



## WEST WIDE WILDFIRE RISK ASSESSMENT

# FINAL REPORT - ADDENDUM VII DELIVERY DATA STRUCTURE

March 31, 2013

Prepared for: Oregon Department of Forestry Western Forestry Leadership Coalition Council of Western State Foresters Funded by: USDA Forest Service Prepared By: The Sanborn Map Company









The Oregon Department of Forestry implemented conducting this assessment on behalf of the Council of Western State Foresters with funding from the USDA Forest Service. Anyone quoting from this material is asked to credit the Oregon Department of Forestry." to bottom of cover page





### WWA Data Delivery

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#### **Project Summary**

The Council of Western State Foresters/Western Forestry Leadership Coalition has teamed with Sanborn and conducted a wildfire risk assessment and report for 17 western states. At the highest level, this assessment is known as the "West Wide Wildfire Risk Assessment, or "WWA". The WWA generated the following:

Wildfire Risk Assessment: Working with Partner States, Sanborn produced a wildfire risk assessment to quantify the magnitude of the current wildland fire problem in the west to provide a baseline for quantifying mitigation activities and monitoring change over time.

The methodology implemented is replicable, quantifiable and provides results comparable across geographic areas. This assessment leverages LANDFIRE data and a methodology similar to the Southern Wildfire Risk Assessment and Colorado Fire Risk Assessment System to minimize cost and maximize consistency.

Since a significant part of the fire problem in the west is associated with federal land, and many of these fires affect state jurisdiction, the assessment includes all lands. The assessment has been developed to allow comprehensive comparisons between regional geographic areas, and to assist in quantifying risk and fire effects to aid in the mitigation of wildfire risks across the west.

Additional State Specific output data was also developed in order to customize the data for partner state use since the primary WWA outputs were calibrated for regional output using data for all states to determine map classes and thresholds. For state specific data, the data is processed using data specific to the individual state and class breaks based upon individual state data distribution, instead of regional data distributions. Methods are identical to the regional methods, except that calibration was done at a state level using FOA class breaks based on state. Once new FOA class breaks were recalculated, new average FOA rates and recalculated burnable acres per FOA class values were calculated for rerunning





the FTI process and from there, the five Values Impacted Scores, Values Impacted Rating, Fire Effects Index and Fire Risk Index are regenerated.

#### Data delivery structure for WWA Regionally Leveled Published Results

The regional outputs from the West Wide Wildfire Risk Assessment that define the current fire situation in the West are referred to as the Published Results. The WWA Regional Published Results are being delivered, by state, to each State Representative, e.g. the Montana Published Results will be delivered to Montana, Kansas Published Results will be delivered to Kansas, etc.

The main folders in this delivery: RegionallyLeveledWWAData, NFIRS\_ZipCode\_Data, and Symbology

**RegionallyLeveledWWAData** -- contains Published Results data in both the official WWA Albers Projection and a State Defined Projection with the data tiled by county (for Alaska, the WWA Albers Projection and the State Defined Projection are the same, therefore only one set of data will be delivered). In addition, some of the county data has been mosaicked by state and is included within the Statewide Data folders. It is important to note that the 'Regionally Leveled' data is the WWA risk assessment data with class breaks<sup>1</sup> developed based on all 17 states.

- AlbersProjection
  - CountyData\_AlbersWWA\_Projection
    - State
  - StatewideData\_AlbersWWA\_Projection
- StateProjection
  - CountyData\_StateProjection
    - State
  - StatewideData\_StateProjection

<u>CountyData</u>- includes 59 datasets (Albers projection) and 58 datasets (state projection) within a file geodatabase created in ESRI ArcInfo 9.3. The directory structure is as follows state\county\county.gdb\<dataset>\_county. The metadata associated with each dataset provides a detailed description of the dataset.

<sup>&</sup>lt;sup>1</sup> Class Breaks are a means of separating the floating point datasets into thematic classes. The WWA uses a cumulative percentile break method. The Regionally Leveled data bases this cumulative percent on values from all 17 states not values within each individual state.

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<u>StatewideData</u> - includes 4 datasets within a file geodatabase created in 9.3. The file structure is as follows *state\state*.gdb\<dataset>\_*state*. See the metadata associated with each dataset for a more detailed description of the dataset.



**NFIRS\_ZipCode\_Data** - contains the tabular NFIRS or Zip Code data, used in conjunction with the fire point data, to generate the Fire Occurrence Areas (FOA) dataset.

#### Data delivery structure for WWA State Specific Published Results

The state specific outputs from the West Wide Wildfire Risk Assessment that define the current fire situation in the individual states are referred to as the State Specific Published Results. The WWA State Specific Published Results are being delivered, by state, to each State Representative, e.g. the Montana Published Results will be delivered to Montana, Kansas Published Results will be delivered to Kansas, etc.

The main folders in this delivery: StateSpecificWWAData, NFIRS\_ZipCode\_Data, and Symbology

**StateSpecificWWAData** -- contains State Specific Published Results data in a State Defined Projection with the data tiled by county as well as statewide.

- StateProjection
  - CountyData\_StateProjection
    - State
  - StatewideData\_StateProjection

<u>CountyData</u>- includes 58 datasets within a file geodatabase created in ESRI Arc Info 9.3. The directory structure is as follows *state*\*county*\*county*.gdb\<dataset>\_*county*. The metadata associated with each dataset provides a detailed description of the dataset.







<u>StatewideData</u> - includes 59 datasets within a file geodatabase created in 9.3. The file structure is as follows *state*/*state*.gdb/<dataset>\_*state*. See the metadata associated with each dataset for a more





detailed description of the dataset. Also, included in this folder is an ArcMap 9.3 map document for each state with the State Specific symbology.



**NFIRS\_ZipCode\_Data** - contains the tabular NFIRS or Zip Code data, used in conjunction with the fire point data, to generate the Fire Occurrence Areas (FOA) dataset.





#### Symbology – Mapping Support

Contains information to assist with displaying the datasets in ArcGIS 9.3. Note that some of the symbology provided with the Regional data is different from the symbology for the State Specific data as the classbreaks are based on regional versus state aggregates. Under the State Specific Statewide data, there is an MXD for each state with the State Specific symbology as well.

**Symbology***statestate\_CountyName.mxd* is a sample map document created in ArcGIS 9.3 with datasets and layer files associated. This map document is a suggested format for initial display of the WWA Published Results data.

Symbology\state\CountyCode: contains county geodatabase for the sample mxd.

**Symbology***state***LayerFiles**: Contains layer files created in ArcGIS 9.3 for the WWA datasets. These layer files have been developed to assist the user with standardized legends for the WWA Published Results data.



#### **Data Layers and Descriptions**

**airports**: The dataset provides users with information about airport locations to be used with West Wide Wildfire Risk Assessment. U.S. Airports represents airport grounds and airport runways within the United States. All airports have a boundary, and most have at least one runway. This is a subset of the ESRI ArcGIS 10 dataset.

**allroads**: U.S. Streets provides nationwide streets display, routing, and geocoding for the United States. The data was subset for input into the West Wide WildFire Risk Assessment. All Roads is a subset of streets, highways, roads with and without limited access, secondary and connecting roads, local and rural roads, roads with special characteristics, access ramps, and ferries within the United States. This data set contains road network features such as arterial classification, speed, and direction of travel. It contains address ranges for all addressable features with addresses. The data is a subset of the ESRI U.S. Streets data, ArcGIS v10.

**asp**: Aspect. The purpose of the aspect grid is to provide a representation of the downslope direction of the maximum rate of change from one pixel to its neighbors. Aspect represents the azimuth of the sloped surfaces across a landscape. This dataset was derived from the Elevation Derivatives for National Applications (EDNA), a multi-layered database that provides systematic and consistent topographically-derived hydrologic derivatives. The aspect grid defines downslope direction. Derived aspect values were reclassified into 0, 90, 180, and 270, with -1 value classified as 180. These four classes are sufficient to support fire behavior modeling.





**congress**: U.S. 112th Congressional Districts provides the locations of congressional districts, primarily for national planning applications. U.S. 112th Congressional Districts represents the political boundaries for the U.S. 112th congressional districts. The official membership is current as of September 15, 2011. This is a subset of the ESRI ArcGIS 10 dataset.

**county**: U.S. Counties provides detailed boundaries that are consistent with the tract and state data sets and are effective at regional and state levels. U.S. Counties represents the counties of the United States in the 50 states and the District of Columbia. This is a subset of the ESRI ArcGIS 10 dataset.

**county\_buf**: U.S. Counties provides buffered county boundaries to be used in processes generating various outputs required for the West Wide Wildfire Risk Assessment Project. The buffered county boundary helps to alleviate edge issues during processing. U.S. Counties represents the counties of the United States in the 50 states and the District of Columbia. This is a subset of the ESRI ArcGIS 10 dataset and was buffered to 3 km.

**ctowers**: Cell Towers. Provide spatial reference information of FCC regulated towers for users of West Wide Wildfire Risk Assessment. Cell Towers is a subset of all FCC regulated towers. These location points include AM/FM, Antenna Structure Registration (ASR), Broadband Radio Service (BRS)/ Educational Broadcast System (EBS), Cellular, Land Mobile (Commercial, Private and Broadcast), Microwave, Paging, and TV (NTSC and Digital).

**dem**: Elevation. The filled DEM was created so that spurious sinks, where there was no flow from pixel to pixel within a hydrologic unit, could be filled to create flow direction and flow accumulation. Natural sink features were maintained. Elevation represents land height, in meters, above mean sea level. The Elevation datasets were acquired from the Elevation Derivatives for National Applications (EDNA), a multi-layered database that provides systematic and consistent topographically-derived hydrologic derivatives. The filled DEM grid was created from the original elevation data by filling all of the depressions, or sinks, in the original DEM. To create this grid, an algorithm was used to locate and fill all depressions or sinks where there was no flow from pixel to pixel. During this process, efforts were made to maintain natural sink features. The units of measurement for Elevation are meters above mean sea level.

**drinkH2O**: Drinking Water Importance (vector data). This Drinking Water Importance Areas layer identifies an index of surface drinking water importance, reflecting a measure of water quality and quantity, characterized by Hydrologic Unit Code 12 (HUC 12) watersheds. The U.S. Forest Service Forests to Faucets (F2F) project is the primary source of the drinking water data set. Watersheds are ranked from 1 to 100 (F2F field) reflecting relative level of importance, with 100 being the most important and 1 the least important. This dataset is intended to be used as a tool for water-resource management and planning activities, particularly for site-specific and localized studies requiring a level of detail provided by large-scale map information. The Watershed Boundary Dataset (WBD) at 1:24,000 scale is a greatly expanded version of the hydrologic units created in the mid-1970's by the U.S. Geological Survey under the sponsorship of the Water Resources Council. The WBD is a complete set of





hydrologic units from new watershed and sub watersheds less than 10,000 acres to entire river systems draining large hydrologic unit regions, all attributed by a standard nomenclature.

Note: In Alaska, the watershed boundaries for public drinking water systems have been provided by the Drinking Water Program of the Alaska Department of Environmental Conservation. The information provided is a data snapshot as of November 11, 2011.

**dwia\_AK**: Drinking Water Importance Areas – Alaska. The data is used in the West Wide WildFire Risk Assessment. It is used as a Value Impacted layer in the Fire Effects Index model. This layer identifies an index of surface drinking water importance, reflecting a measure of water quality and quantity. An Environmental Conservation statewide data set is used for Alaska (Alaska Department of Environmental Conservation, Drinking Water Program's GIS data for the Drinking Water Systems). Watersheds are ranked based upon population served from 1 to 10 reflecting relative level of importance, with 10 being the most important and 1 the least important.

**dwia\_HI**: Drinking Water Importance Areas – Hawaii. The data is used in the West Wide WildFire Risk Assessment. It is used as a Value Impacted layer in the Fire Effects Index model. This layer identifies an index of surface drinking water importance based upon population served from surface water and priority watershed areas. The U.S. Environmental Protection Agency Municipal Watersheds S02-Surface Water data set was used in combination with State of Hawaii provided Watershed Protection Priority I and II dataset. Hawaii's The Rain Follows the Forest data indicates areas of highest rainfall and re-supply to fund on-the-ground actions proven to benefit watershed health. The Hydrologic Unit system is a standardized watershed classification system developed by USGS. Areas that are a source of drinking water are of critical importance and adverse effects from fire are a key concern. Watersheds are ranked from 1 to 10 for this WWA data reflecting relative level of importance, with 10 being the most important and 1 the least important.

**dwia\_115**: Drinking Water Importance Areas – lower 15 states. The data was subset for input into the West Wide WildFire Risk Assessment. It is used as a Value Impacted layer in the Fire Effects Index model. This Drinking Water Importance Areas layer identifies an index of surface drinking water importance, reflecting a measure of water quality and quantity, characterized by Hydrologic Unit Code 12 (HUC 12) watersheds. The Hydrologic Unit system is a standardized watershed classification system developed by USGS. Areas that are a source of drinking water are of critical importance and adverse effects from fire are a key concern. The U.S. Forest Service Forests to Faucets (F2F) project is the primary source of the drinking water data set. This project used GIS modeling to develop an index of importance for supplying drinking water using HUC 12 watersheds as the spatial resolution. Watersheds are ranked from 1 to 100 reflecting relative level of importance, with 100 being the most important and 1 the least important. Several criteria were used in the F2F project to derive the importance rating including water supply, flow analysis, and downstream drinking water demand. The final model of surface drinking water importance used in the F2F project combines the drinking water supply. The values generated by the drinking water protection model are simply multiplied by the results of the



model of mean annual water supply to create the final surface drinking water importance index. Watersheds are ranked from 1 to 10 reflecting relative level of importance, with 10 being the most important and 1 the least important.

**dwia\_rfs**: The Drinking Water Importance Areas Response Function Score represents a relative measure of the impact of fire on Drinking Water Importance Areas based on the response function values provided by the states. Response functions are a method of assigning a net change in the value to a resource or asset based on susceptibility to fire of different intensity levels. The assets in the WWA are the values datasets and each one has a corresponding response function output, or score. The Response Function Score for each values dataset will be a number from 0 to -9, with a more negative number indicating a more negative impact from fire. Positive effects from fire were not considered in the West Wide Risk Assessment. **evh**: This Existing Vegetation Height dataset is a subset of the LANDFIRE existing vegetation height fuel data. The data was subset for use in the West Wide Wildfire Risk Assessment. The LANDFIRE existing vegetation layers describe the following elements of existing vegetation for each LANDFIRE mapping zone: existing vegetation type, existing vegetation canopy cover, and existing vegetation height. Vegetation is mapped using predictive landscape models based on extensive field reference data, satellite imagery, biophysical gradient layers, and classification and regression trees.

**evt**: Existing Vegetation Type. The LANDFIRE existing vegetation layers describe the following elements of existing vegetation for each LANDFIRE mapping zone: existing vegetation type, existing vegetation canopy cover, and existing vegetation height. Vegetation is mapped using predictive landscape models based on extensive field reference data, satellite imagery, biophysical gradient layers, and classification and regression trees.

**fa**: The Forest Assets layer identifies forest land categorized by its height, cover and susceptibility or response to fire. Using these characteristics allows for the prioritization of landscapes reflecting forest assets that would be most adversely affected by fire. The rating of importance or value of the forest assets is relative to each state's interpretation of those characteristics considered most important for their landscapes. There are 12 categories of Forest Asset.

**fa\_rfs**: The Forest Assets Response Function Score represents a relative measure of the impact of fire on Forest Assets based on the response function values provided by the states. Response functions are a method of assigning a net change in the value to a resource or asset based on susceptibility to fire of different intensity levels. The assets in the WWA are the values datasets and each one has a corresponding response function output, or score. The Response Function Score for each values dataset will be a number from 0 to -9, with a more negative number indicating a more negative impact from fire. Positive effects from fire were not considered in the West Wide Risk Assessment.

**fei**: The Fire Effects Index (FEI) is developed for the West Wide Wildfire Risk Assessment. The FEI is comprised of two inputs: Suppression Difficulty Rating and Values Impacted Rating. The purpose of the FEI is to identify those areas that have important values at risk to wildland fire and/or are costly to suppress. The FEI is combined with the FTI to calculate the Fire Risk Index.





**firelocations**: This Fire Locations dataset contains the point locations of historic wildfire occurrences, compiled for the years 1999 - 2008 from state and federal agencies. Federal data was acquired from the Cheetah database provided by the National Interagency Coordination Center.

**flmln\_a**: Flame Length Expected. The expected flame length is the sum product of the flame length under Low, Moderate, High and Extreme weather conditions times the proportion of fires (by WIZ) within each of these four percentile categories. Fire Behavior data are used, along with Fire Occurrence and Fire Suppression Effectiveness data, as inputs to the Fire Threat Index model used in the West Wide Wildfire Risk Assessment. Flame length is measured in Feet (ft).

**flmln\_e**: Flame Length Extreme. This dataset shows the estimated flame lengths for a given area under extreme weather percentile conditions. Fire Behavior data are used, along with Fire Occurrence and Fire Suppression Effectiveness data, as inputs to the Fire Threat Index model used in the West Wide Wildfire Risk Assessment. Flame length is measured in Feet (ft).

**flmln\_h**: Flame Length High. This dataset shows the estimated flame lengths for a given area under high weather percentile conditions. Fire Behavior data are used, along with Fire Occurrence and Fire Suppression Effectiveness data, as inputs to the Fire Threat Index model used in the West Wide Wildfire Risk Assessment (WWA). Flame length is measured in Feet (ft).

**flmln\_l**: Flame Length Low. This dataset shows the estimated flame lengths for a given area under low weather percentile conditions. Fire Behavior data are used, along with Fire Occurrence and Fire Suppression Effectiveness data, as inputs to the Fire Threat Index model used in the West Wide Wildfire Risk Assessment (WWA). Flame length is measured in Feet (ft).

**flmln\_m**: Flame Length Moderate. This dataset shows the estimated flame lengths for a given area under moderate weather percentile conditions. Fire Behavior data are used, along with Fire Occurrence and Fire Suppression Effectiveness data, as inputs to the Fire Threat Index model used in the West Wide Wildfire Risk Assessment (WWA). Flame length is measured in Feet (ft).

**foa**: A Fire Occurrence Area (FOA) is an area where the probability of each acre igniting is the same. The FOA grids were developed based on historic wildfire location data and are continuous, floating point grids of mean fire ignition rates measured in fires/1000 acres/year. Wildfire point location data was collected for the years 1999 - 2008 and zip code referenced data (NFIRS and state zip code referenced fires) was collected for the years 2004 - 2009 (Wyoming zip code data was for 2000 - 2008), for development of the FOAs. The data was collected from both state and federal agencies. The historical fire location data was then used in a spatial filtering calculation to create the surface grid of mean fire ignition rates.

**fri**: The Fire Risk Index (FRI) provides a measure of wildfire risk. The FRI can be used to: identify areas where mitigation options may be of value; allow agencies to work together and better define priorities; develop a refined analysis of a complex landscape and fire situations using GIS; and increase communication with local residents to address community priorities and needs. It is calculated as the



Fire Threat Index (FTI) times the Fire Effects Index (FEI) times 10,000. It is one of the two primary outputs of the West Wide WIldfire Risk Assessment (WWA) and is a measure of wildfire risk. It combines the probability of an acre burning with the expected effects if a fire occurs. This reflects the possibility of suffering loss.

**fti**: The Fire Threat Index (FTI) is a value greater than 0.0 and less than or equal to 1.0. It was developed consistent with the mathematical calculation process for determining the probability of an acre burning. The FTI integrates the probability of an acre igniting and the expected final fire size based on the rate of spread in four weather percentile categories into a single measure of wildland fire susceptibility. Due to some necessary assumptions, mainly fuel homogeneity, it is not the true probability. But since all areas of the project have this value determined consistently, it allows for comparison and ordination of areas of the state as to the likelihood of an acre burning.

**ftype\_a**: Probability of Canopy Fire. This dataset shows the probability of canopy fire for a given area. Fire Behavior data are used, along with Fire Occurrence and Fire Suppression Effectiveness data, as inputs to the Fire Threat Index model used in the West Wide Wildfire Risk Assessment (WWA). Values range from 0 to 1.

**ftype\_e**: Fire Type Extreme. This dataset shows the expected fire type for a given area under extreme weather percentile conditions. Fire Behavior data are used, along with Fire Occurrence and Fire Suppression Effectiveness data, as inputs to the Fire Threat Index model used in the West Wide Wildfire Risk Assessment (WWA). Values represent Fire Type as follows: 0 Non Burnable, 1-3 Surface, 4-5 Passive, 6-8 Active.

**ftype\_h**: Fire Type High. This dataset shows the expected fire type for a given area under high weather percentile conditions. Fire Behavior data are used, along with Fire Occurrence and Fire Suppression Effectiveness data, as inputs to the Wildland Fire Susceptibility Index model used in the West Wide Wildfire Risk Assessment (WWA). Values represent Fire Type as follows: 0 Non Burnable, 1-3 Surface, 4-5 Passive, 6-8 Active.

**ftype\_l**: Fire Type Low. This dataset shows the expected fire type for a given area under low weather percentile conditions. Fire Behavior data are used, along with Fire Occurrence and Fire Suppression Effectiveness data, as inputs to the Wildland Fire Susceptibility Index model used in the West Wide Wildfire Risk Assessment (WWA). Values represent Fire Type as follows: 0 Non Burnable, 1-3 Surface, 4-5 Passive, 6-8 Active.

**ftype\_m**: Fire Type Moderate. This dataset shows the expected fire type for a given area under moderate weather percentile conditions. Fire Behavior data are used, along with Fire Occurrence and Fire Suppression Effectiveness data, as inputs to the Wildland Fire Susceptibility Index model used in the West Wide Wildfire Risk Assessment (WWA). Values represent Fire Type as follows: 0 Non Burnable, 1-3 Surface, 4-5 Passive, 6-8 Active.





**hospitals**: This dataset provides the locations for hospitals in the US. Each institution is named and shows the state and county it resides in. The hospital data layer is a subset of the ESRI ArcGIS 10 Institutions dataset. Hospitals represent point locations within the United States for hospitals.

**ia**: Infrastructure Assets. This layer identifies key Infrastructure Assets, such as schools, airports, hospitals, roads and railroads that are susceptible to adverse effects from wildfires. These features are combined into a single data set, buffered to reflect areas of concern surrounding the assets, and rasterized from polygons. Roads and railroads use a 300-meter buffer while schools, airports and hospitals use a 500-meter buffer. Values are 1.

**ia\_rfs**: The Infrastructure Assets Response Function Score represents a relative measure of the impact of fire on Infrastructure Assets based on the response function values provided by the states. Response functions are a method of assigning a net change in the value to a resource or asset based on susceptibility to fire of different intensity levels. The assets in the WWA are the values datasets and each one has a corresponding response function output, or score. The Response Function Score for each values dataset will be a number from 0 to -9, with a more negative number indicating a more negative impact from fire. Positive effects from fire were not considered in the West Wide Risk Assessment.

**ownership**: This GIS-based dataset was created to help people integrate protected areas data into their daily work (e.g. mapping, planning, analyses, and problem-solving). For example, this database makes it easy for users to address important conservation and resource questions pertaining to climate change adaptation, green energy development, infrastructure planning, and wildlife connectivity. State and regional planners and managers will appreciate this dataset as it provides critical contextual information for their work. Institutions responsible for national and international reporting will find this database full of reliable, accurate information for their purposes. The scientific and conservation community will also benefit from having this standardized base map to carry out their research and planning objectives.

**ra**: Riparian Assets. Riparian areas that are important as a suite of ecosystem services, including both terrestrial and aquatic habitat, water quality and quantity, and other ecological functions. The overall purpose of the Riparian Assets model is to provide an ecosystem, and specifically a watershed ecosystem, variable for the West Wide Wildfire Risk Assessment. This model uses riparian areas as a means of representing the most essential ecosystem variables associated with watersheds. This model attempts to represents the spatial extent of riparian zones on perennial streams, intermittent streams, and wetland areas. Additionally, this model will allow the user to analyze a suite of variables in those riparian areas that may be most affected by fire. The National Hydrography Dataset (NHD), the National Wetlands Inventory (NWI) and LANDFIRE's Existing Vegetation Dataset (EVT) were the primary inputs to this dataset. Riparian Assets are ranked from 1 to 3 reflecting relative level of importance, with 3 being the most important and 1 the least important.

**ra\_rfs**: The Riparian Assets Response Function Score represents a relative measure of the impact of fire on Infrastructure Assets based on the response function values provided by the states. Response functions are a method of assigning a net change in the value to a resource or asset based on susceptibility to fire of different intensity levels. The assets in the WWA are the values datasets and each





one has a corresponding response function output, or score. The Response Function Score for each values dataset will be a number from 0 to -9, with a more negative number indicating a more negative impact from fire. Positive effects from fire were not considered in the West Wide Risk Assessment.

**railroads**: U.S. Railroads represents the railroads of the United States. The data is a subset of the ESRI U.S. Streets data, ArcGIS v10.

**roads1**: Level 1 Roads are mainly interstate highways. They are roads that fall in the routing importance of: Largest/Longest Highways, Connect Major/Largest Cities, "Coast-to-Coast" Origin to Destination, Inter-State Commerce/Travel, and Intra-State Commerce/Travel. All ferry routes have been excluded from the dataset. The data is a subset of the ESRI U.S. Streets data, ArcGIS v10.

**roads2**: Level 2 Roads are mainly state highways. They are roads that are Long/Large Highways, Beltways/Secondary Freeways, and Connect Major Cities. All ferry routes have been excluded from the dataset. The data is a subset of the ESRI U.S. Streets data, ArcGIS v10.

**ros\_a**: Rate of Spread Expected. The expected rate of spread is the sum product of the ROS under Low, Moderate, High and Extreme weather conditions times the proportion of fires (by WIZ) within each of these four percentile categories. Fire Behavior data are used, along with Fire Occurrence and Fire Suppression Effectiveness data, as inputs to the Fire Threat Index model used in the West Wide Wildfire Risk Assessment (WWA). Rate of spread is represented as Chains per Hour (ch/hr).

**ros\_e**: Rate of Spread Extreme. This dataset shows the estimated rate of spread for a given area under extreme weather percentile conditions. Fire Behavior data are used, along with Fire Occurrence and Fire Suppression Effectiveness data, as inputs to the Fire Threat Index model used in the West Wide Wildfire Risk Assessment (WWA). Rate of spread is represented as Chains per Hour (ch/hr).

**ros\_h**: Rate of Spread High. This dataset shows the estimated rate of spread for a given area under high weather percentile conditions. Fire Behavior data are used, along with Fire Occurrence and Fire Suppression Effectiveness data, as inputs to the Fire Threat Index model used in the West Wide Wildfire Risk Assessment (WWA). Rate of spread is represented as Chains per Hour (ch/hr).

**ros\_l**: Rate of Spread Low. This dataset shows the estimated rate of spread for a given area under low weather percentile conditions. Fire Behavior data are used, along with Fire Occurrence and Fire Suppression Effectiveness data, as inputs to the Fire Threat Index model used in the West Wide Wildfire Risk Assessment (WWA). Rate of spread is represented as Chains per Hour (ch/hr).

**ros\_m**: Rate of Spread Moderate. This dataset shows the estimated rate of spread for a given area under moderate weather percentile conditions. Fire Behavior data are used, along with Fire Occurrence and Fire Suppression Effectiveness data, as inputs to the Fire Threat Index model used in the West Wide Wildfire Risk Assessment (WWA). Rate of spread is represented as Chains per Hour (ch/hr).

**schools**: The schools data layer is a subset of two ESRI ArcGIS 10.0 datasets. U.S. Geographic Names Information System School represents an automated inventory of the proper names and locations of



physical and cultural geographic features located throughout the United States and its Territories. The U.S. Institutions represents point locations within the United States for common institution landmark types including educational institutions.

**sdr**: Suppression Difficulty Rating (SDR). The Suppression Difficulty Rating is a measure of the increased difficulty in suppressing a fire. It is combined with the Values Impacted Rating (VIR) to determine the Fire Effects Index (FEI) for the West Wide Wildfire Risk Assessment. This suppression difficulty rating is based on two elements: fuel type production rate and slope. The rating reflects the difficulty of suppression - the higher the rating, the more difficult the suppression. The fireline production rates from the Fireline Handbook as well as the Fire Program Analysis (FPA) project were used to group the surface fuel models from the Fire Behavior Prediction System Fuel Model Set developed in 2005 (Scott and Burgan) into three fireline production rate categories: Slow, Medium and Fast. The values range from 0 to -9, with a more negative number indicating greater suppression difficulty.

**slp**: Slope represents the percent change of elevation over a specific area. This dataset was derived from the Elevation Derivatives for National Applications (EDNA), a multi-layered database that provides systematic and consistent topographically-derived hydrologic derivatives. The slope grid was generated from the filled DEM using the "slope" function. The units of measurement were derived in percent rise. These percent slope values were then reclassified into values 0, 22, 32, 44, 64 and 90 for use in the West Wide Wildfire Risk Assessment (WWA) project. This dataset was subset for use in the WWA.

**vir**: The Values Impacted Rating is combined with the Suppression Difficulty Rating to determine the Fire Effects Index for the West Wide Wildfire Risk Assessment. The Values Impacted Rating (VIR) reflects those areas that have important values at risk to wildland fire. This rating is based on the five Values Impacted: drinking water importance areas, riparian assets, forest assets, infrastructure assets, and wildland development areas. Ratings are assigned by state fire managers using a matrix process to combine individual ratings for each element into one overall rating for each burnable cell. The VIR values range from 0 to -9, with a more negative number indicating a more negative impact from fire. Positive effects from fire were not considered in the West Wide Risk Assessment.

**wda**: Wildland Development Areas. Wildland Development Areas (WDA) are a key input into the West Wide Wildfire Risk Assessment (WWA) Fire Effects process. This data is being used as a surrogate for the original WUI data layer to represent where people live in the wildland. More detailed LandScan data is being used instead of other WUI datasets (i.e. USFS Silvis, Theobald, local state datasets) to provide a better spatial delineation of wildland population patterns. Wildland Development Areas (WDA) reflects housing density depicting where people live in the wildland. Wildland Development Areas (WDA) represents housing density per 30 sq meters. An urban mask which excludes the core urban areas that are not in the neighborhood or threatened by fire burning in wildland fuels area has been applied where values in these urban areas have been reclassed to no data. This dataset was developed for the West Wide Wildfire Risk Assessment (WWA) project.

**wda\_rfs**: The Wildland Development Areas Response Function Score represents a relative measure of the impact of fire on Wildland Development Areas based on the response function values provided by





the states. Response functions are a method of assigning a net change in the value to a resource or asset based on susceptibility to fire of different intensity levels. The assets in the WWA are the values datasets and each one has a corresponding response function output, or score. The Response Function Score for each values dataset will be a number from 0 to -9, with a more negative number indicating a more negative impact from fire. Positive effects from fire were not considered in the West Wide Risk Assessment.

wdarc: Wildland Development Areas represent housing density per 30 sq meters recoded into 7 classes (see WDA for more information). The classes are: 1 (0.000001 to 6.177635) Less than 1 HU / 40 acres 2 (6.177635 to 12.355269) 1 HU / 40 acres to 1 HU / 20 acres 3 (12.355269 to 24.710538) 1 HU / 20 acres to 1 HU / 10 acres 4 (24.710538 to 49.42) 1 HU / 10 acres to 1 HU / 5 acres 5 (49.42 to 123.55269) 1 HU / 5 acres to 1 HU / 2 acres 6 (123.55269 to 741.31614) 1 HU / 2 acres to 3 HU / acre 7 (741.31614 to 100,000) More than 3 HU / acre This dataset was developed for the West Wide Wildfire Risk Assessment (WWA) project.

**wpl**: Where People Live. This WPL dataset was developed for the West Wide Wildfire Risk Assessment (WWA) project. The location of people living in Wildland Urban Interface and rural areas is key information for defining potential impacts to people and homes from fire. Where People Live (WPL) represents housing density per 30 sq meters. This dataset was developed for the West Wide Wildfire Risk Assessment (WWA) project to develop the Wildland Development Areas.

**wplrc**: Where People Live reclassed represents housing density per 30 sq meters recoded into 7 classes (see WDA for more information). The classes are: 1 (0.000001 to 6.177635) Less than 1 HU / 40 acres 2 (6.177635 to 12.355269) 1 HU / 40 acres to 1 HU / 20 acres 3 (12.355269 to 24.710538) 1 HU / 20 acres to 1 HU / 10 acres 4 (24.710538 to 49.42) 1 HU / 10 acres to 1 HU / 5 acres 5 (49.42 to 123.55269) 1 HU / 5 acres to 1 HU / 2 acres 6 (123.55269 to 741.31614) 1 HU / 2 acres to 3 HU / acre 7 (741.31614 to 100,000) More than 3 HU / acre This dataset was developed for the West Wide Wildfire Risk Assessment (WWA) project.

**wwacbd**: WWA Canopy Bulk Density. This CBD dataset is a subset of the LANDFIRE fuel data. An urban mask which excludes the core urban area that are not in the neighborhood or threatened by fire burning in wildland fuels area has been applied where values in these urban areas have been reclassed to value 0 (Non-Forested). The dataset was subset for the West Wide Wildfire Risk Assessment. WWA CBD is represented in kg/m3\*100.

**wwacbh**: WWA Canopy Base Height. This CBH dataset is a subset of the LANDFIRE fuel data. The values were reclassed to Feet\*10 for use in the West Wide Wildfire Risk Assessment. An urban mask which excludes the core urban area that are not in the neighborhood or threatened by fire burning in wildland fuels area has been applied where values in these urban areas have been reclassed to value 0 (Non-Forested). The dataset was subset for the West Wide Wildfire Risk Assessment System.

**wwacc**: WWA Canopy Cover. This CC dataset is a subset of the LANDFIRE canopy cover fuel data. An urban mask which excludes the core urban area that are not in the neighborhood or threatened by fire





burning in wildland fuels area has been applied where values in these urban areas have been reclassed to value 0 (Non-Forested). The dataset was subset for the West Wide Wildfire Risk Assessment. WWA CC is represented in percent.

**wwach**: WWA Canopy Height. This CH dataset is a subset of the LANDFIRE canopy height fuel data. The values were reclassed to feet for use in the West Wide Wildfire Risk Assessment System. An urban mask which excludes the core urban area that are not in the neighborhood or threatened by fire burning in wildland fuels area has been applied where values in these urban areas have been reclassed to value 0 (Non-Forested). The dataset was subset for the West Wide Wildfire Risk Assessment.

**wwafuel13**: WWA Fuels13. This WWA Fuels 13 dataset is a subset of the LANDFIRE fuel data. An urban mask which excludes the core urban area that are not in the neighborhood or threatened by fire burning in wildland fuels area has been applied where values in these urban areas have been reclassed to value 91 (Urban). The data was subset for use in the West Wide Wildfire Risk Assessment.

**wwafuel40**: WWA Fuels40. This WWA Fuels 40 dataset is a subset of the LANDFIRE fuel data. An urban mask which excludes the core urban area that are not in the neighborhood or threatened by fire burning in wildland fuels area has been applied where values in these urban areas have been reclassed to value 91 (Urban). The data was subset for use in the West Wide Wildfire Risk Assessment.