|  |  |
| --- | --- |
| **IMPLICATIONS of SURFACE FUELS****CONDITIONS** | Management Consideration  |
| Fuel Characteristics | Influence on Wildfire Behavior  | Objective  | Potential results of Objectives onSuppression Efforts | Fire and Ecological Effects | Management Considerations |
| 1. Dead fuel less than 3” in diameter
2. Continuous Fuel bed continuity
3. Fuel loading (influenced by amount and size of material – particularly large logs and thick brush)
 | Critical to wildfire surface rates of spread on the landscape. These fuels are receptors for initiation of new fire starts. 1. Continuous fuels can sustain fire spread over larger area
2. Potential to pre-heat fuels ahead of fire or aerial fuels above surface fire
3. Provides receptors in advance of fire increasing spotting potential
4. Fire can build up momentum
5. Generates longer and high amount of heat released
6. Increases; length of time flaming front is on site through longer burning & smoldering phase; generates more heat to surface soils
7. Increases fire intensities/flame lengths, spread rates with brush/grass component,
8. Increased likelihood for igniting overstory/canopy torching.
9. Pre-heat and dries aerial fuels overhead creating potential for a re-burn later
10. Increase spotting potential and distance
11. Logs are excellent receptors for hot embers and spotting
 | Reduce surface fuelsBreak up fuel continuity on the landscape. Reduce fuel loadings and fuel bed height  | 1. Lowering tons/acre can improve opportunities for fire control

b. Grass fuels often respond to water and fire retardant applications for increasing suppression success. c. Fine fuels also have a shorter flaming phase with faster consumption rates. Reduced mop-up frees resources for suppression1. Fire containment opportunities are increased; fireline production rates increase and resources are more effective
2. Potential for less acres burned
3. Increases opportunities for direct attack and head fire suppression actions.

 1. Increased line production rates and resource effectiveness
2. Improved options for direct attack on flaming front and fire flanks.
3. Decreased spotting potential
4. Increases likelihood of successful containment
5. Improves safety through direct attack options
6. Less suppression resources committed to mop-up and more to suppression efforts.
7. Decreased potential for structure involvement through spotting
 | 1. Lowers potential flame length
2. Reduce torching and spotting potential is reduced
3. Removal of down woody allows for grass and herbaceous species.
4. Western Larch seeds more likely to germinate in burned areas.

 1. Fire spread is interrupted
2. Fire spread rates can be slowed
3. Reduces potential for high momentum rates of spread when fuel patterns are broken.
4. Reduced acres burned
5. Fire responds more readily to mop-up, decreases time for smoldering and glowing embers.
6. Disturbance of soils from heat generated during flaming/smoldering phase
7. Reduces amount of mop-up and increase mop-up effectiveness.
8. Potential for decreased acreage burned
9. Reduced fire intensities, flame lengths, spotting & reburn potential
10. Less residual heat once flaming front has passed reducing amount of heat in burned area sooner.
11. Higher retention of overstory trees with less canopy involvement, lower heat at tree base.

  | 1. In lands that comprise the “middle ground”, reduction of dead fuels can often be accomplished with prescribed burning or spot burning under management specified weather and fuel conditions. Cost Effective
2. Prescribed burning across landownership (surface disturbance is lower with fire)
3. Dispose of down woody from site within CAR’s; remove from site
4. Change physical characteristics of down woody fuel and slash to assist in expediting decomposition. i.e. : slash busting, mastication
5. Maintenance of investment
6. Establish treatment opportunities to break-up horizontal fuel bed to interrupt fire spread.
7. Take advantage of natural barriers with some treatments to increase areas for suppression options
8. Utilize options to change fuel characteristics and loading
9. Consider fuel beds outside of CAR and within “Middle ground” that have potential to build momentum and move toward CAR.
10. Maintenance of investment
11. Biomass Utilization of material
12. Modify fuel characteristics through multiple options such as piling, mastication, chipping, etc.
13. Pile and burn
14. Combine with stand treatments
15. Maintenance of investment
16. Infrastructure capabilities/availabiilty and utilization of material
 |

|  |  |
| --- | --- |
| **IMPLICATIONS of LADDER FUELS AND CANOPY****CONDITIONS** | Management Consideration  |
| Fuel Characteristics | Influence on Wildfire Behavior  | Objective  | Potential results of Objectives onSuppression Efforts | Fire and Ecological Effects | Management Consideration |
| Ladder Fuels and base canopy heightsCrown Density   | 1. Conduit for surface fire to spread to canopy
2. Requires shorter flame lengths to transition to crown
3. Generates higher flame lengths and flame heights.
4. Transports hot embers to higher levels increasing both spotting potential and distance
5. Related to torching and crown fire activity.
6. Large scale simultaneously ignitions possible
7. Associated with spotting – fire brands lofted high in convection column; Can cause mass ignition from spotting over a wide area; spotting can range from a few hundred feet to miles from source
8. Increased flame lengths and rates of spread; heat and energy is intense
9. Spatial arrangement of stands affect the growth of large fires
10. Fire spread unaffected by barriers such as: roads, rivers, etc.
11. Increases fire frontal spread
 | Increase height to live crown – lengthens distance between surface fuels and aerial fuels.Decrease crown density and increase distance between tree canopiesPromote fire tolerant species (fts) | 1. Less torching; results in less spotting and lower flame lengths
2. Fire is primarily confined to surface improving successful suppression efforts.
3. Improves firefighter safety
4. Potential for reduced structures ignitions; structure involvement often occurs due to spotting
5. Fire spread is primarily as a surface fires, which are easier to suppress than crown fires.
6. More successful structure protection efforts
7. Surface fires are safer to fight than crown fires
8. Reduced fire heat and energy release
9. A more direct suppression strategy can be used

  | 1. Requires longer flame lengths for torching
2. Overstory mortality is reduced
3. pruning of stand through mechanical or prescribed fire (scorch height)
4. Ecological recovery higher with fire tolerant species
5. Promotes healthier trees with higher resistance to insect and disease.
6. Increase residual tree diameter and tree vigor.
7. Less fire mortality higher likelihood of ecological recovery
8. Open stands could encourage surface spread; suppression efforts would be more successful
9. Reduces fire spread through spotting
10. Less probability of tree to tree fires
11. Reduces crown fire potential
12. Increases likelihood of overstory retention in canopy.
13. Dense stands once opened often promote grass and herbs
14. Promotes healthier trees with higher resistance to insect and disease.
15. Increase residual tree diameter and tree vigor.
 | 1. Raise canopy base height
2. Understory thinning
3. Promote fire tolerant species/historical structure
4. Pruning; i.e.: prescribed burn through lower limb scorching
5. More effective in combination with crown density reduction and/or fuels reduction; location dependent
6. Biomass utilization
7. Economic considerations
8. Timber
9. Rangeland – forage
10. Infrastructure – type/distance
11. Access
12. Thinning of Canopy and understory
13. More effective when crown density is combined with fuels reduction; location dependent
14. Economic considerations
15. Timber, biomass, fuel wood
16. Rangeland – forage
17. Infrastructure – type/distance
18. Access
19. Promote fire tolerant species for resilient landscape
20. Promote historic stand structure

  |

|  |  |
| --- | --- |
| **IMPLICATIONS of STRUCTURE FUELS** | Management Consideration  |
| Fuel Characteristics | Influence on Wildfire Behavior or Suppression Efforts | Objective  | Potential results of Objectives onSuppression Efforts | Fire and Ecological Effects | Management Consideration |
| Homes and StructuresProperties within close proximity of structures  | 1. Can ignite structures from wildfire
2. Exhibits high intensity burning
3. Complicates suppression – wildland firefighters are not trained for actual structure protection, only properties outside home.
4. Building material is often toxic
5. Heavy fuels can generate high levels of radiant heat to structure
6. Heavy fuels can generate high levels of radiant heat to suppression resources
7. Increases likelihood of structure ignitions
8. Miscellaneous stored products may be volatile when exposed to heat (propane, gas tanks)

  | Decrease the likelihood of structural ignitions Apply treatments to increase distance from structure to general forest/grasslands.    | 1. Improves firefighter and home owner safety
2. Structures ignitions reduced; structure involvement often occurs due to spotting
3. Fire prepared homes allows more firefighters to focus on suppression of wildfire verse heavy home protection.
4. Fire is primarily confined to surface improving successful suppression efforts
5. Less spotting opportunities to buildings
6. More successful structure protection efforts
7. Surface fires are safer to fight than crown fires
8. Reduced fire heat and energy release
9. Provide added protection distance from forested areas and structures.
10. Potential to increase access capabilities

  | 1. Fire often changes to surface fire where areas in and around buildings are treated adequately.
2. Post fire impacts are reduced for home and homeowner
3. Ecological recovery quickened
4. Less large tree mortality - higher likelihood of ecological recovery.
5. Open stands encourage surface spread; suppression efforts would be more successful
6. Reduces fire spread through spotting
7. Less probability of tree to tree torching
8. Reduces crown fire potential
9. Dense stands once opened often promote grass and herbs which respond more readily to water application.
 | 1. Building material that is less susceptible as an fire receptor such as composite roofing,
2. Non-flammables away from structures
3. Building standards for new homes
4. Firewise and other protection programs
5. Pre, During, Post fire plans
6. Economic considerations
7. Treatment tools options near homes
8. Landowner expenses
9. Workforce availability
10. Homeowner aid/assistance – funds, boots on the ground, education
11. Thinning of Canopy and ground vegetation
12. Locations of hazmat materials
13. All-inclusive lands verse checker board treatments: All Hands All Lands approach
14. Pilot projects and site visits
15. Education and outreach
16. Residence verses outbuildings
17. Workforce availability
 |