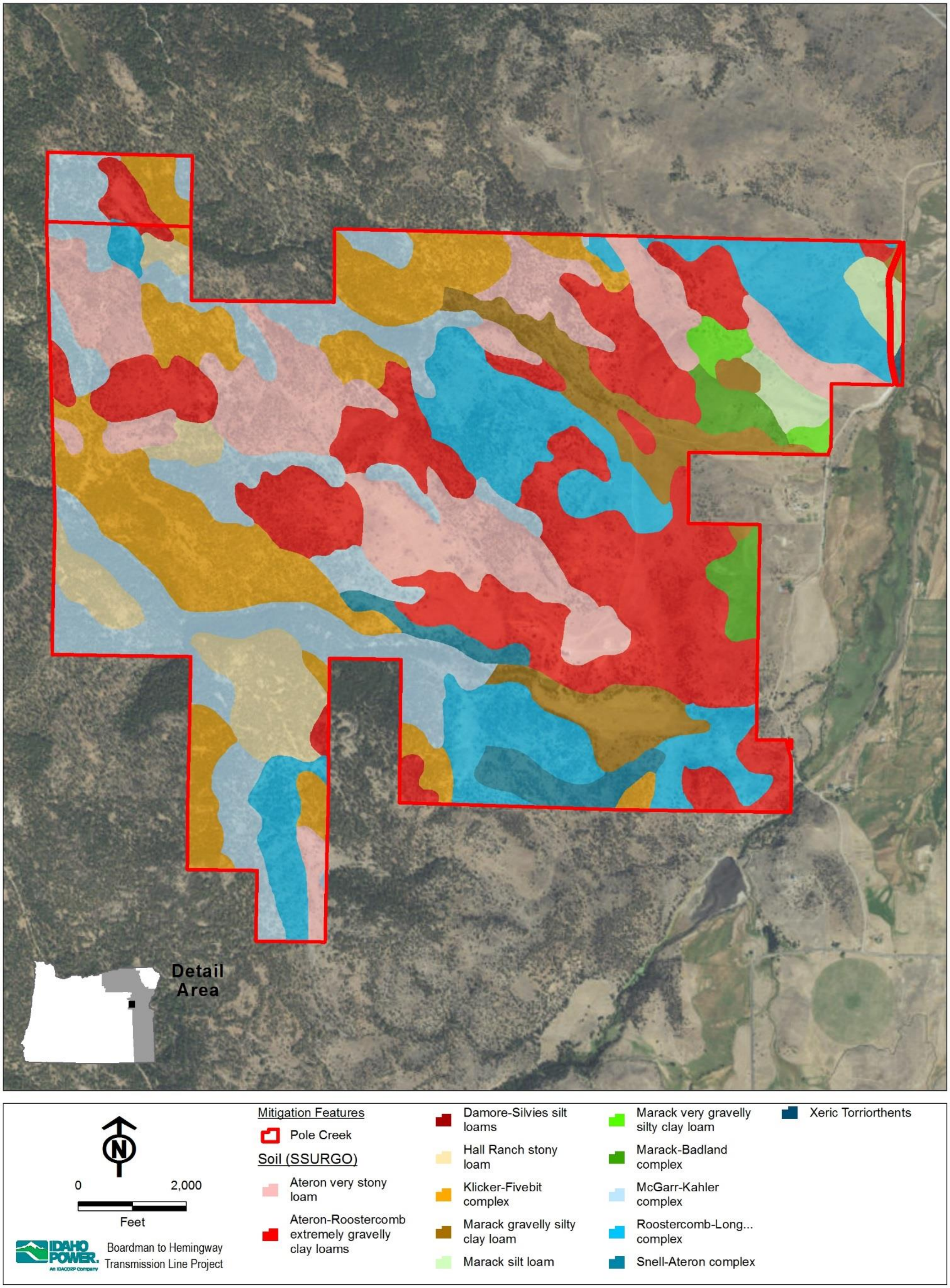

Figure 3. Pole Creek Soil Types

Boardman to Hemingway Transmission Line Project

Desktop Habitat Mitigation Site Assessment Worksheet

Parcel Name: Alder Creek
Date of Assessment: 9/11/2014
Landowner:
Parcel Elevation (ft): 3,700 – 4,450
Parcel Size in Acres: 3,081
Within Mitigation Service Area?: Yes

Location Description
(County, miles and direction from known location, TRS, UTM, other):

Baker County, approximately 20 miles northwest of Brogan, 20 miles southwest of Durkee.
T13S R40E Sections 14, 15, 16, 21, 22, 23, 26, 27, 28 (**Figure 1**)

Vegetation Cover Classes (GAP[1], **Figure 2**)

HMP Habitat Category[2] and Type	HMP General Vegetation Type	Acres	% of Parcel	Wildlife Habitat[3]
Category 1		**0**	**0**	
Category 2		**0**	**0**	-
Shrub-Steppe with Big Sage	Shrub/Grass	1,452.3	49.3	RMEWR
Shrub-Steppe with Big Sage	Shrub/Grass	294.1	10.0	RMEWR, MDWR
Introduced Upland Vegetation	Shrub/Grass	258.1	8.8	RMEWR
Introduced Upland Vegetation	Shrub/Grass	233.7	7.9	RMEWR, MDWR
Shrub-Steppe without Big Sage	Shrub/Grass	213.7	7.3	RMEWR
Shrub-Steppe without Big Sage	Shrub/Grass	171.6	5.8	RMEWR, MDWR
Native Grasslands	Shrub/Grass	41.2	1.4	RMEWR
Native Grasslands	Shrub/Grass	27.0	0.9	RMEWR, MDWR
Bare Ground Cliffs Talus	Bare Ground	5.6	0.2	RMEWR
Bare Ground Cliffs Talus	Bare Ground	1.3	0.0	RMEWR, MDWR
Emergent Wetland	Wetland	3.4	0.1	RMEWR
Emergent Wetland	Wetland	13.5	0.5	RMEWR, MDWR
Desert Shrub	Shrub/Grass	0.4	0.0	RMEWR
Desert Shrub	Shrub/Grass	12.2	0.4	RMEWR, MDWR
Forested Wetland	Wetland	0.2	0.0	RMEWR
Forested Wetland	Wetland	0.7	0.0	RMEWR, MDWR
Western Juniper	Forest/Woodland	13.8	0.5	RMEWR, MDWR
Ponderosa Pine	Forest/Woodland	4.4	0.2	RMEWR, MDWR
Scrub-Shrub Wetland	Wetland	1.1	0.0	RMEWR, MDWR
Rocky Mountain Aspen	Forest/Woodland	0.2	0.0	RMEWR, MDWR
Mixed Grand Fir / Douglas Fir	Forest/Woodland	0.2	0.0	RMEWR, MDWR
Category 3		**0**	**0**	-
Category 4		**0**	**0**	-
Category 5		**0**	**0**	-
Category 6		**198.3**	**6.7**	
Agriculture	Agriculture/ Developed	194.5	6.6	RMEWR
Developed	Agriculture/ Developed	3.8	0.1	RMEWR
Total[4]	**NA**	**2,947.1**	**100**	**-**

[1] USGS Gap Analysis Project (GAP) GIS data for ecological systems. Ecological systems were cross-walked to HMP Habitat Type as shown in Exhibit P1, Attachment P1-1 Habitat Categorization Matrix.
[2] Represents the habitat category based on overlap with wildlife habitat layers. Agriculture and Developed habitat types' categories are not modified by overlap with wildlife habitat.
[3] RMEWR = Category 2 habitat for ODFW Rocky Mountain elk winter range. MDWR = Category 2 habitat for ODFW mule deer winter range.
[4] Total acres of habitat type may not match actual parcel size due to resolution of the GAP raster dataset. Pixels of the raster dataset were not simplified or smoothed to match the exact shape of the parcel boundary.

Hydrologic Features Present (SteamNet, NWI, NHD)	One perennial (Alder Creek) and four intermittent streams (NHD). Some spring and emergent wetlands not associated with the NHD streams are identified in the NWI dataset.

Adjacent land ownership, use, and condition	Property is bordered by both BLM and private lands. Land use is mostly rangeland with some agricultural developments. A majority of the adjacent landscape is classified as intermountain basins big sagebrush-steppe by GAP.

Infrastructure Density within or Near the Parcel (Qualitative Description)	Per the real estate listing, the property contains dwellings, shop, multiple large hay sheds, center pivot irrigation, and a livestock processing facility. HWY 26 and an existing transmission line are 5 miles to the south; state route 245 is approximately 4 miles to the north. Otherwise, the landscape is open rangeland.

Soil type, soil temperature and moisture regime (NRCS 2014)	Detailed SSURGO data is not available for this portion of Malheur County. STATSGO2 identifies the property is within the Ruclick-Ruckles-Lookout mapunit. Ruckles soils are shallow. They have a surface layer of very dark grayish brown very stony clay loam and a subsoil of dark brown very stony clay. These soils are on south- and west-facing slopes of 2 to 70 percent. Ruclick soils are moderately deep. They have a surface layer of very dark grayish brown very cobbly silt loam and a subsoil of dark brown very cobbly and extremely cobbly clay. These soils are on all aspects of the terrain at a slope of 2 to 70 percent. Lookout soils are moderately deep to a duripan. They have a surface layer mainly of very dark grayish brown very cobbly silt loam and a subsoil of dark yellowish brown clay over a duripan. In some areas the surface layer is silt loam. These soils are on hilltops and benches with slopes of 2 to 12 percent. The soils in this unit are used mainly for livestock grazing. The unit also provides habitat for many kinds of wildlife. In the areas used for livestock grazing, the main limitations are the very cobbly or very stony surface layer and the slope of the Ruckles and Rucklick soils. The temperature regime is Mesic and the moisture regime is Aridic bordering on Xeric (Warm/Dry bordering on Moist). This area is identified as having low relative resilience and resistance to disturbances (drought, fire, invasive species).

NRCS. 2014. Sage Grouse Management Zones Soil Taxonomic Temperature and Moisture Regimes. GIS Dataset.

Summary	The property is in sage-grouse core area within the Cow Valley PAC. According to Alternative D of the Oregon Sub-Region SAGR FEIS (Chapter 2, Figure 2-4), this property is located within or immediately adjacent to three proposed Sage-Grouse Strategic Areas: Climate Change Consideration Area – identified as higher elevation areas of high quality habitat likely to provide habitat over the long-term; Restoration Opportunity Area – within existing habitat where restoration would increase habitat quality and connectivity; and High-density Breeding Area – high quality habitat with a high density of active lek sites. The property is also completely within elk winter range and elk summer range and the northern 1/3 of the property is within mule deer winter range. Year-round springs, perennial stream (Alder Creek), and emergent wetlands increase the value of the property to wildlife in the arid landscape as well as provide potential for watershed improvement projects. GAP data indicates that introduced upland vegetation is present on site and could provide upland habitat restoration opportunities. Weed treatment and revegetation opportunities are available across the entire property but are abundant in areas currently in agricultural production and where livestock congregate. Opportunity areas generally coincide with habitat identified as Agriculture and/or Introduced Upland Vegetation by the GAP dataset (**Figure 2**). Western juniper woodlands are encroaching into sagebrush habitats on the parcel.

Pass/Fail Assessment?	Pass

Boardman to Hemingway Transmission Line Project

Consideration of Property as a Potential Mitigation Site

Mitigation Function	This mitigation site has been identified as in-kind and in-proximity mitigation for impacts on both Category 1 and category 2 sage-grouse core area habitat and Category 2 elk and mule deer winter range within the shrub/grass general vegetation type. Areas where sage-grouse habitat and big game winter range overlap are typically shrub-steppe and native grassland types with a continuous or mosaic big sagebrush component. The mitigation site contains important habitat features with ample opportunities to provide durable ecological uplift through implementation of standard mitigation actions. The mitigation actions listed below, upon successful implementation, will increase the quality of habitat available to sage-grouse and big game (among other species) within the mitigation site and result in an ecological uplift to the mitigation site above what is provided under the current management.

Mitigation Site Manager	Fee title acquisition with transfer of ownership to State of Oregon, Federal Land Management Agency, approved NPO or Land Trust

Mitigation Actions	The following are mitigation actions that IPC may consider implementing at this mitigation site in order to satisfy the mitigation policies/guidelines of the permitting agencies. All mitigation actions will follow reliable methods and be conducted as necessary to maintain desired habitat conditions throughout the life of the Project impacts. The mitigation actions presented here are not comprehensive. Implementation will likely be some combination of one or more of the following: • *Juniper/Conifer Removal* – There are approximately 300-450 acres of shrub-steppe and introduced upland vegetation where juniper encroachment is occurring (**Figure 3**). The juniper stands appear to be Phase I consisting of early successional young trees at very low density. Opportunity for spot-treating single trees occurs throughout the property. • *Modification of Livestock Grazing* – this would benefit a majority of the mitigation site as grazing has reduced native plant cover and has likely been a contributor to dispersal of non-native/invasive plant species across the site. In addition, livestock grazing may be incompatible with the short-term success of some of the mitigation actions identified, such as seeding of native plant species. Long-term maintenance of the mitigation site may consider domestic livestock grazing as a management tool. • *Fence Removal/Marking/Upgrade* – the mitigation site has approximately 60,000 feet of cross fencing (**Figure 3**) that can be removed. Fence removal would reduce the potential for wildlife injuries/mortalities from collisions. Fencing acts as a source of weed establishment through accumulation of windblown weeds. Fences provide perching opportunity for raptors and corvids. Marking of perimeter fencing in areas of concern would allow sage-grouse and other wildlife to more effectively visualize the fence and avoid collisions. Fences maintained on the mitigation site can be upgraded to a more wildlife friendly design that reduces the likelihood of significant injury during crossing events. • *Weed treatment* – the extent of noxious weed invasion on the mitigation site is unknown at this time but it is anticipated that opportunities exist to implement this mitigation action. Opportunities likely exist in areas identified for native seeding (**Figure 3**), along fence lines, within livestock handling facilities, near the residence, and other outbuildings/haysheds etc.

Mitigation Actions (cont.)	• *Native seeding/revegetation* – opportunity exists to seed native plant species in areas currently in agriculture and lowland areas adjacent to drainages where cattle have congregated. These areas cover approximately 300 acres of the mitigation site (**Figure 3**). Other seeding opportunities are available throughout the mitigation site. • *Wetland/Spring/Riparian Improvement* – drainages and riparian/wetland areas on the mitigation site are currently lacking native vegetation components. Opportunities exist to modify/improve water resources (channel modification, erosion control, vegetation treatment/plantings) on the mitigation site to reflect a more natural state and to provide water to mitigation action areas as needed to ensure success. There is approximately 3-8 miles of riparian corridor within the mitigation site and several acres of wetlands.

Monitoring	A specific plan for monitoring will be developed, but in general, mitigation progress will be monitored through vegetation plot monitoring and establishment of photo locations. Monitoring will occur annually for the first 3-5 years and an annual report will be produced. During the annual monitoring phase, a longer-term monitoring plan will be developed using similar protocols and methods to monitor the mitigation actions at larger time intervals (i.e., 5 years, 10 years).

Success Criteria	Specific success criteria will be developed once baseline conditions have been determined and potential mitigation actions have been confirmed for the site. Success criteria may include but are not limited to: • Vegetation plots show an increase in native vegetation cover and general trend toward increased habitat quality representing an ecological uplift. • Successful weed control through documentation of weed reduction. • Natural recruitment of sagebrush into areas currently in Agriculture or Introduced Upland Vegetation that were seeded to native plant species. • Successful juniper removal and continued control of encroachment onto the mitigation site for the life of the project. • Mitigation success will not be dependent on documentation of increased use of the mitigation site by sage-grouse or any other wildlife species.

Financial Outline	This financial outline provides estimated figures and data for informational purposes only. These estimates are meant to provide an overview of the potential and commercially reasonable costs of acquiring and implementing mitigation on this mitigation site. The financial outline does not guarantee the final sales price and costs for the acquisition, and the price offering is subject to prior sale, price change, correction, amendment or withdrawal.
	• Initial purchase of the mitigation site: $2,750,000
	• Juniper removal: $80 - $200 per acre
	• Fence removal: $1.88 per foot
	• Fence marking: $0.11 per foot of fence ($581 per mile)
	• Weed treatment: $20 - $200 per acre
	• Native Seeding:
	    o Site preparation (mowing/discing) $500 per acre
	    o Broadcast/Drill seed: $100 - $250 per acre
	• Hydroseeding: $792 per acre

Financial Outline (cont.)

- Wetland/Spring/Riparian Improvement
  - Complex Restoration: $2,400 per acre
  - Riparian Herbacous Cover
    - Broadcast Seeding: $687 per acre
    - Pollinator Cover: $1,303 per acre
    - Plug Planting: $13,730 per acre
    - Combo Seeding and Plug Planting: $6,947 per acre
  - Riparian Forest Buffer
    - Hand Plant, bare root: $768 per acre
    - Cuttings, small to medium: $867 per acre
    - Seeding: $106 per acre

Estimated Budget for the Alder Creek Mitigation Site

Action	Cost per Unit	Units	Years	Expense
One-time Costs				
Acquisition of mitigation site	$2,750,000	1	-	$2,750,000
Juniper Removal	$100	450	-	$45,000
Grazing Modification	-	-	-	-
Removal of cross fencing	$2	60,000	-	$120,000
Marking of perimeter fence	-	-	-	-
Weed Treatment	$20-$200	75	-	$15,000
Native Seeding	$750	300	-	$225,000
50-year Operation and Management Costs				
O&M[1]	$30	3,081	50	$4,621,500
Total	**-**			**$7,776,500** ($2,524/acre)[2]

[1] This O&M cost is an estimate of the cost per acre per year (not including acquisition/easement costs) based on the research presented in the Independent Economic Analysis Board's 2007 *Investigation of Wildlife O&M Costs*. The average cost per acre presented in that document was $24 in 2004 dollars, this has been adjusted to reflect 2015 dollars. In addition, one of the projects presented in the document was the 10,000 acre Sagebrush Flat Wildlife Mitigation area in Washington state which is within a similar habitat type and has a FY2015 budget of approximately $300,000 (or $30/acre).

[2] Cost per acre here includes cost of acquisition and initial mitigation actions and long-term O&M for 50 years.

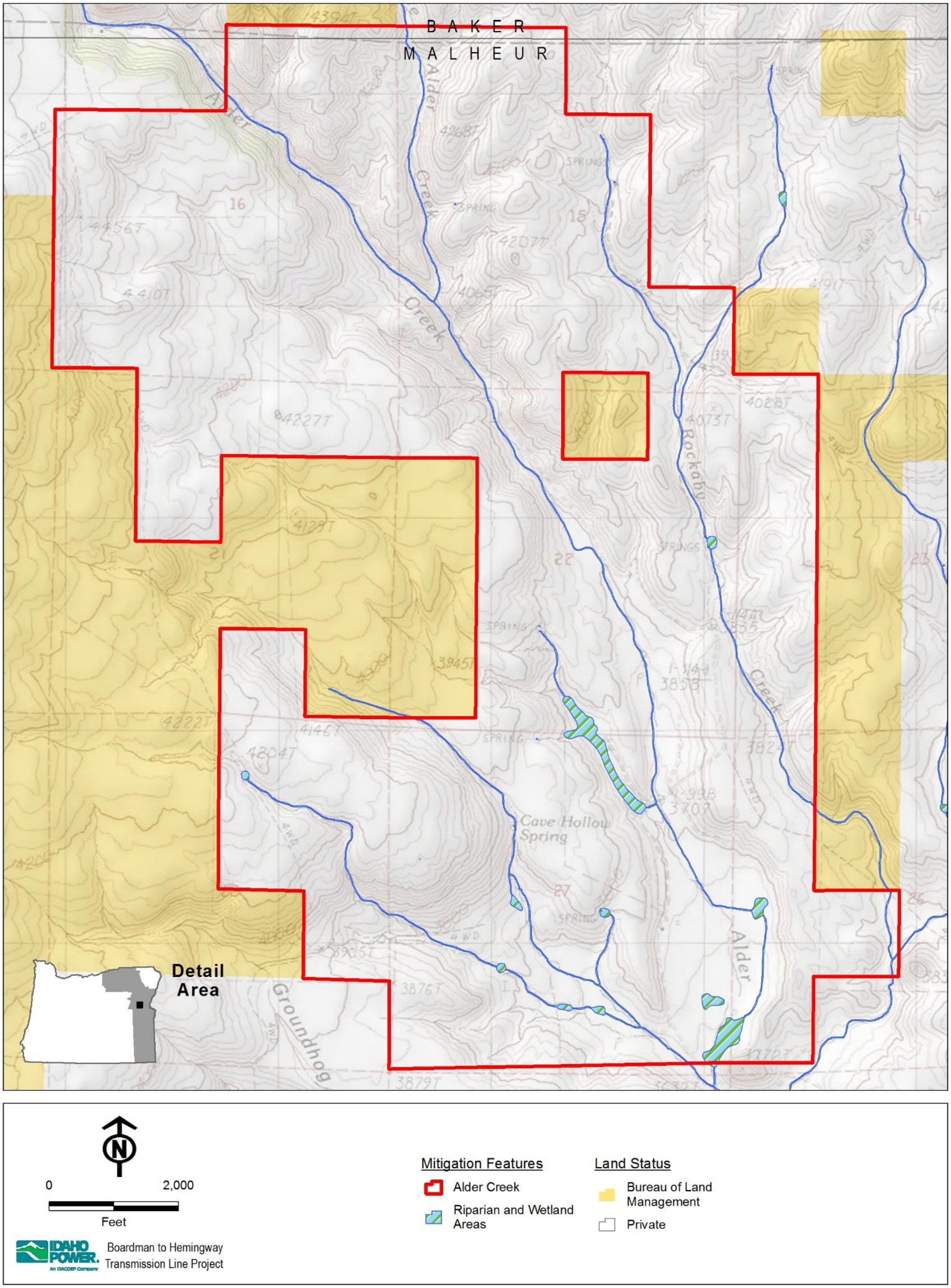

Figure 1. Alder Creek Ownership and Water

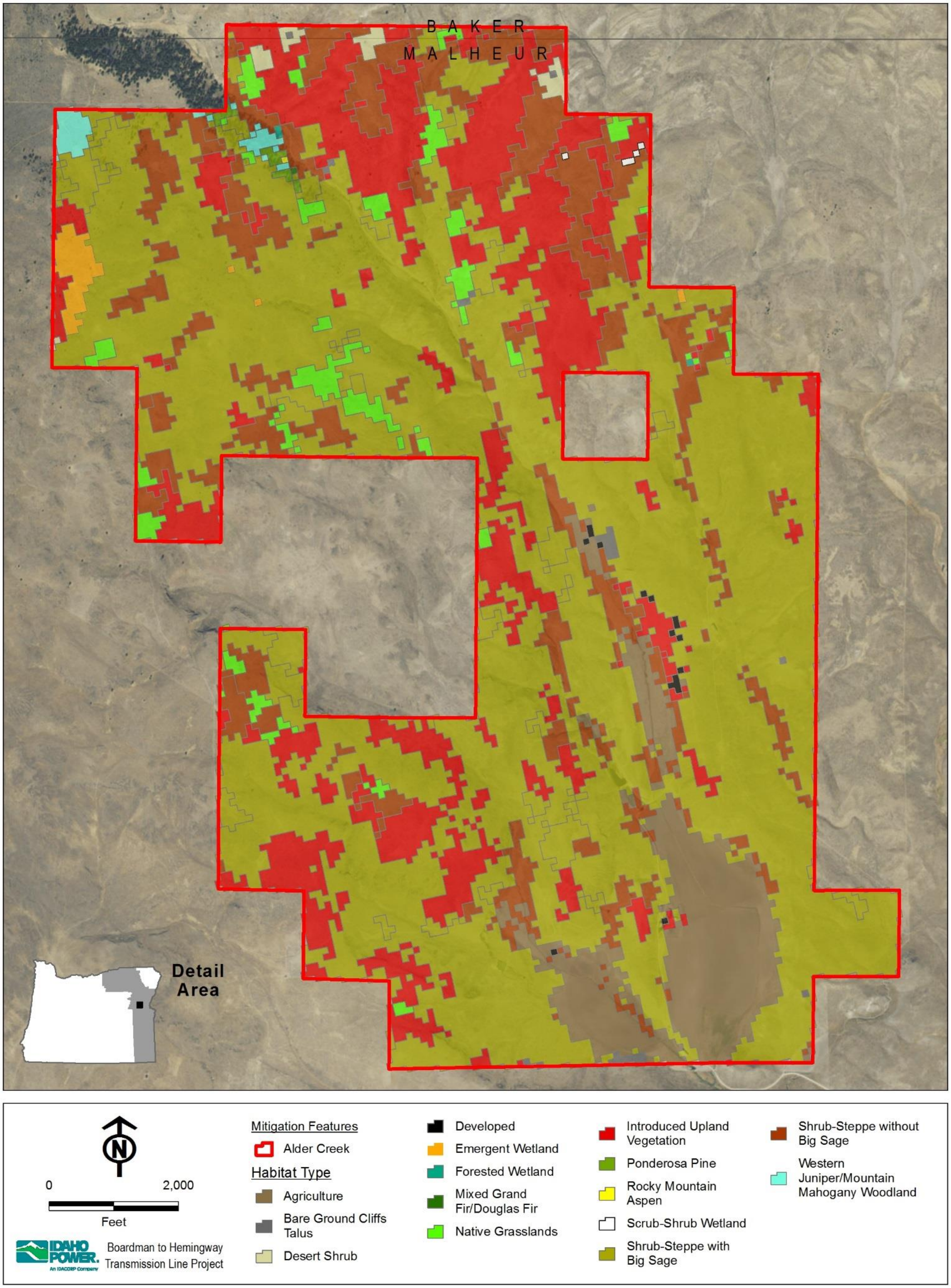

Figure 2. Alder Creek Ranch Habitat Types

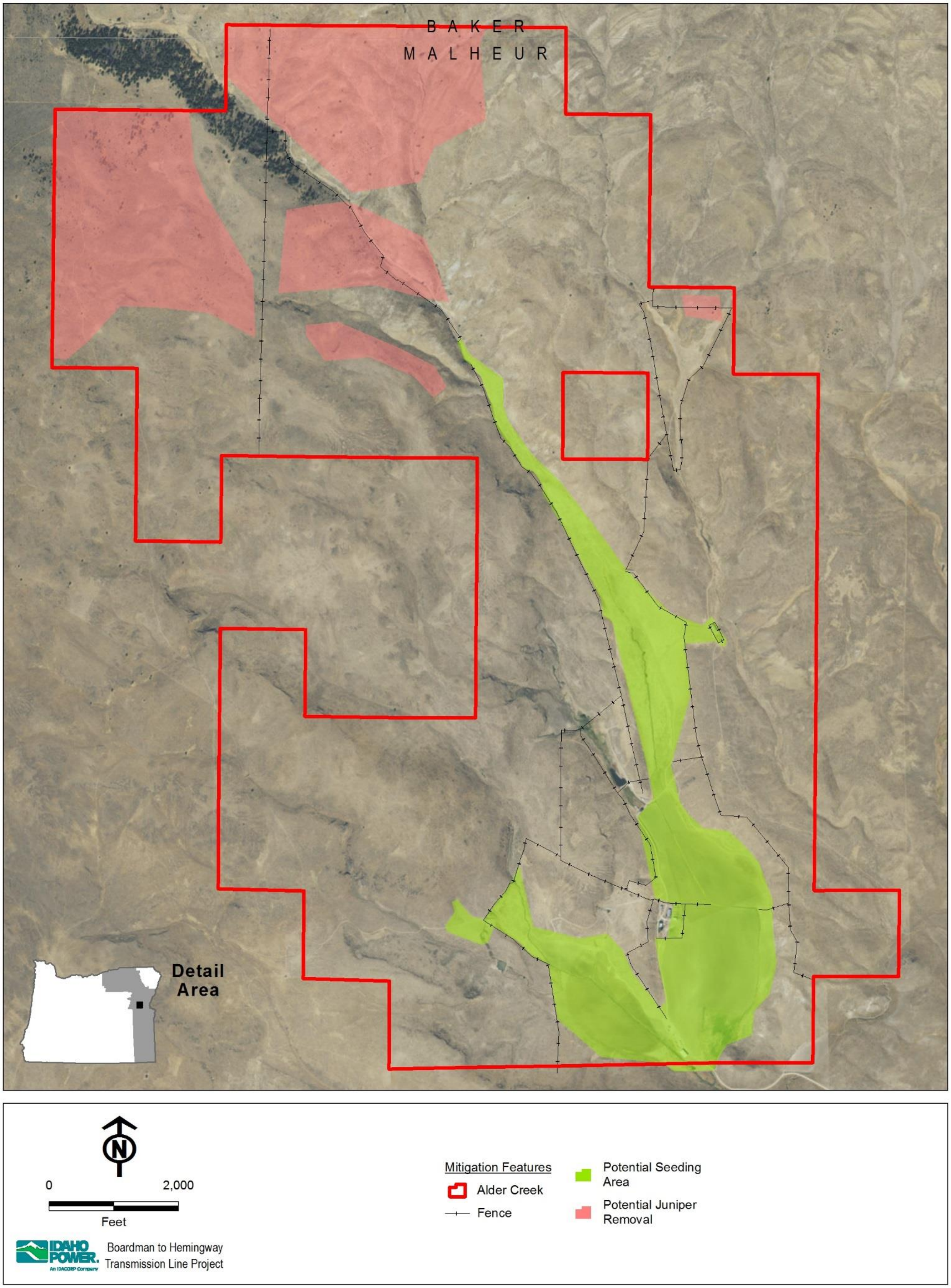

Figure 3. Alder Creek Potential Mitigation Action Areas

Boardman to Hemingway Transmission Line Project

Desktop Habitat Mitigation Site Assessment Worksheet

Parcel Name: Glasgow (**Figure 1**)

Landowner:

Parcel Size in Acres: 1,438

Date of Assessment: 10/13/2014

Parcel Elevation (ft): 3,000 – 4,600

Within Mitigation Service Area?: Yes

Location Description
(County, miles and direction from known location, TRS, UTM, other):

Baker County, 10 miles southeast of Keating.
T9S R43E Sections 11, 12, 13, 14, 23, 24

Vegetation Cover Classes (GAP[1], **Figure 2**)

HMP Habitat Category[2] and Type	HMP General Vegetation Type	Acres	% of Total	Wildlife Habitat[3]
Category 1		**0**	**0**	
Category 2				-
Shrub-Steppe with Big Sage	Shrub/Grass	675.9	47.0	MDWR
Shrub-Steppe with Big Sage	Shrub/Grass	364.9	25.4	MDWR, RMEWR, RMESR
Shrub-Steppe with Big Sage	Shrub/Grass	25.9	1.8	MDWR, RMESR
Shrub-Steppe with Big Sage	Shrub/Grass	6.2	0.4	RMEWR, MDWR
Shrub-Steppe without Big Sage	Shrub/Grass	76.0	5.3	MDWR
Shrub-Steppe without Big Sage	Shrub/Grass	159.9	11.1	MDWR, RMEWR, RMESR
Shrub-Steppe without Big Sage	Shrub/Grass	10.5	0.7	MDWR, RMEWR
Native Grasslands	Shrub/Grass	39.6	2.7	MDWR, RMEWR, RMESR
Native Grasslands	Shrub/Grass	35.6	2.5	MDWR
Native Grasslands	Shrub/Grass	1.7	0.1	MDWR, RMESR
Mixed Grand Fir/Douglas Fir	Forest/Woodland	23.8	1.7	MDWR, RMEWR, RMESR
Western Juniper/Mountain Mahogany Woodland	Forest/Woodland	4.4	0.3	MDWR, RMEWR, RMESR
Rocky Mountain Aspen	Forest/Woodland	1.6	0.1	MDWR, RMEWR, RMESR
Introduced Upland Vegetation	Shrub/Grass	8.0	0.6	MDWR
Ponderosa Pine	Forest/Woodland	0.9	0.1	MDWR, RMEWR, RMESR
Forested Wetland	Wetland	1.1	0.1	MDWR
Emergent Wetland	Wetland	0.7	0.0	MDWR
Remaining	-	2.2	0.2	-
Category 3		**0**	**0**	-
Category 4		**0**	**0**	-
Category 5		**0**	**0**	-
Category 6		**0**	**0**	-
Total		**1,438.9**	**100**	**-**

[1] USGS Gap Analysis Project (GAP) GIS data using ecological systems. Ecological systems were cross-walked to HMP Habitat Type as shown in the Habitat Categorization Matrix (Attachment P1-1 of Exhibit P1).

[2] Represents the habitat category based on overlap with wildlife habitat layers. Agriculture and Developed habitat types' categories are not modified by overlap with wildlife habitat.

[3] RMEWR = Category 2 habitat for ODFW Rocky Mountain elk winter range. MDWR = Category 2 habitat for ODFW mule deer winter range.

[4] Total acres of habitat type may not match actual parcel size due to the resolution of the GAP raster dataset. Pixels of the raster dataset were not simplified or smoothed to match the exact shape of the parcel boundary.

Soil types	The NRCS Soil Survey Geographic Database (SSURGO) data was reviewed and the following soils were identified on the property (**Figure 3**): *Ateron very stony loam* (**84 acres**). Ateron soils consist of shallow, well drained soils found on ridge tops and side slopes of hills and mountains at elevations from 3,600 to 5,800 feet. Ateron soils are used for livestock grazing. The native vegetation is mountain big sagebrush, Idaho fescue, bluebunch wheatgrass, and Sandberg bluegrass. *Brownscombe silt loam* (**389 acres**). Brownscombe soils consist of moderately deep, well drained soils found on hills at elevations of 2,400 to 3,600 feet. Brownscombe soils are used for range, dryland winter wheat, and wildlife habitat. Native vegetation is bluebunch wheatgrass, Sandberg bluegrass and arrowleaf balsamroot. *Hibbard gravelly silty clay loam* (**143 acres**). Hibbard soils consist of moderately deep to a duripan, well drained soils found on fan terraces at elevations of 3,000 to 3,700 feet. Hibbard soils are used for rangeland. The native vegetation is bluebunch wheatgrass, Idaho fescue and big sagebrush. *Lookout very cobbly silt loam* (**85 acres**). Lookout soils consist of moderately deep to a duripan, well drained soils found on hills at elevations of 2,800 to 3,600 feet. Lookout soils are mainly rangeland. Small acreage is irrigated for alfalfa, hay, pasture and small grain. Native vegetation dominantly is bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass, buckwheat, and big sagebrush. *Ruckles-Ruclick complex* (**20 acres**). Ruckles soils consist of shallow, well drained soils found on hill and canyon side slopes at elevations ranging from 1,200 to 3,800 feet in Oregon. Ruckles soils are used for livestock grazing. Native vegetation dominantly is bluebunch wheatgrass, Idaho fescue on north slopes, Sandberg bluegrass and Wyoming big sagebrush. Ruclick soils consist of moderately deep, well drained soils found on summits, dipslopes, and sideslopes of foothills and tablelands at elevations of 4,000 to 6,500 feet in Idaho, and as low as 1,200 feet in Oregon. Ruclick soils are used mainly for rangeland and wildlife habitat. The dominant natural vegetation is Wyoming big sagebrush, bluebunch wheatgrass, and Sandberg bluegrass. *Skullgulch silty clay loam* (**196 acres**). Skullgulch soils consist of very deep, well drained soils in concave positions on north-facing side slopes on terraces and on fans with elevations ranging from 4,000 to 5,400 feet. Skullgulch soils are used for rangeland. The native vegetation in MLRA 10 is Idaho fescue, bluebunch wheatgrass, prairie junegrass, mountain big sagebrush, and green rabbitbrush. The native vegetation in MLRA 9 is Idaho fescue, bluebunch wheatgrass and prairie junegrass. *Snell-Ateron complex* (**468 acres**). Snell series consists of moderately deep, well drained soils found on hills, plateaus, mountains and on canyon walls at elevations of 2,000 to 6,800 feet. Snell soils are used for livestock grazing and wildlife habitat. Potential native vegetation is bluebunch wheatgrass, Idaho fescue, and Sandberg bluegrass. Ateron soils consist of shallow, well drained soils found on ridge tops and side slopes of hills and mountains at elevations from 3,600 to 5,800 feet. Ateron soils are used for livestock grazing. The native vegetation is mountain big sagebrush, Idaho fescue, bluebunch wheatgrass, and Sandberg bluegrass. *Virtue very gravelly silt loam* (**53 acres**). Virtue soils consist of moderately deep to a duripan well drained soils found on fans and terraces at elevations of 2,300 to 4,000 feet. Virtue soils are used for rangeland, irrigated small grain, hay and pasture. The native vegetation is bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass, Thurber needlegrass and Wyoming big sagebrush.

Hydrologic Features Present	Two perennial streams and one intermittent stream within the property boundary (NHD). NWI identifies a couple of emergent wetlands, a scrub-shrub wetland, and three cold water springs in addition to riparian areas associated with NHD data.

(SteamNet, NWI, NHD)	
Adjacent land ownership, use, and condition	The northern boundary of the property connects to a very large tract of BLM land that connects many of the uplands above the Lower Powder Valley; including Spring Creek and Goose Creek areas to the north of State Route 86; Love Creek, Ritter Creek and Ruckles Creek south of State Route 86; and areas extending into the upper Lower Powder Valley including Crews Creek and portions of the Powder River north of State Route 203 to the Union/Baker County line. However, a majority of the property is immediately adjacent to private properties. Adjacent land use is rangeland that appears to be heavily grazed.
Infrastructure Density within or Near the Parcel (Qualitative Description)	Property is approximately 1 mile south of State Route 86 and contains some fencing and two-track trails; otherwise, the property is open rangeland absent of development.
Summary	The entire property is within a sage-grouse Core Area that is well-studied by ODFW. Nesting sage-grouse have been documented on the property. The property contains both elk and mule deer winter ranges and is heavily utilized by pronghorn in the spring. The property is grazed every other year, and has been managed in this manner for the last 10 years. Landowner explained that since this grazing rotation was implemented, he has seen an upward trend in desirable vegetation (Idaho fescue especially). The property is mostly Wyoming big sagebrush with islands of invasive species (Japanese brome was mentioned) that would need treatment. Landowner believes that ten years of rest from grazing and some treatments would get the property to a state where, barring fire or some other unexpected event, habitat would contain enough native desirable vegetation that few management actions would be needed to maintain the quality of habitat.
Pass/Fail Desktop Assessment?	Pass

Boardman to Hemingway Transmission Line Project

Consideration of Property as a Potential Mitigation Site

Mitigation Function	This mitigation site has been identified as in-kind and in-proximity mitigation for impacts on Category 2 Rocky Mountain elk winter range and mule deer winter range within the shrub/grass general vegetation type. This mitigation site could also help meet the Project need for sage-grouse habitat mitigation. It also provides opportunity for shrub/grass mitigation of Category 3, 4, & 5 habitats. It contains important habitat features that could be preserved and has some uplift opportunities that could be achieved through implementation of standard mitigation actions. The mitigation actions listed below, upon successful implementation, will increase the quality of habitat available to sage-grouse, elk, and deer (among other species) within the mitigation site and result in an ecological uplift to the mitigation site above what is provided under the current management.
Mitigation Site Manager	Fee title acquisition with transfer of ownership to State of Oregon, Federal Land Management Agency, approved NPO or Land Trust.
Mitigation Actions	The following are mitigation actions that may be implemented at this mitigation site in order to satisfy the mitigation policies/guidelines of the permitting agencies. All mitigation actions will follow reliable methods. The mitigation actions presented here are not comprehensive. Implementation will likely be some combination of one or more of the following: • *Modification of Livestock Grazing* – this property has been grazed every other year for the past ten years, allowing for re-establishment of native vegetation. Future management would focus primarily on grazing practices that would not compete with native wildlife life history needs. Targeted grazing may be considered for habitat enhancement/treatment actions. • *Fence Removal/Marking* – opportunities are unknown at this time, but it is anticipated that some unnecessary fencing may be removed or necessary fencing can be upgraded to more wildlife friendly fencing. • *Weed treatment* – the extent of noxious weed invasion on the mitigation site is unknown at this time but it is anticipated that opportunities exist to implement this mitigation action. Some areas of introduced upland vegetation (specifically Japanese brome) were noted on the property in cattle congregation areas. • *Native revegetation/restoration* – focus of efforts would be to promote establishment of sagebrush and bunchgrasses; opportunities exist but have not been specifically identified at this time. • *Fire readiness* – efforts made to make the property more resistant to catastrophic fire and a fire response plan could be developed.
Monitoring	A specific plan for monitoring will be developed, but in general, mitigation progress will be monitored through vegetation plot monitoring and establishment of photo locations. Monitoring will occur annually for the first 3-5 years and an annual report will be produced. During the annual monitoring phase, a longer-term monitoring plan will be developed using similar protocols and methods to monitor the mitigation actions at larger time intervals (i.e., 5 years, 10 years).

Success Criteria	Specific success criteria will be developed once baseline conditions have been determined and potential mitigation actions have been confirmed for the site. Success

criteria may include but are not limited to:

- Vegetation plots show an increase in native vegetation cover and general trend toward increased habitat quality representing an ecological uplift.
- Successful weed control through documentation of a reduction in weeds and non-native invasive plant species.
- Mitigation success will not be dependent on documentation of increased use of the mitigation site by sage-grouse or any other wildlife species.

Financial Outline

Estimated Budget for the Glasgow Mitigation Site

Action	Cost per Unit	Units	Years	Expense
One-time Costs				
Acquisition	?	1		?
50-year Operation and Management Costs				
O&M[1]	$30.00	1,438	50	$2,157,000
Total	**-**			**$?** ($?)[2]

[1] This O&M cost is an estimate of the cost per acre per year (not including acquisition/easement costs) based on the research presented in the Independent Economic Analysis Board's 2007 *Investigation of Wildlife O&M Costs*. The average cost per acre presented in that document was $24 in 2004 dollars, this has been adjusted to reflect 2015 dollars. In addition, one of the projects presented in the document was the 10,000 acre Sagebrush Flat Wildlife Mitigation area in Washington state which is within a similar habitat type and has a FY2015 budget of approximately $300,000 (or $30/acre).

[2] Cost per acre here includes cost of acquisition/easement and initial mitigation actions and long-term O&M for 50 years.

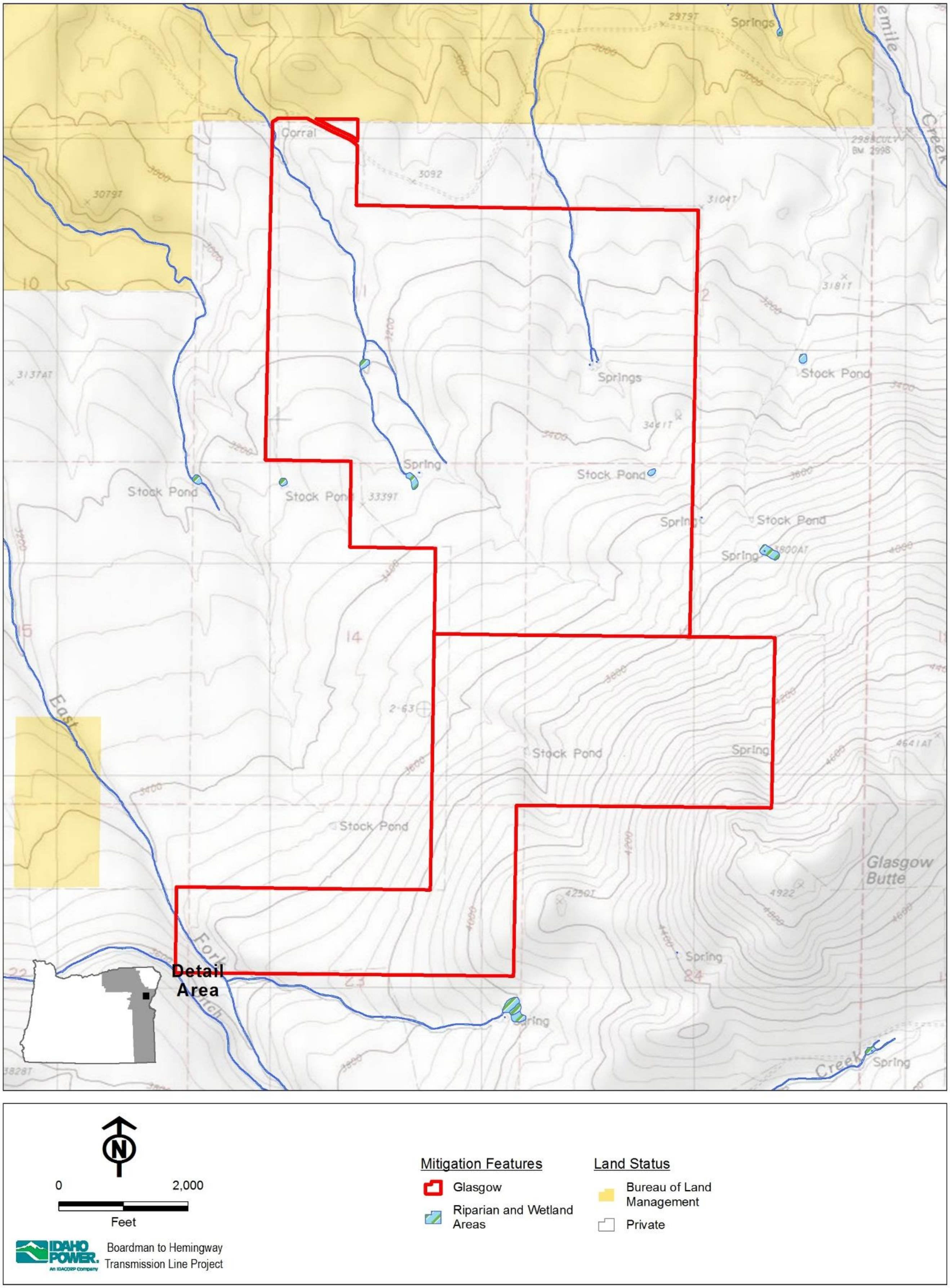

Figure 1. Glasgow Ownership and Water

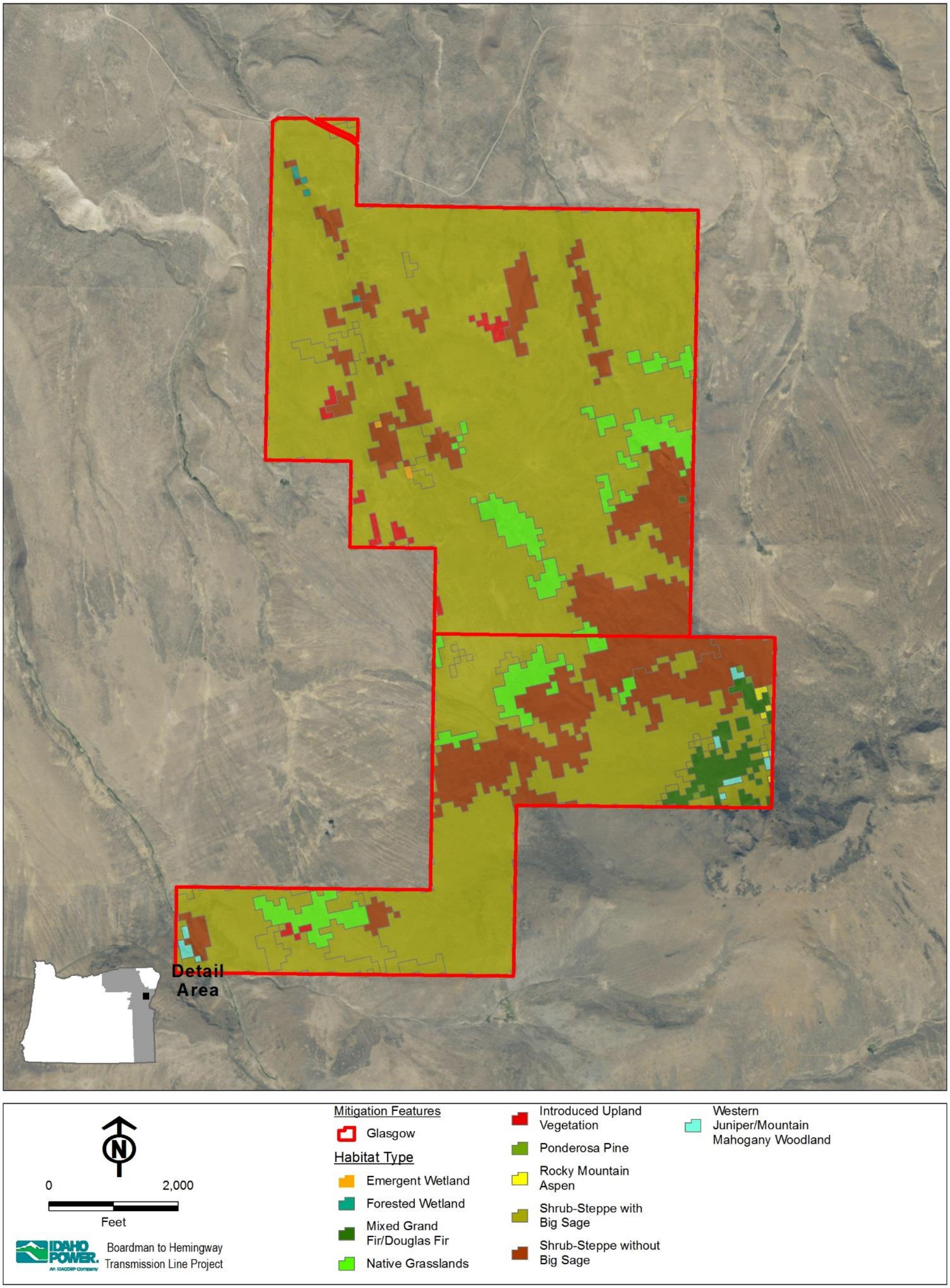

Figure 2. Glasgow Habitat Types

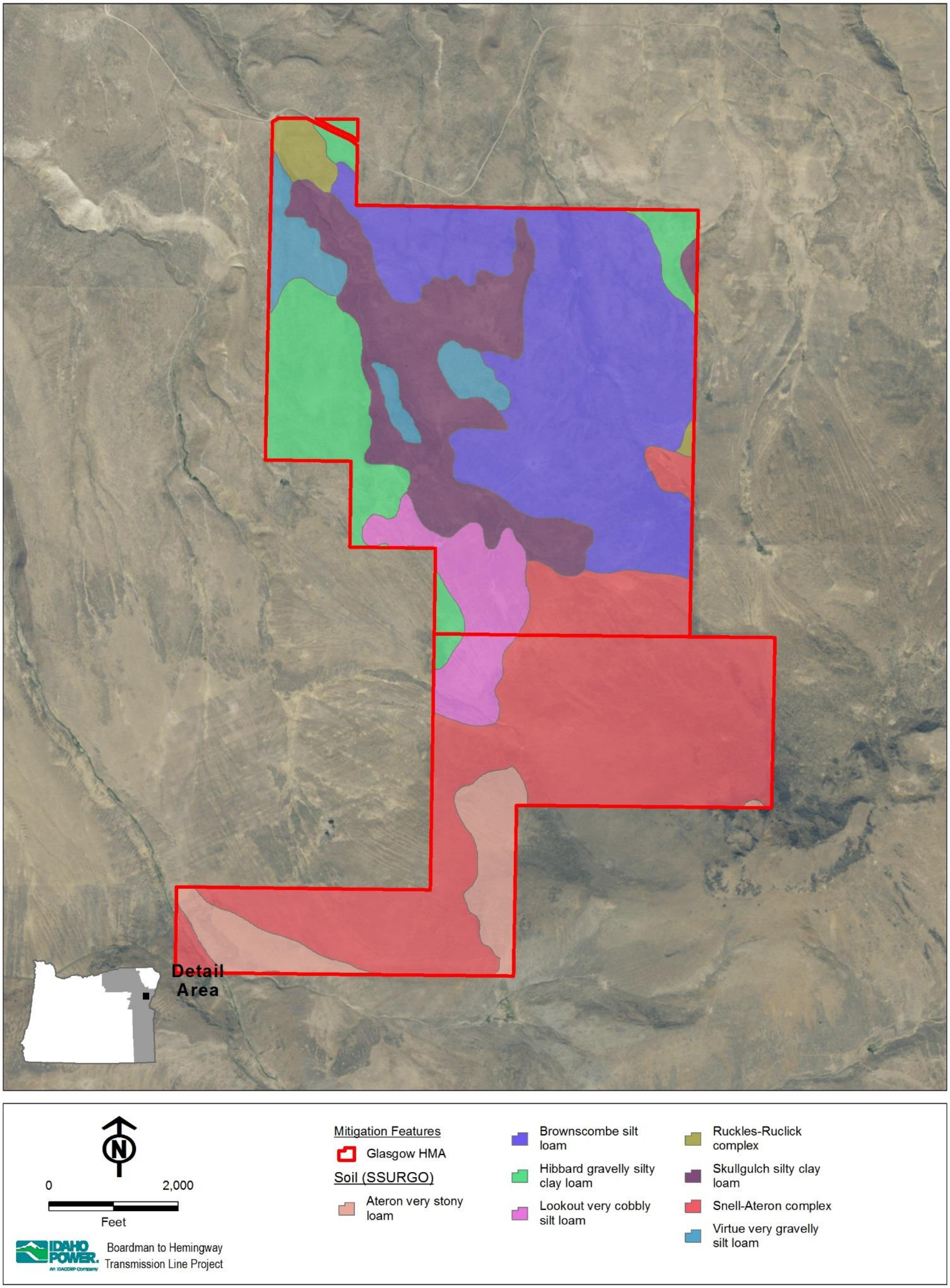

Figure 3. Glasgow Soil Types

Boardman to Hemingway Transmission Line Project

Desktop Habitat Mitigation Site Assessment Worksheet

Parcel Name:	Trail Creek	**Date of Assessment:**	10/13/2014
Landowner:		**Parcel Elevation (ft):**	3,600 – 4,580
Parcel Size in Acres:	624	**Within Mitigation Service Area?:**	Yes

Location Description
(County, miles and direction from known location, TRS, UTM, other):

Baker County, approximately 5 miles northeast of Durkee.
T10S R43E Section 36, T10S R44E Section 31, T11S R43E Section 1, T11S R44E Section 6 (**Figure 1**)

Vegetation Cover Classes (GAP[1], **Figure 2**)

HMP Habitat Category[2] and Type	HMP General Vegetation Type	Acres	% of Parcel	Wildlife Habitat[3]
Category 1		**0**	**0**	-
Category 2		**624.5**	**100**	-
Shrub-Steppe with Big Sage	Shrub/Grass	490.0	78.5	RMEWR, RMESR, MDSR
Shrub-Steppe without Big Sage	Shrub/Grass	75.6	12.1	RMEWR, RMESR, MDSR
Native Grasslands	Shrub/Grass	27.1	4.3	RMEWR, RMESR, MDSR
Introduced Upland Vegetation	Shrub/Grass	8.2	1.3	RMEWR, RMESR, MDSR
Western Juniper /Mountain Mahogany Woodland	Forest/Woodland	7.6	1.2	RMEWR, RMESR, MDSR
Ponderosa Pine	Forest/Woodland	7.1	1.1	RMEWR, RMESR, MDSR
Mixed Grand Fir / Douglas Fir	Forest/Woodland	3.1	0.5	RMEWR, RMESR, MDSR
Rocky Mountain Aspen	Forest/Woodland	3.1	0.5	RMEWR, RMESR, MDSR
Bare Ground Cliffs Talus	Bare Ground	2.0	0.3	RMEWR, RMESR, MDSR
Emergent Wetland	Wetland	0.7	0.1	RMEWR, RMESR, MDSR
Category 3		**0**	**0**	-
Category 4		**0**	**0**	-
Category 5		**0**	**0**	-
Category 6		**0**	**0**	-
Total	**NA**	**624.5**[4]	**100**	**-**

[1] USGS Gap Analysis Project (GAP) GIS data using ecological systems. Ecological systems were cross-walked to HMP Habitat Type as shown in Exhibit P1, Attachment P1-1 Habitat Categorization Matrix.
[2] Represents the habitat category based on overlap with wildlife habitat layers. Agriculture and Developed habitat types' categories are not modified by overlap with wildlife habitat.
[3] RMEWR = Rocky Mountain Elk Winter Range.
[4] Total acres of habitat type may not match actual parcel size due to resolution of the GAP raster dataset. Pixels of the raster dataset were not simplified or smoothed to match the exact shape of the parcel boundary. This is apparent in **Figure 2**.

Soil type

The NRCS Soil Survey Geographic Database (SSURGO) data was reviewed and the following soil was identified on the property (**Figure 3**):

Durkee gravelly silt loam (**623**). Durkee soils consist of moderately deep, well drained soils on smooth rolling hills at elevation ranges from 3,600 to 6,100 feet.

Hydrologic Features Present (SteamNet, NWI, NHD)	Two intermittent streams are on the property (NHD). NWI does not indicate any additional wetland features beyond those associated with the streams identified by NHD.

Adjacent land ownership, use, and condition (if possible)	A majority of this property shares a border with a BLM parcel that is approximately 4,000 acres in size. Also adjacent to private land ownership. Dominant land use in the area is rangeland. Adjacent private lands appear to be more degraded as a result of heavier grazing practices (per 2013 site visit).

Infrastructure Density within or Near the Parcel (Qualitative Description)	The property contains some fencing and gates and some two track roads; otherwise open rangeland.

Summary	The property is completely within a sage-grouse Core Area and the Lookout Mountain Rocky Mountain elk herd's winter range. The property is completely within elk summer range and mule deer summer range as well. The property is close to the Nodine sage-grouse lek. The property provides sage-grouse breeding habitat, adequate sagebrush cover and height ensures adequate winter forage, and an abundance of forbs in the understory and a source of water in Trail Creek provides quality brood-rearing habitat. The property is able to support sage-grouse year-round and therefore provides habitat for many other sagebrush obligate species.

Pass/Fail Desktop Assessment?	Pass

Boardman to Hemingway Transmission Line Project

Consideration of Property as a Potential Mitigation Site

Mitigation Function	This mitigation site has been identified as in-kind and in-proximity mitigation for impacts on Category 2 Rocky Mountain elk winter range within the shrub/grass general vegetation type. This mitigation site could also help meet the Project need for sage-grouse habitat mitigation. It also provides opportunity for shrub/grass mitigation of Category 3, 4, & 5 habitats. It contains important habitat features that could be preserved and has some uplift opportunities that could be achieved through implementation of standard mitigation actions. The mitigation actions listed below, upon successful implementation, will increase the quality of habitat available to sage-grouse and elk (among other species) within the mitigation site and result in an ecological uplift to the mitigation site above what is provided under the current management.
Mitigation Site Manager	Fee title acquisition with transfer of ownership to State of Oregon, Federal Land Management Agency, approved NPO or Land Trust.
Mitigation Actions	The following are mitigation actions that IPC may consider implementing at this mitigation site in order to satisfy the mitigation policies/guidelines of the permitting agencies. All mitigation actions will follow reliable methods. The mitigation actions presented here are not comprehensive. Implementation will likely be some combination of one or more of the following: • *Juniper/Conifer Removal* –Opportunity for spot-treating single trees occurs throughout the property to prevent future encroachment. • *Modification of Livestock Grazing* –grazing on this property appears to have been managed in a manner that allows native vegetation to remain established and provide cover and forage for wildlife species. Future management would focus primarily on grazing practices that would not compete with native wildlife life history needs. Targeted grazing may be considered for habitat enhancement/treatment actions. • *Fence Removal/Marking* – opportunities are unknown at this time, but it is anticipated that some unnecessary fencing may be removed or necessary fencing can be upgraded to more wildlife friendly fencing. • *Weed treatment* – the extent of noxious weed invasion on the mitigation site is unknown at this time but it is anticipated that opportunities exist to implement this mitigation action. Some areas of introduced upland vegetation were noted along Trail Creek where cattle congregate. • *Native revegetation/restoration* – focus of efforts would be to promote establishment of sagebrush and bunchgrasses; opportunities exist but have not been specifically identified at this time. • *Fire readiness* – efforts made to make the property more resistant to catastrophic fire and a fire response plan could be developed. • *Wetland/Spring/Riparian Improvement* – opportunity exists along Trail Creek to perform riparian/watershed improvements.
Monitoring	A specific plan for monitoring will be developed, but in general, mitigation progress will be monitored through vegetation plot monitoring and establishment of photo locations. Monitoring will occur annually for the first 3-5 years and an annual report will be produced. During the annual monitoring phase, a longer-term monitoring plan will be developed using similar protocols and methods to monitor the mitigation actions at larger time intervals (i.e., 5 years, 10 years).

Success Criteria

Specific success criteria will be developed once mitigation actions have been confirmed for the site. Success criteria may include but are not limited to:

- Vegetation plots show an increase in native vegetation cover and general trend toward increased habitat quality representing an ecological uplift.
- Successful weed control through documentation of weed reduction.
- Successful juniper removal and continued control of encroachment onto the mitigation site for the life of the project.
- Mitigation success will not be dependent on documentation of increased use of the mitigation site by sage-grouse or any other wildlife species.

Financial Outline

Estimated Budget for the Trail Creek Mitigation Site

Action	**Cost per Unit**	**Units**	**Years**	**Expense**
One-time Costs				
Acquisition	?	1		?
50-year Operation and Management Costs				
O&M[1]	$30.00	624	50	$936,000
Total	**-**			**$?** ($?)[2]

[1] This O&M cost is an estimate of the cost per acre per year (not including acquisition/easement costs) based on the research presented in the Independent Economic Analysis Board's 2007 *Investigation of Wildlife O&M Costs*. The average cost per acre presented in that document was $24 in 2004 dollars, this has been adjusted to reflect 2015 dollars. In addition, one of the projects presented in the document was the 10,000 acre Sagebrush Flat Wildlife Mitigation area in Washington state which is within a similar habitat type and has a FY2015 budget of approximately $300,000 (or $30/acre).

[2] Cost per acre here includes cost of acquisition/easement and initial mitigation actions and long-term O&M for 50 years.

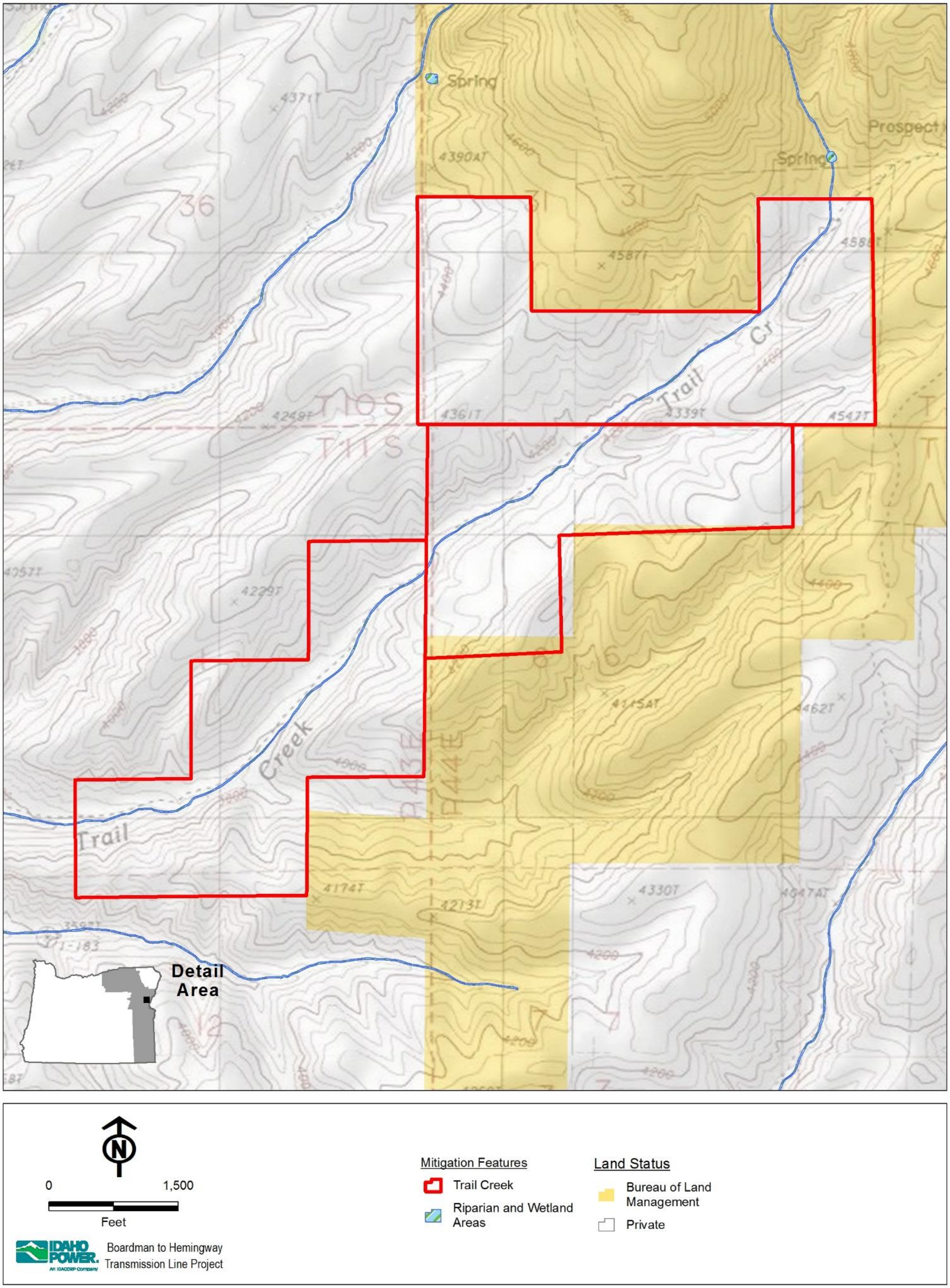

Figure 1. Trail Creek Ownership and Water

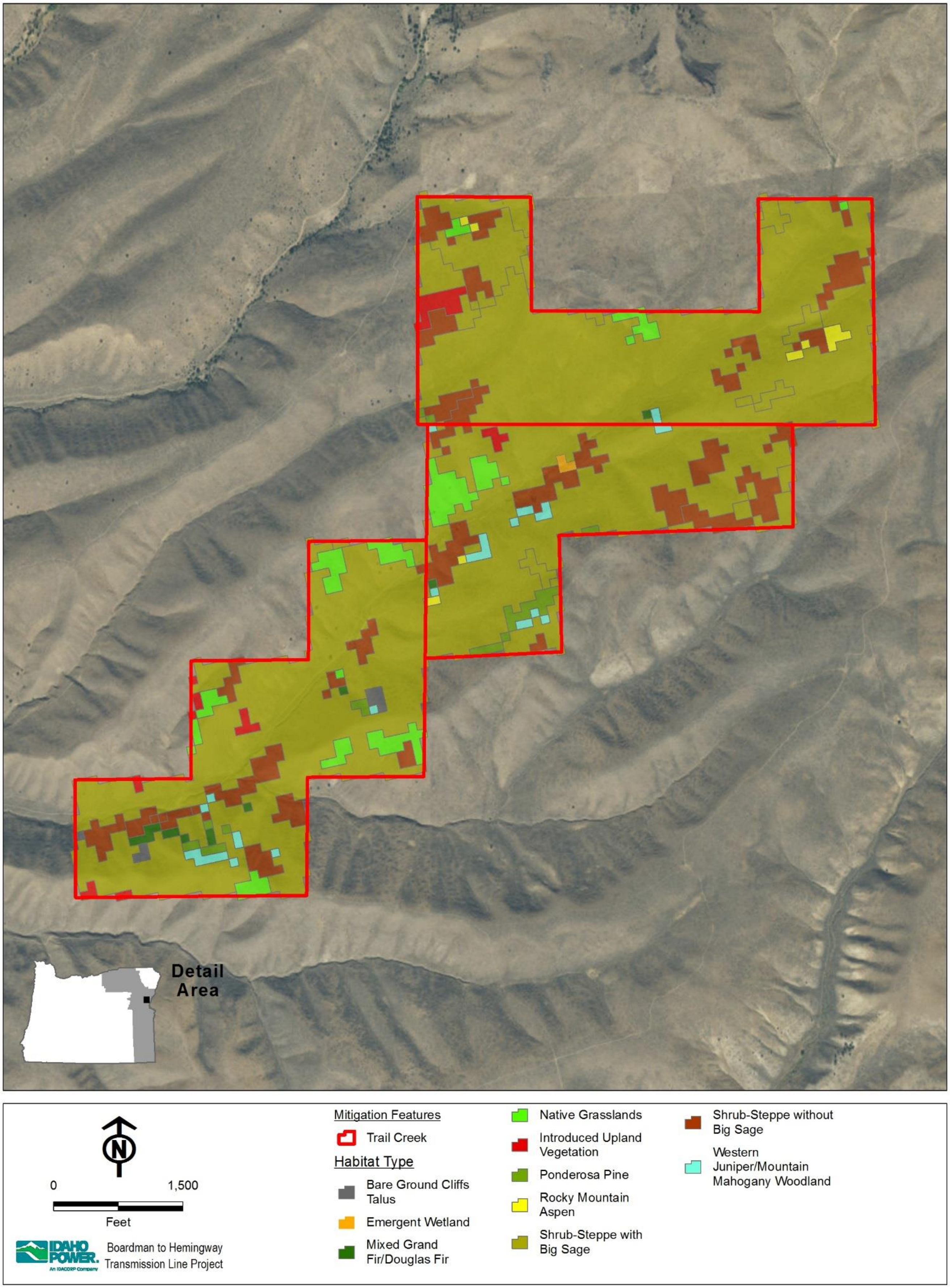

Figure 2. Trail Creek Habitat Types

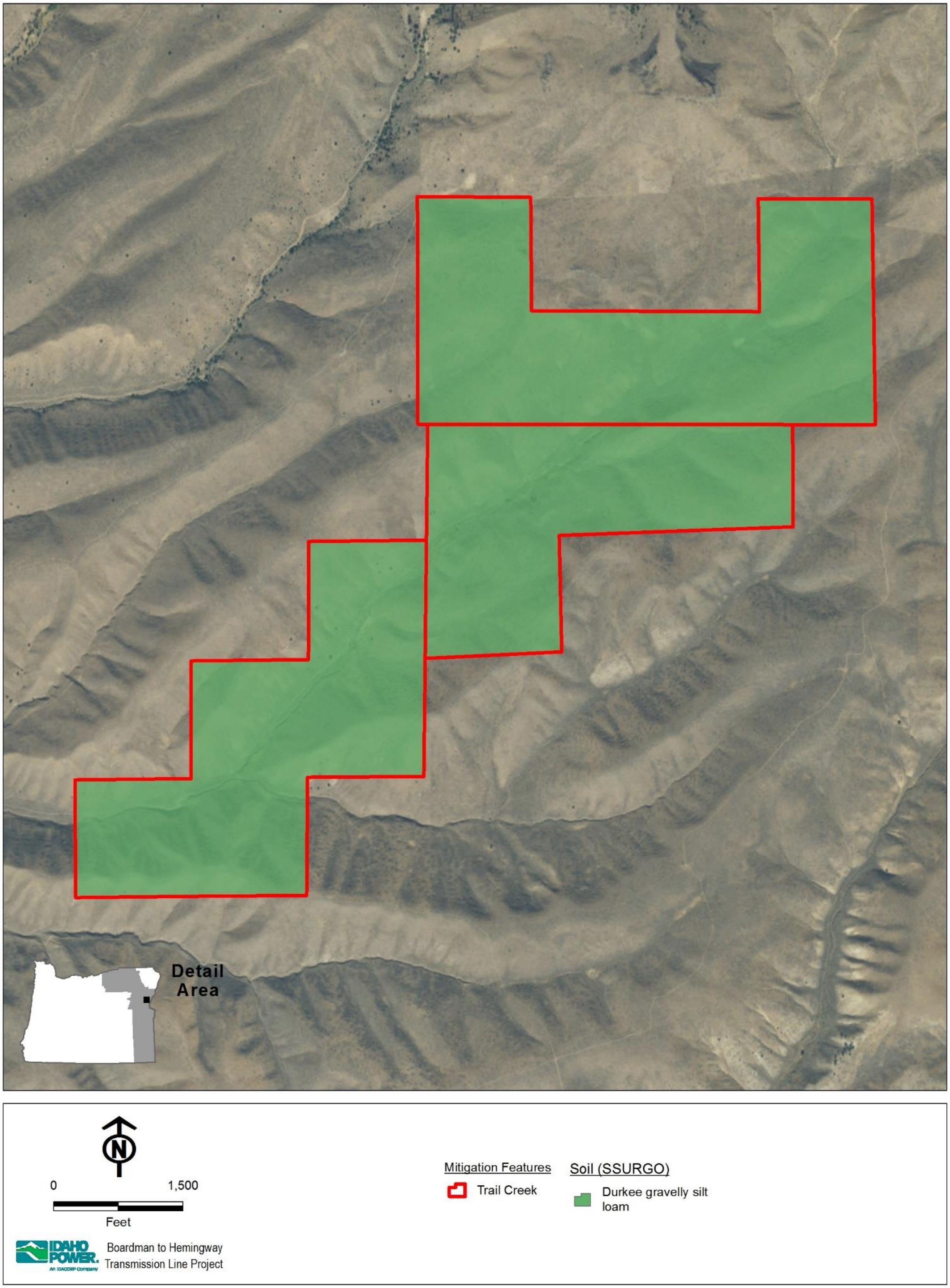

Figure 3. Trail Creek Soil Types

Boardman to Hemingway Transmission Line Project

Desktop Habitat Mitigation Site Assessment Worksheet

Parcel Name: Upper Timber (**Figure 1**)
Landowner:
Parcel Size in Acres: 1,577

Date of Assessment: 10/13/2014
Parcel Elevation (ft): 3,000 – 4,800
Within Mitigation Service Area?: Yes

Location Description
(County, miles and direction from known location, TRS, UTM, other):

Baker County, 5 miles west of Richland.
T9S R44E Sections 22, 23, 26, 27, 28, 29

Vegetation Cover Classes (GAP[1], **Figure 2**)

HMP Habitat Category[2] and Type	HMP General Vegetation Type	Acres	% of Total	Wildlife Habitat[3]
Category 1		**0**	**0**	
Category 2				-
Shrub-Steppe with Big Sage	Shrub/Grass	538.1	34.2	MDWR
Shrub-Steppe with Big Sage	Shrub/Grass	407.6	25.8	MDWR, RMESR
Shrub-Steppe with Big Sage	Shrub/Grass	104.1	6.6	RMEWR, RMESR, MDWR
Shrub-Steppe without Big Sage	Shrub/Grass	79.3	5.1	MDWR
Shrub-Steppe without Big Sage	Shrub/Grass	189.7	12.0	MDWR, RMESR
Shrub-Steppe without Big Sage	Shrub/Grass	32.1	2.0	RMEWR, RMESR, MDWR
Native Grasslands	Shrub/Grass	19.5	1.2	MDWR
Native Grasslands	Shrub/Grass	80.0	5.1	MDWR, RMESR
Native Grasslands	Shrub/Grass	11.2	0.7	RMEWR, RMESR, MDWR
Introduced Upland Vegetation	Shrub/Grass	36.2	2.3	MDWR
Introduced Upland Vegetation	Shrub/Grass	52.2	3.3	MDWR, RMESR
Introduced Upland Vegetation	Shrub/Grass	6.4	0.4	RMEWR, RMESR, MDWR
Forested Wetland	Wetland	7.4	0.5	MDWR
Forested Wetland	Wetland	1.5	0.1	MDWR, RMESR
Agriculture[4]	Ag/Developed	3.3	0.3	MDWR
Agriculture[4]	Ag/Developed	3.8	0.2	MDWR, RMESR
Mixed Grand Fir/Douglas Fir	Forest/Woodland	1.8	0.1	MDWR
Ponderosa Pine	Forest/Woodland	1.6	0.1	MDWR
Rocky Mountain Aspen	Forest/Woodland	1.1	0.1	MDWR
Category 3		**0**	**0**	-
Category 4		**0**	**0**	-
Category 5		**0**	**0**	-
Category 6		**0**	**0**	-
Total[5]		**1,576.9**	**100**	**-**

[1] USGS Gap Analysis Project (GAP) GIS data using ecological systems. Ecological systems were cross-walked to HMP Habitat Type as shown in the Habitat Categorization Matrix (Attachment P1-1 of Exhibit P1).
[2] Represents the habitat category based on overlap with wildlife habitat layers. Agriculture and Developed habitat types' categories are not modified by overlap with wildlife habitat.
[3] RMEWR = Category 2 habitat for ODFW Rocky Mountain elk winter range. MDWR = Category 2 habitat for ODFW mule deer winter range.
[4] A brief review of aerial imagery indicated that ReGAP is misclassifying areas as Agriculture. In this instance, the Agriculture appears likely to be wetlands. Therefore, Agriculture is remaining as a Category 2 habitat in this case. Reviewing of ReGAP data via aerial photo interpretation is not performed for the vast majority of habitat classifications on potential mitigation properties. On the ground knowledge of this property prompted a review of the Agriculture habitat classification.
[5] Total acres of habitat type may not match actual parcel size due to the resolution of the GAP raster dataset. Pixels of the raster dataset were not simplified or smoothed to match the exact shape of the parcel boundary.

Soil types	The NRCS Soil Survey Geographic Database (SSURGO) data was reviewed and the following soils were identified on the property (**Figure 3**): *Ateron very stony loam* (**123 acres**). Ateron soils consist of shallow, well drained soils found on ridge tops and side slopes of hills and mountains at elevations from 3,600 to 5,800 feet. Ateron soils are used for livestock grazing. The native vegetation is mountain big sagebrush, Idaho fescue, bluebunch wheatgrass, and Sandberg bluegrass. *Bakeoven-Ruckles complex* (**101 acres**). Bakeoven soils consist of very shallow, well drained soils found on mountains, ridgetops, hillslopes, mesas, and benches at elevations of 300 to 4,800 feet. Bakeoven soils are used for livestock grazing and wildlife habitat. Native vegetation is Sandberg bluegrass and stiff sagebrush. Ruckles soils consist of shallow, well drained soils found on hill and canyon side slopes at elevations ranging from 1,200 to 3,800 feet in Oregon. Ruckles soils are used for livestock grazing. Native vegetation dominantly is bluebunch wheatgrass, Idaho fescue on north slopes, Sandberg bluegrass and Wyoming big sagebrush. *Bouldrock complex* (**129 acres**) and *Bouldrock loam* (**118 acres**). Bouldrock soils consist of moderately deep, well drained soils found on south-facing side slopes of mountainous areas at elevations ranging from 4,000 to 6,200 feet. Bouldrock soils are used for rangeland. The native vegetation is bluebunch wheatgrass, mountain big sagebrush, arrowleaf balsamroot and gray rabbitbrush. *Greenscombe loam* (**280 acres**). Greenscombe soils consist of moderately deep, well drained soils on low hills at elevations 3,200 to 3,800 feet. Greenscombe soils are Rangeland. The native vegetation is Idaho fescue, bluebunch wheatgrass, Sandberg bluegrass, Thurber needlegrass, and big sagebrush. *Hyall-Simas association* (**91 acres**). Hyall soils consist of moderately deep to consolidated old alluvium (densic material), well drained soils on side slopes of dissected terraces at elevations of 2,700 to 3,500 feet. Hyall soils are used for range, watershed and wildlife habitat. Native vegetation is bluebunch wheatgrass, Idaho fescue and arrowleaf balsamroot. Simas soils consist of very deep, well drained soils found on hills at elevations of 1,200 to 4,000 feet. Simas soils are used for livestock grazing. Native plants are bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass, and Wyoming and basin big sagebrush. *Kilmerque loam* (**25 acres**). Kilmerque soils consist of moderately deep, well drained soils on gently rolling bench tops to moderately steep south aspect side slopes in forested mountains at elevations ranging from 3,500 to 6,000 feet. Kilmerque soils are used for woodland. The native vegetation is ponderosa pine, Douglas fir and pinegrass. *Ruckles-Ruclick-Snellby complex* (**50 acres**). Ruckles soils consist of shallow, well drained soils found on hill and canyon side slopes at elevations ranging from 1,200 to 3,800 feet in Oregon. Ruckles soils are used for livestock grazing. Native vegetation dominantly is bluebunch wheatgrass, Idaho fescue on north slopes, Sandberg bluegrass and Wyoming big sagebrush. Ruclick soils consist of moderately deep, well drained soils found on summits, dipslopes, and sideslopes of foothills and tablelands at elevations of 4,000 to 6,500 feet in Idaho, and as low as 1,200 feet in Oregon. Ruclick soils are used mainly for rangeland and wildlife habitat. The dominant natural vegetation is Wyoming big sagebrush, bluebunch wheatgrass, and Sandberg bluegrass. Snellby soils consist of moderately deep, well drained soils on hills at elevations of 3,400 to 3,800 feet. Snellby soils are used for rangeland. The native vegetation is Idaho fescue, bluebunch wheatgrass, and big sagebrush.

Soil types (cont.)	*Ruckles-Ruclick complex* (**336 acres**). Ruckles soils consist of shallow, well drained soils found on hill and canyon side slopes at elevations ranging from 1,200 to 3,800 feet in Oregon. Ruckles soils are used for livestock grazing. Native vegetation dominantly is bluebunch wheatgrass, Idaho fescue on north slopes, Sandberg bluegrass and Wyoming big sagebrush. Ruclick soils consist of moderately deep, well drained soils found on summits, dipslopes, and sideslopes of foothills and tablelands at elevations of 4,000 to 6,500 feet in Idaho, and as low as 1,200 feet in Oregon. Ruclick soils are used mainly for rangeland and wildlife habitat. The dominant natural vegetation is Wyoming big sagebrush, bluebunch wheatgrass, and Sandberg bluegrass. *Ruclick very cobbly silt loam* (**135 acres**). Ruclick soils consist of moderately deep, well drained soils found on summits, dipslopes, and sideslopes of foothills and tablelands at elevations of 4,000 to 6,500 feet in Idaho, and as low as 1,200 feet in Oregon. Ruclick soils are used mainly for rangeland and wildlife habitat. The dominant natural vegetation is Wyoming big sagebrush, bluebunch wheatgrass, and Sandberg bluegrass. *Snell-Ateron complex* (**32 acres**). Snell series consists of moderately deep, well drained soils found on hills, plateaus, mountains and on canyon walls at elevations of 2,000 to 6,800 feet. Snell soils are used for livestock grazing and wildlife habitat. Potential native vegetation is bluebunch wheatgrass, Idaho fescue, and Sandberg bluegrass. Ateron soils consist of shallow, well drained soils found on ridge tops and side slopes of hills and mountains at elevations from 3,600 to 5,800 feet. Ateron soils are used for livestock grazing. The native vegetation is mountain big sagebrush, Idaho fescue, bluebunch wheatgrass, and Sandberg bluegrass. *Snellby stony silt loam* (**79 acres**). Snellby soils consist of moderately deep, well drained soils on hills at elevations of 3,400 to 3,800 feet. Snellby soils are used for rangeland. The native vegetation is Idaho fescue, bluebunch wheatgrass, and big sagebrush. *Taterpa loam* (**77 acres**). Taterpa soils consist of deep, well drained soils on north-facing side slopes of mountains at elevations ranging from 4,000 to 6,200 feet. Taterpa soils are used for rangeland. The native vegetation is Idaho fescue, bluebunch wheatgrass, mountain big sagebrush and green rabbitbrush.

Hydrologic Features Present (SteamNet, NWI, NHD)	The property contains four perennial streams. NWI identifies several (14) emergent wetlands, a couple of impounded ponds, and three cold springs.

Adjacent land ownership, use, and condition	A majority of the immediately adjacent lands are private ownership; however, a few small BLM parcels border the property and larger tracts of BLM land are within 1 mile of the property. Livestock rangeland is the primary land use in the area, with irrigated agriculture in the valley surrounding Richland, approximately 2 miles to the east of the property.

Infrastructure Density within or Near the Parcel (Qualitative Description)	State Route 86 is 1 mile north of the property. The property itself contains some fencing and two track trails; otherwise, the property is open range.

Summary	The property contains some high quality shrub-steppe and native grassland habitat, but is interspersed with invasive vegetation such as medusahead wildrye. The property contains numerous water sources and riparian habitat. The property is completely within a sage-grouse Core Area and mule deer winter range and also contains some elk winter range. The highest density of wintering mule deer in Baker County occurs just north of the property. Pronghorn are common in the area. The property is adjacent to multiple sage-grouse leks and is situated between known lek sites and Sheep Mountain where radio-collared birds have been located, indicating the property is likely used during seasonal migrations and/or for nesting and brood rearing. The Pevine Flat area to the east is important for both sage-grouse and wintering big game.
Pass/Fail Desktop Assessment?	Pass

Boardman to Hemingway Transmission Line Project

Consideration of Property as a Potential Mitigation Site

Mitigation Function	This mitigation site has been identified as in-kind and in-proximity mitigation for impacts on Category 2 mule deer winter range and Rocky Mountain elk winter range within the shrub/grass general vegetation type. This mitigation site could also help meet the Project need for sage-grouse habitat mitigation. It also provides opportunity for shrub/grass mitigation of Category 3, 4, & 5 habitats. It contains important habitat features that could be preserved and has some uplift opportunities that could be achieved through implementation of standard mitigation actions. The mitigation actions listed below, upon successful implementation, will increase the quality of habitat available to sage-grouse, elk, and deer (among other species) within the mitigation site and result in an ecological uplift to the mitigation site above what is provided under the current management.

Mitigation Site Manager	Fee title acquisition with transfer of ownership to State of Oregon, Federal Land Management Agency, approved NPO or Land Trust.

Mitigation Actions	The following are mitigation actions that may be implemented at this mitigation site in order to satisfy the mitigation policies/guidelines of the permitting agencies. All mitigation actions will follow reliable methods. The mitigation actions presented here are not comprehensive. Implementation will likely be some combination of one or more of the following: • *Modification of Livestock Grazing* –. Future management would focus primarily on grazing practices that would not compete with native wildlife life history needs. Targeted grazing may be considered for habitat enhancement/treatment actions. • *Fence Removal/Marking* – opportunities are unknown at this time, but it is anticipated that some unnecessary fencing may be removed or necessary fencing can be upgraded to more wildlife friendly fencing. • *Weed treatment* – the extent of noxious weed invasion on the mitigation site is unknown at this time but it is anticipated that opportunities exist to implement this mitigation action. Some areas of introduced upland vegetation (specifically medusahead wildrye) were noted on the property. • *Native revegetation/restoration* – focus of efforts would be to promote establishment of sagebrush and bunchgrasses; opportunities exist but have not been specifically identified at this time. • *Fire readiness* – efforts made to make the property more resistant to catastrophic fire and a fire response plan could be developed. • *Wetland/Spring/Riparian Improvement* – opportunity exists along Canyon Creek, Upper Timber Gulch, and other areas to perform riparian/watershed improvements.

Monitoring	A specific plan for monitoring will be developed, but in general, mitigation progress will be monitored through vegetation plot monitoring and establishment of photo locations. Monitoring will occur annually for the first 3-5 years and an annual report will be produced. During the annual monitoring phase, a longer-term monitoring plan will be developed using similar protocols and methods to monitor the mitigation actions at larger time intervals (i.e., 5 years, 10 years).

Success Criteria

Specific success criteria will be developed once baseline conditions have been determined and potential mitigation actions have been confirmed for the site. Success criteria may include but are not limited to:

- Vegetation plots show an increase in native vegetation cover and general trend toward increased habitat quality representing an ecological uplift.
- Successful weed control through documentation of a reduction in weeds and non-native invasive plant species.
- Mitigation success will not be dependent on documentation of increased use of the mitigation site by sage-grouse or any other wildlife species.

Financial Outline

Estimated Budget for the Upper Timber Mitigation Site

Action	Cost per Unit	Units	Years	Expense
One-time Costs				
Acquisition	?	1		?
50-year Operation and Management Costs				
O&M[1]	$30.00	1,577	50	$2,365,500
Total	**-**			**$?** ($?)[2]

[1] This O&M cost is an estimate of the cost per acre per year (not including acquisition/easement costs) based on the research presented in the Independent Economic Analysis Board's 2007 *Investigation of Wildlife O&M Costs*. The average cost per acre presented in that document was $24 in 2004 dollars, this has been adjusted to reflect 2015 dollars. In addition, one of the projects presented in the document was the 10,000 acre Sagebrush Flat Wildlife Mitigation area in Washington state which is within a similar habitat type and has a FY2015 budget of approximately $300,000 (or $30/acre).

[2] Cost per acre here includes cost of acquisition/easement and initial mitigation actions and long-term O&M for 50 years.

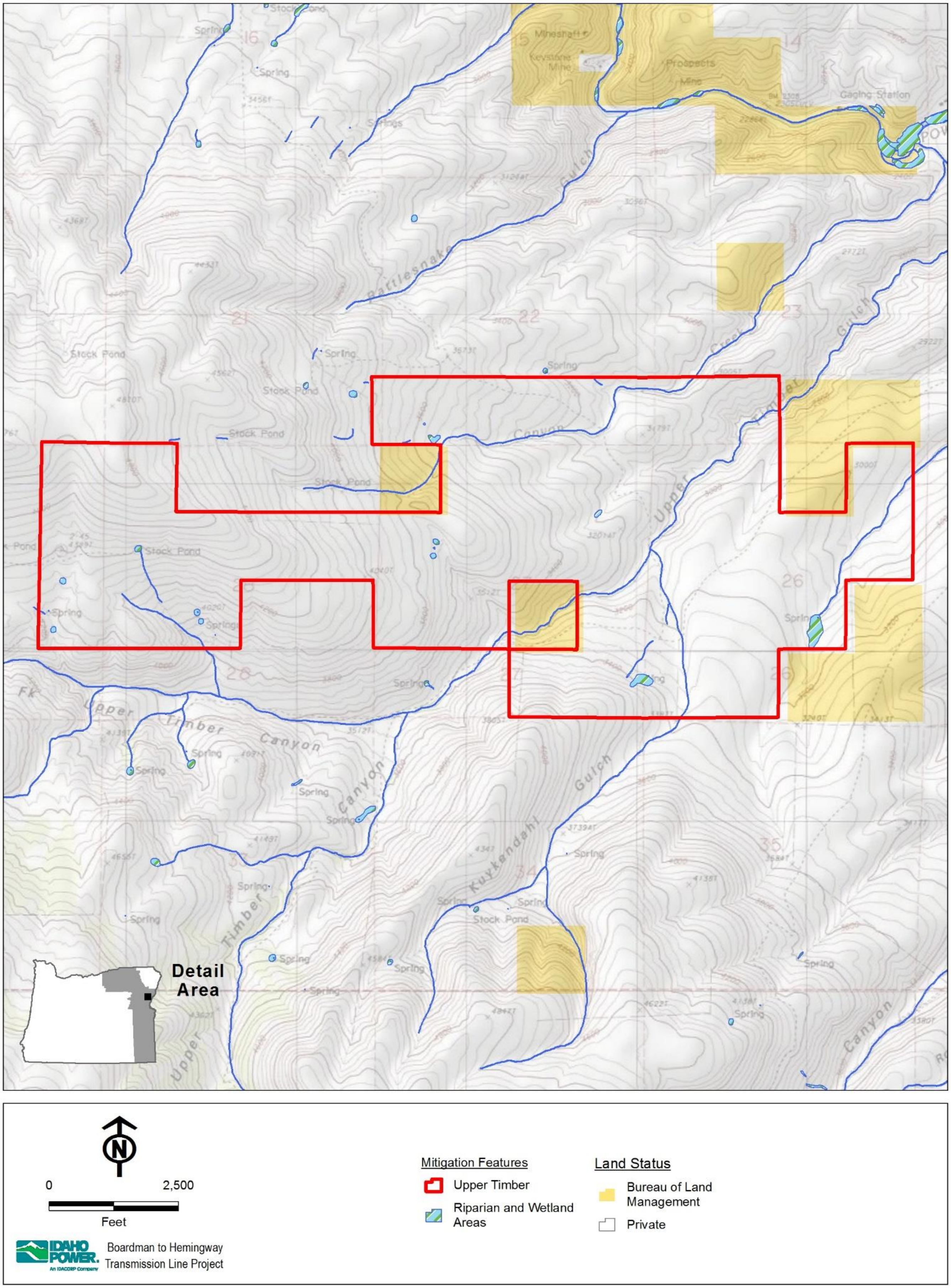

Figure 1. Upper Timber Ownership and Water

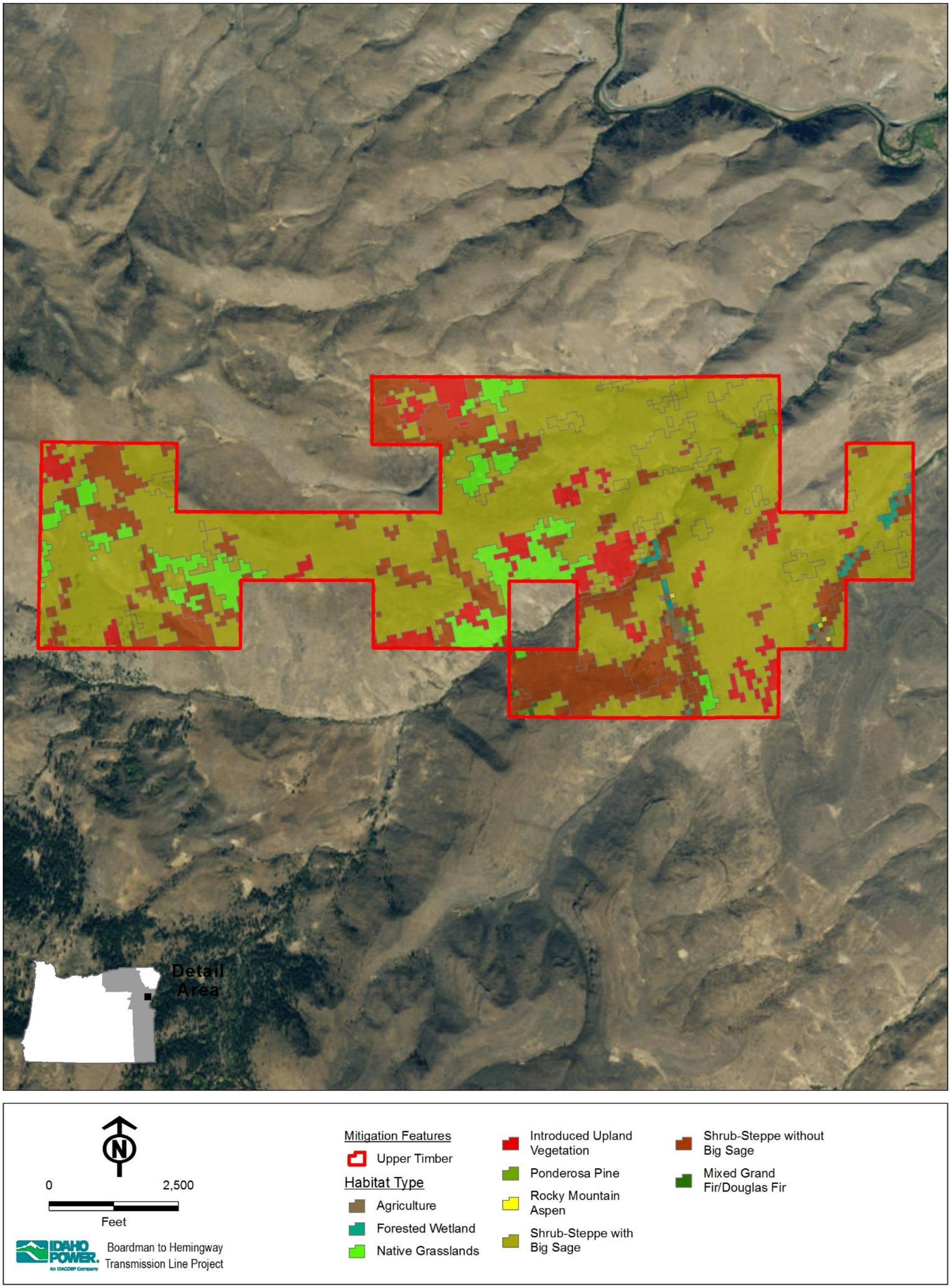

Figure 2. Upper Timber Habitat Types

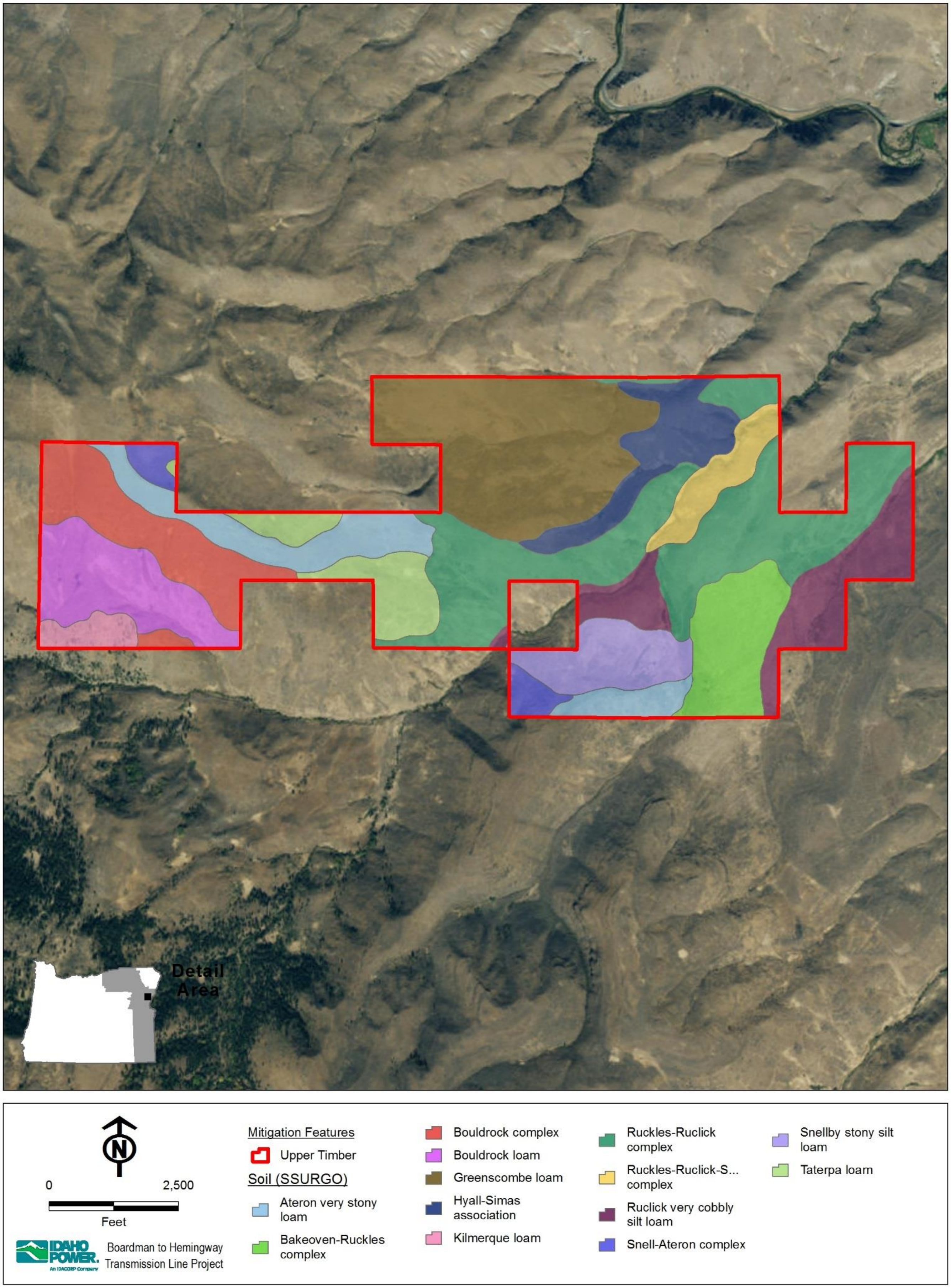

Figure 3. Upper Timber Soil Types

APPENDIX B
WOLF CREEK MITIGATION SITE EXPANDED ASSESSMENT

Boardman to Hemingway Transmission Line Project

Wolf Creek Mitigation Site

Mitigation Site Name:	Wolf Creek (**Figure 1**)	**Parcel Elevation (ft):**	3,750 – 4,650
Mitigation Credit:	1,775.8 acres	**Within Mitigation Service Area:**	Yes

Summary

Background

Idaho Power's Boardman to Hemingway Transmission Line Project will impact fish and wildlife habitat in Oregon. Idaho Power assigned a habitat category to each area impacted by the Project (Habitat Category 1 through 6) and identified the vegetation types within each habitat category area. Idaho Power also quantified the acres of the following species-specific habitats affected by the Project: Washington ground squirrel habitat, raptor nests, elk winter and summer range, mule deer winter and summer range, and sage-grouse habitat.

Idaho Power is required to secure compensatory mitigation sites to offset impacts to Habitat Category 1 through 5, and to offset impacts to the relevant species-specific habitats. Compensatory mitigation credits may be "stacked." That is, to the extent habitat within a mitigation site comprises Habitat Category 1 through 5 and provides relevant species-specific habitat, the relevant portion of the habitat site will be credited against both the habitat-category and species-specific mitigation requirements. For example, a mitigation site with 20 acres of Habitat Category 2 forest/woodland habitat, all of which occurs within elk winter range and half of which occurs within mule deer winter range, may be used to offset impacts to 20 acres of Habitat Category 2 forest/woodland habitat, 20 acres of elk winter range, and 10 acres of mule deer winter range.

Mitigation Site Description

The Wolf Creek Mitigation Site comprises approximately 1,781 acres and is located adjacent to Wolf Creek Reservoir and Forest Service-administered lands. The site is mostly timberland, providing winter and summer range for elk and mule deer. Wolf Creek runs through the site and is considered bull trout designated critical habitat. The site is very close to Oregon Department of Wildlife's (ODFW) Elkhorn–North Powder Wildlife Management Area. The site is partially within the Baker Valley Conservation Opportunity Area identified in the Oregon Conservation Strategy.

Mitigation Actions

Idaho Power would secure control over this mitigation site by obtaining a conservation easement or through acquisition for the life of the Project. Idaho Power would conduct the following mitigation actions on the site, which would benefit the entirety of the mitigation site and the fish and wildlife that use the mitigation site:

- Install or repair wildlife-friendly fence along the entirety of mitigation site boundary.
- Redistribute, burn, or otherwise dispose of approximately 200 slash piles, and revegetate and provide weed control at the slash pile sites.
- Decommission up to 12 miles of unnecessary roads, and close or limit access to other roads as directed by ODFW.

	Mitigation Site Credits This mitigation site has been identified by Idaho Power as a potential site for in-kind compensatory mitigation to offset the following Habitat Category and species-specific habitat impacts related to the Project:

Habitat Category and Vegetation Types	Mitigation Credit Acres
Category 2	**1,775.8**
Forest/Woodland	1,361.3
Shrub/Grass	344.3
Open Water/Wetlands	70.2

Species-Specific Habitat	Mitigation Credit Acres
Elk Winter Range	1,775.8
Mule Deer Winter Range	1,266.0
Elk Summer Range	1,775.8
Mule Deer Summer Range	1,775.8

Location Description (County, miles and direction from known location, TRS)	Union County, 5 miles northwest of North Powder. T5S R38E Sections 27, 33, 34; T6S R38E Sections 3, 4, 10, 11.
Hydrologic Features Present (StreamNet, NWI, NHD)	Property contains two intermittent streams and two perennial streams (Clear Creek and Wolf Creek) per the NHD. Wetland features outside of those associated with the riparian corridors of the NHD streams includes an emergent wetland and an impoundment. The property borders the west side of Wolf Creek Reservoir.

Adjacent Ownership and Land Use	Majority of adjacent land ownership is private; however, the property does border a large tract of USFS lands and is within 0.5 mile of ODFW's Elkhorn WMA. Adjacent land use is open range, timbered range, timber harvest, and agricultural development.

Infrastructure Density within or Near the Parcel	Parcel has some residential buildings/shops in the southeast corner and some dirt/gravel roads; otherwise, the property is open timber/recently harvested timber. Wolf Creek Reservoir is adjacent to the property; the valley floor 1 mile to the east contains developed agricultural areas and associated infrastructure. I84 is over 4 miles away.

Table 1. Mitigation Credits by ODFW Habitat Category and General Vegetation Type[1]

Habitat Category and General Vegetation Type	Mitigation Credits
Category 2	**1,775.8**
Forest/Woodland	1,361.3
Shrub/Grass	344.3
Open Water/Wetlands	70.2

[1] USGS Gap Analysis Project (GAP) GIS data using ecological systems. Ecological systems were cross-walked to HMP General Vegetation Type (**Figure 2**) as shown in the Habitat Categorization Matrix (Attachment P1-1 of Exhibit P1).

Table 2. Mitigation Credits by Wildlife Habitat Layers[1]

Species-Specific Habitat	Mitigation Credits
Category 2 Elk Winter Range[2]	1,775.8
Category 3 Elk Summer Range[3]	1,266.0
Category 2 Mule Deer Winter Range[2]	1,775.8
Category 3 Mule Deer Summer Range[4]	1,775.8

[1] Wildlife habitat layers are not spatially discreet; there is abundant spatial overlap between the layers. In this mitigation site, the entire property is within elk winter range, mule deer summer range, and mule deer winter range. Elk summer range covers over half of the property.
[2] ODFW. 2013. ODFW Winter Range for Eastern Oregon. GIS data files (2). Available online at: https://nrimp.dfw.state.or.us/DataClearinghouse/default.aspx?p=202&XMLname=885.xml
[3] Rocky Mountain Elk Foundation. 1999. M.A.P. Elk Habitat Project. GIS data.
[4] WAFWA (Western Association of Fish and Wildlife Agencies). 2002. Mule Deer Habitat of the Western United States. GIS Dataset. Remote Sensing/Geographic Information Systems Laboratory, Utah State University. Logan, UT.

Soil types

The NRCS Soil Survey Geographic Database (SSURGO) data were reviewed and the following soils were identified on the property (**Figure 3**):

Anatone-Klicker complex (**168 acres**). Anatone soils consist of shallow, well drained soils found on mountain side slopes, ridgetops, hills, and and plateaus at elevations of 2,000 to 6,200 feet. Anatone soils are mostly used for livestock grazing, wildlife habitat, and recreation. Native vegetation is mainly bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass, mossy stonecrop, curlleaf mountain mahogany and stiff sagebrush. Klicker soils consist of moderately deep, well drained soils on mountains, plateaus, and benches at elevations from 2,500 to 6,200 feet. Klicker soils are used mainly for timber production and wildlife habitat. Native vegetation is an open stand of ponderosa pine and Douglas-fir with an understory of bluebunch wheatgrass, slender wheatgrass, brome grass, elk sedge, Oregon-grape, common snowberry, Saskatoon serviceberry, creambush oceanspray, mallow ninebark, and wild rose.

Soil types (cont.)	*Encina silt loam* (**57 acres**). Encina silt loam soils consist of deep, well drained soils found on dissected slopes of terrace fronts, usually with southern aspects, at elevations from 2,000 to 4,000 feet. Used for rangeland, small grains, hay pasture, wildlife habitat, and water supply. Native vegetation dominantly is bluebunch wheatgrasss, Sandberg bluegrass, Idaho fescue, rabbitbrush, big sagebrush, and squaw apple. *Gwinly-Rockly complex* (**20 acres**). The Gwinly soils consist of shallow, well drained soils found on hills, plateaus, structural benches, mountains, and canyons at elevations from 1,400 to 4,600 feet. Used for livestock grazing and wildlife habitat. Potential native vegetation is dominantly bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass and low sagebrush. The Rockly soils consist of shallow and very shallow, well drained soils on mesas, ridges, plateaus, structural benches, canyon walls, and nearly level to very steep south and west slopes on uplands at elevations of 300 to 5,000 feet. These soils are used for livestock grazing, wildlife habitat, and water supply purposes. Native vegetation is mostly stiff sagebrush, lomatium, bluebunch wheatgrass, and Sandberg bluegrass. *Gwinly very cobbly silt loam* (**67 acres**). The Gwinly soils consist of shallow, well drained soils found on hills, plateaus, structural benches, mountains, and canyons at elevations from 1,400 to 4,600 feet. Used for livestock grazing and wildlife habitat. Potential native vegetation is dominantly bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass, and low sagebrush. *Klicker-Anatone complex* (**157 acres**). Klicker soils consist of moderately deep, well drained soils on mountains, plateaus, and benches at elevations from 2,500 to 6,200 feet. Klicker soils are used mainly for timber production and wildlife habitat. Native vegetation is an open stand of ponderosa pine and Douglas-fir with an understory of bluebunch wheatgrass, slender wheatgrass, brome grass, elk sedge, Oregon-grape, common snowberry, Saskatoon serviceberry, creambush oceanspray, mallow ninebark, and wild rose. Anatone soils consist of shallow, well drained soils found on mountain side slopes, ridgetops, hills, and and plateaus at elevations of 2,000 to 6,200 feet. Anatone soils are mostly used for livestock grazing, wildlife habitat, and recreation. Native vegetation is mainly bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass, mossy stonecrop, curlleaf mountain mahogany, and stiff sagebrush. *Klicker stony silt loam* (**765 acres**). Klicker soils consist of moderately deep, well drained soils on mountains, plateaus, and benches at elevations from 2,500 to 6,200 feet. Klicker soils are used mainly for timber production and wildlife habitat. Native vegetation is an open stand of ponderosa pine and Douglas-fir with an understory of bluebunch wheatgrass, slender wheatgrass, brome grass, elk sedge, Oregon-grape, common snowberry, Saskatoon serviceberry, creambush oceanspray, mallow ninebark and wild rose. *Lookingglass very stony silt loam* (**45 acres**). Lookingglass soils consist of very deep, moderately well drained soils found on uplands at elevations of 1,800 to 4,000 feet. Lookingglass soils are used mainly for timber production. Cleared areas are cropped to small grains, hay, pasture, and peas. The native vegetation is ponderosa pine and Douglas-fir with an understory of spirea, oceanspray, Idaho fescue, pinegrass, and elksedge.

Soil types (cont.)	*Olot stony silt loam* (**4 acres**). Olot soils consist of moderately deep, well drained soils found on plateaus, canyons, mountains and structural benches at elevations typically between 2,800 to 5,000 feet. Olot soils are used mainly for timber production. Also used for wildlife habitat. Vegetation is western larch, Douglas fir, willow, mountain alder, common snowberry, elk sedge, and pinegrass. *Starkey very stony silt loam* (**2 acres**). Starkey soils consist of shallow, well drained soils found on mountains and hills at elevations of 2,400 to 4,000 feet. Starkey soils used for rangeland. Native vegetation is mainly Idaho fescue, bluebunch wheatgrass and Sandberg bluegrass. *Tolo silt loam* (**289 acres**). Tolo soils consist of deep and very deep, well drained soils found on nearly level upland plateaus and steep north and east-facing mountain side slopes at elevations of 2,800 to 5,400 feet. Tolo soils used for timber production and livestock grazing with small areas at lower elevations cleared for cultivation. Principal trees include Douglas fir, grand fir, larch, ponderosa pine, and lodgepole pine. *Ukiah-Starkey complex* (**166 acres**). Ukiah soils consist of moderately deep, well drained soils found on hills with an elevation of 2,400 to 4,600 feet. Ukiah soils are mainly used for range. Some areas are cultivated for dryland hay and small grains. Native vegetation is mainly Idaho fescue, bluebunch wheatgrass and Sandberg bluegrass. Starkey soils consist of shallow, well drained soils found on mountains and hills at elevations of 2,400 to 4,000 feet. Starkey soils used for rangeland. Native vegetation is mainly Idaho fescue, bluebunch wheatgrass and Sandberg bluegrass. *Ukiah silty clay loam* (**8 acres**). Ukiah soils consist of moderately deep, well drained soils found on hills with an elevation of 2,400 to 4,600 feet. Ukiah soils are mainly used for range. Some areas are cultivated for dryland hay and small grains. Native vegetation is mainly Idaho fescue, bluebunch wheatgrass and Sandberg bluegrass. *Veazie-Voats complex* (**32 acres**). Veazie soils consist of very deep, well drained soils found on flood plains broken by old stream channels at elevations of 750 to 4,000 feet. Veazie soils are used mainly for irrigated hay and pasture. Other uses are livestock grazing and wildlife. Native vegetation is bluebunch wheatgrass, basin wildrye, sedges, rushes and willows. Voats soils consist of very deep, well drained soils found on flood plains broken by old stream channels and occur at elevations of 1,600 to 4,000 feet. Voats soils are used mainly for pasture. Other uses are livestock grazing and wildlife habitat. Potential native vegetation is bluebunch wheatgrass, basin wildrye, timothy, Kentucky bluegrass, sedges, rushes, and scattered willow, alder, hawthorne, and rose.

Mitigation Site Manager	Fee title acquisition with transfer of ownership to the State of Oregon to be managed as part of ODFW’s Elkhorn WMA.

Mitigation Actions	The following mitigation actions are proposed in order to earn 1, 75.8 acres of mitigation credit at this mitigation site. • *Fence Installation/Repair* – Boundary fencing will be installed and/or repaired/replaced on approximately 15 miles. This will include the use of wildlife friendly fence designs. • *Slash Pile Treatment* (**Figure 4**) – Extensive logging has taken place on the property resulting in nearly 200 slash piles that are visible on satellite imagery. Slash piles will be treated (re-distribution, burning, or other method) and revegetation and weed control will occur at the slash pile scars. • *Road Closure and/or Decommissioning* (**Figure 4**) – Several miles of logging roads, landing areas, and skid trails exist within the mitigation site. Mitigation actions will include any activity that results in the stabilization and restoration of unneeded roads to a more natural state. Actions may include scarifying and spreading slash at landing areas and skid trails, denying access (eliminate traffic), and ripping, waterbarring, and seeding of roads. IPC has preliminarily identified roads to maintain and roads to decommission. Roads that are proposed for decommissioning are symbolized by a black line in **Figure 4**, and roads that will be maintained on the property are symbolized by a white line. Existing easements for other parties are unknown at this time, but will not be affected. Access to maintained roads will be limited to ODFW use. Up to 12 miles of roads and trails will be closed or decommissioned.
Monitoring	A specific plan for monitoring will be developed, but in general, mitigation progress will be monitored through establishment of photo locations and vegetation monitoring. Monitoring will occur annually for the first 3-5 years and an annual report will be produced. Long-term monitoring will be developed with reporting that will occur at larger time intervals (i.e., 5 years, 10 years).
Success Criteria	Specific success criteria will be developed once mitigation actions have been confirmed for the site. Success criteria may include but are not limited to: • Completion of fence improvement and/or removal projects. • Completion of slash pile treatments. • Completion of road closure and/or decommissioning.

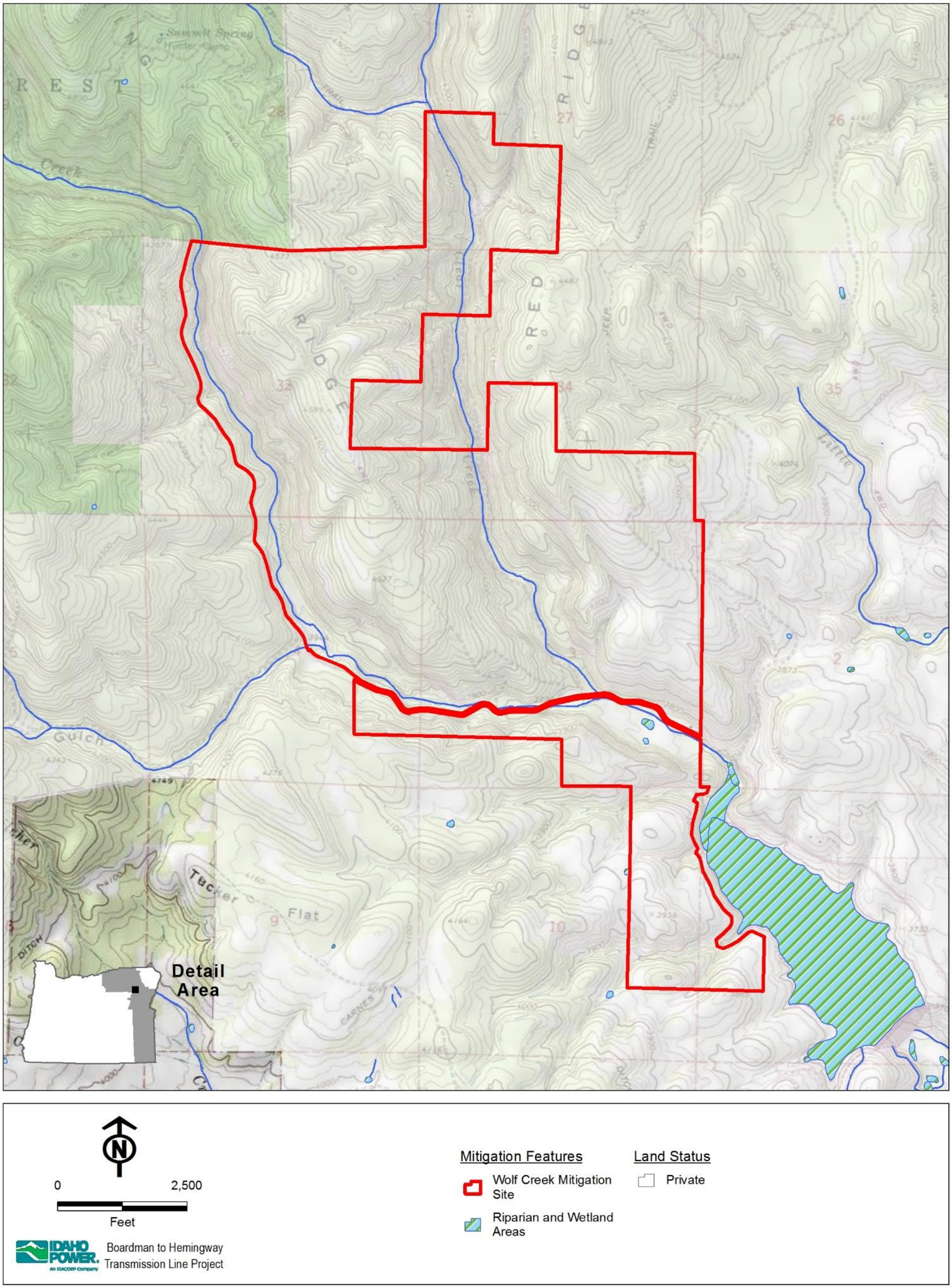

Figure 1. Wolf Creek Mitigation Site Ownership and Water

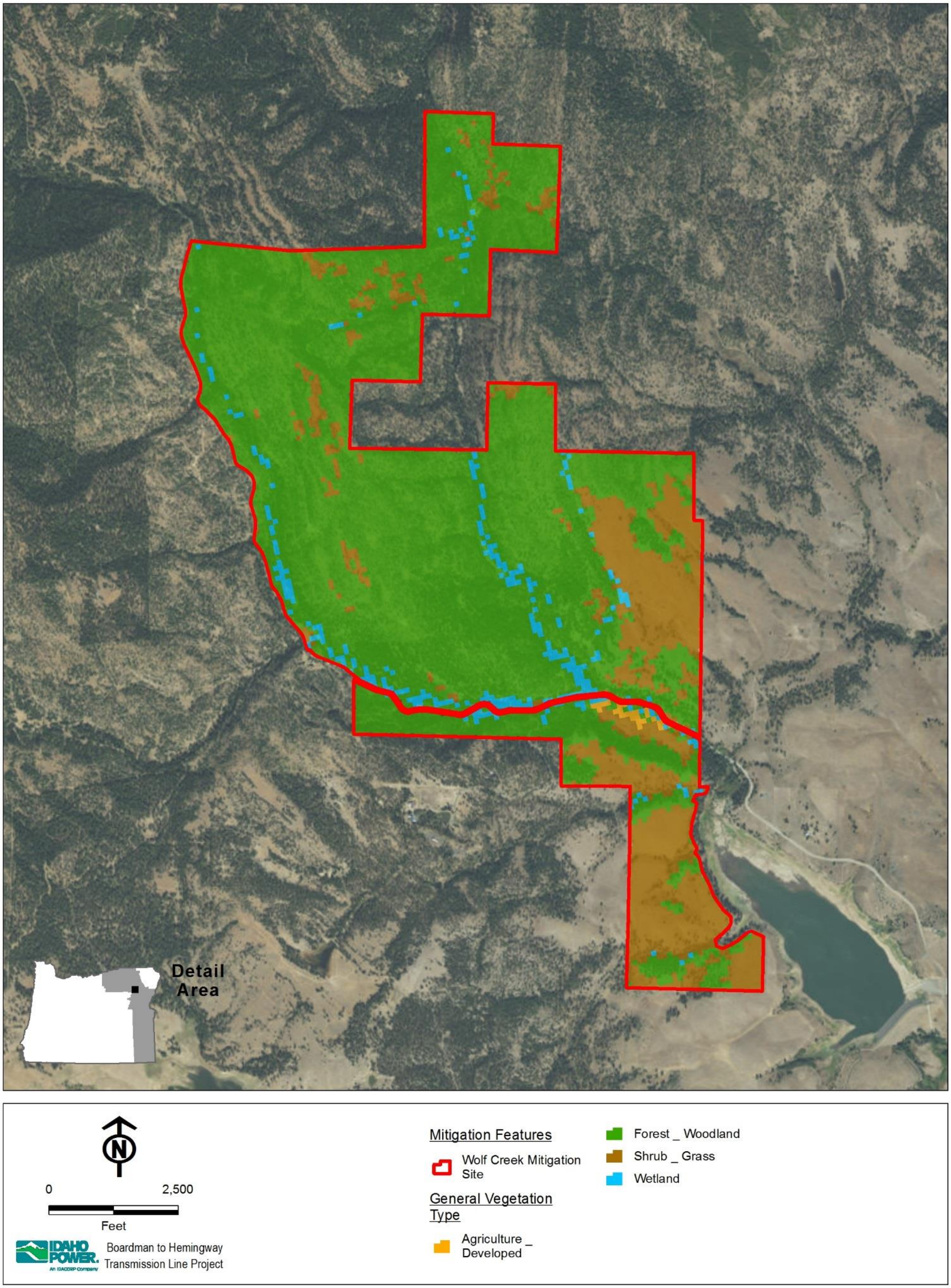

Figure 2. Wolf Creek Mitigation Site General Vegetation Types

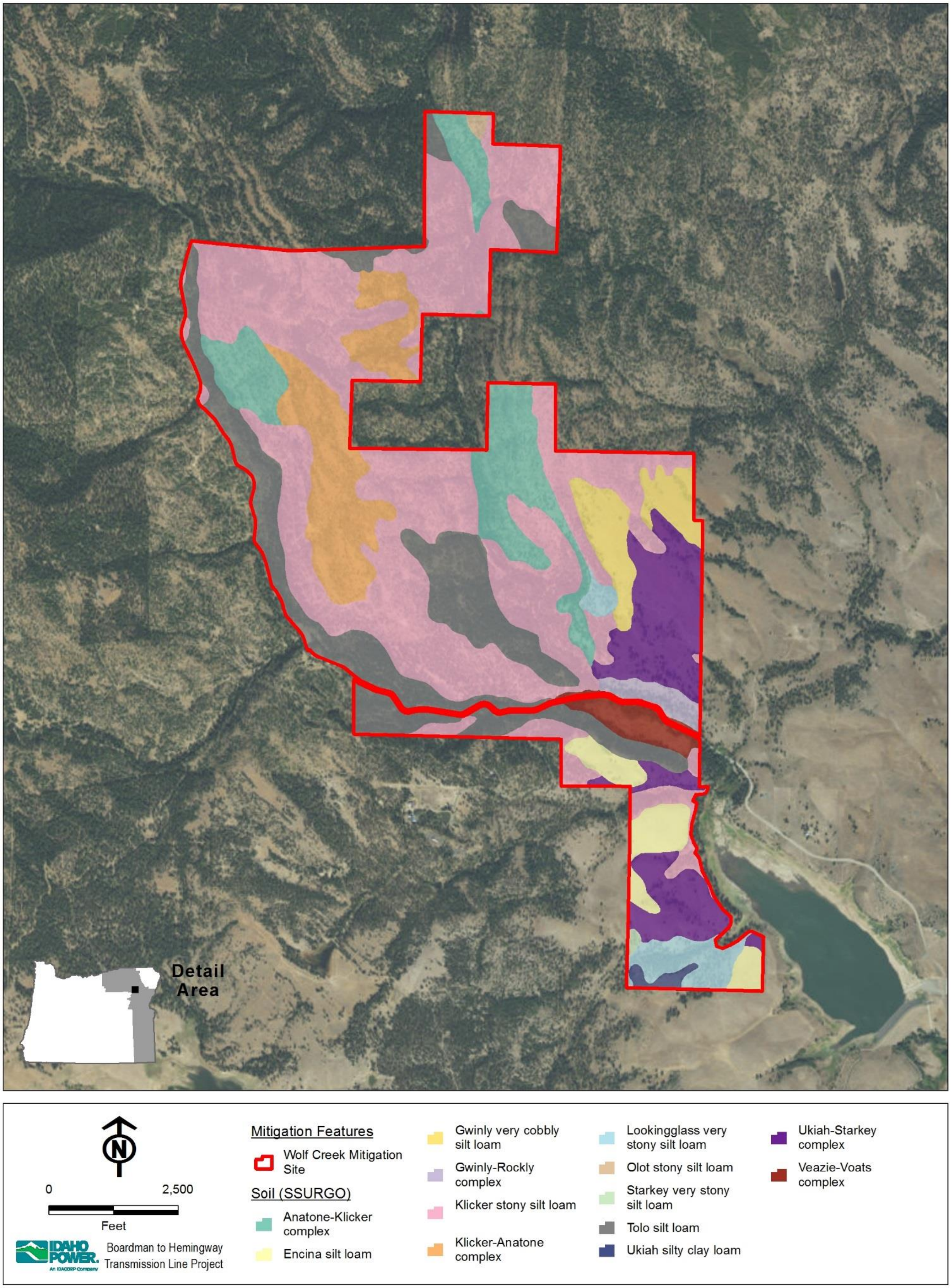

Figure 3. Wolf Creek Mitigation Site Soil Types

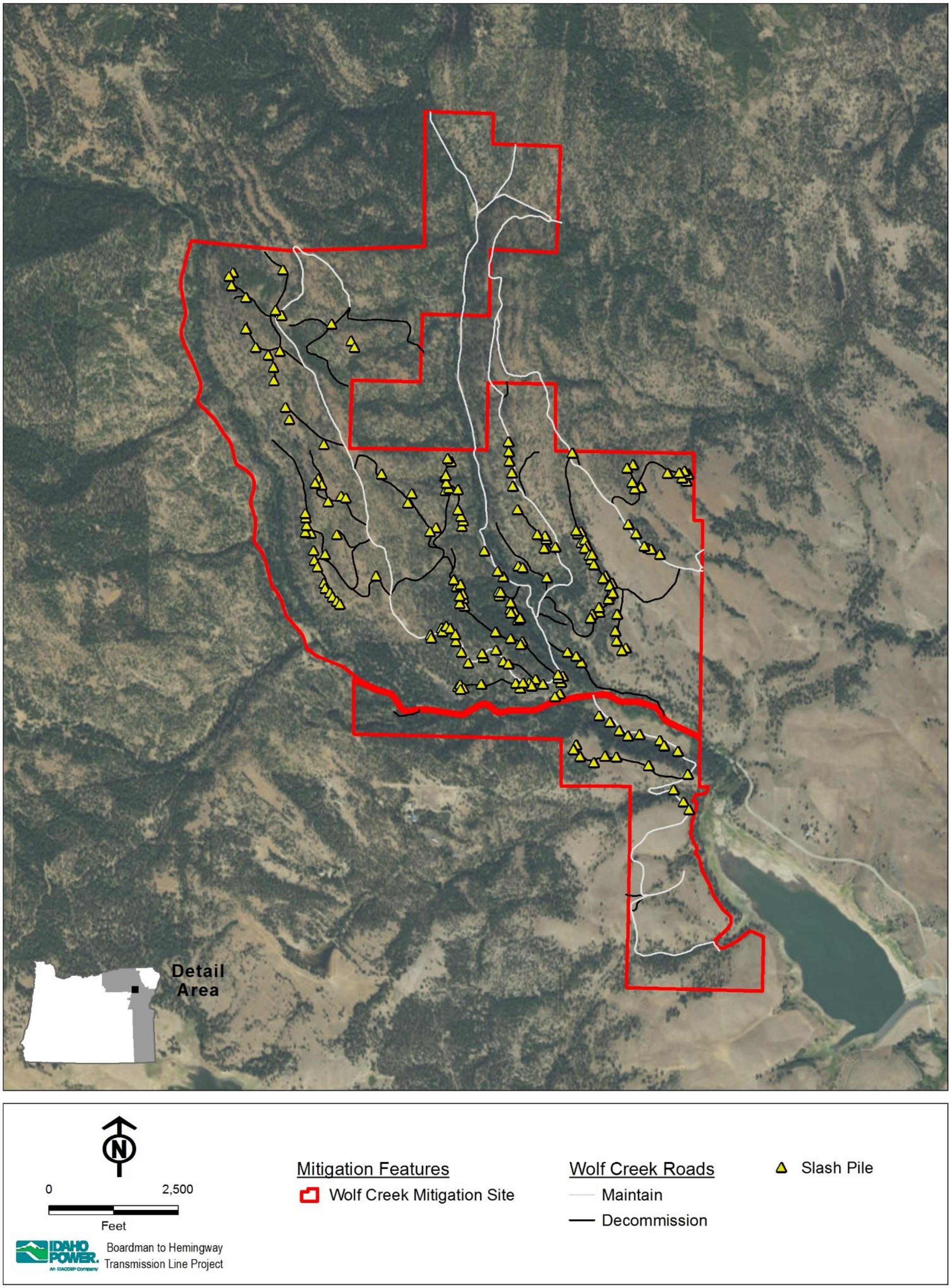

Figure 4. Wolf Creek Mitigation Site Slash Piles and Roads