IV. Fuels Treatment Strategies and Maintenance

Maintaining Oregon's Investments in Fuel Treatments

There is an increasing threat of large, uncharacteristically intense wildfires and a corresponding elevated risk to homes and human infrastructure in Oregon.

Local USFS and BLM district managers have prioritized areas for initial fuel treatment based on fuel conditions, proximity to the WUI and human infrastructure, forest health, and other forest values. In the past, treatments have not been well coordinated between USFS and BLM districts, nor with neighboring communities. In addition, initial treatments did not adequately assess landscape-level risks, resulting in treatment areas that were typically small in size and not coordinated between agencies in their application across the landscape.

Since 2002, prioritizing areas for initial fuel treatments on federal lands have been based on *fire regime* and *current condition class* (see Tables 1 and 2, Schmidt and others 2002, Agee 2002). Land managers developed condition classes (1, 2 and 3) to exhibit the departure in severity, intensity, and frequency for wildfires today compared to historic conditions. Changes in historic fire regimes have led to changes in key ecosystem components such as vegetation (e.g. species composition, stand age, structural stage, canopy closure, and mosaic patterns); fire frequency, severity, and pattern; introduction of invasive plants; and altered insect and disease dynamics. A coarse-scale map of condition classes was developed for the United States to determine rough acreages in each condition class category (Schmidt et al. 2002) but this map is too coarse-scale for determining condition class at specific site locations on the ground.

Following adoption of the fire regime and condition class framework by federal land managers, initial fuel treatments now strive to target condition class 3 areas where historically fire was frequent (fire regimes I, II and III) and now contains high fuel loading. The overall purpose of these fuel treatments is to re-establish stand and landscape characteristics that make forests more fire-resilient (see Table 3, Agee 2002). Information on fire regime and condition class guides choices about where fuel reduction is needed most, and treatments are also being strategically applied in and around WUI areas to protect human infrastructure.

NFP guiding principles speak to maintaining ecosystems in and around the WUI in conditions that provide for a fire-safe environment (NFP 2002). Achieving this would not only protect critical elements of ecosystems currently at risk of uncharacteristically intense wildfire, but would also provide ecosystem characteristics that would enhance public and firefighter safety and property protection through reduced incidents of extreme fire behavior and increased ability to manage fires with a range of suppression strategies and tactics.

The goal of all fuel treatments (e.g., thinning, mowing, pruning, and prescribed fire) is to "step down" fuels in wildlands and in the WUI. Figure 1 shows the acres targeted for fuel treatment on USDA Forest Service lands in Region 6 from 1989 through 2004. Substantial increases in treated acres occurred after 1995, reaching 140,000 and 130,000 acres in 2003 and 2004 respectively. Between 1999 and 2004, the ODF treated 35,000 acres of mostly private land.

groups is readily available on GIS vegetation layers from federal agencies, but is lacking on private lands. Using these two pieces of information, projections can be made using stand simulation and fire behavior models to determine when a particular site will move beyond acceptable fire behavior criteria and require some level of retreatment. Retreatment priorities will also need to consider surrounding risk (e.g., structures), thus areas close in to homes and subdivisions would be scheduled for retreatment first while outlying areas would be treated later.

The development of a fuel treatment maintenance strategy is important for Oregon. A maintenance strategy could assist communities in developing Community Wildfire Protection Plans, which require some detailed explanation of how fuel treatments in the WUI will be maintained over time. Developing and implementing a fuel maintenance strategy will be critical in estimating budgets and future funding needed from federal and other sources to maintain these areas over time. Also, a fuel treatment maintenance strategy would be an important component of the fire risk assessment model for Oregon (Jim Wolf, *in progress*).

The major challenge for developing a cohesive fuel maintenance program for Oregon is the diversity of state, federal, and private ownerships with contrasting objectives and legal mandates. Thus, close collaboration with all stakeholders will be key to the development of a statewide fuels maintenance strategy and its implementation. Another challenge will be deciding who keeps track of all the fuel treatments performed on the ground and developing a common database so that queries can be made about retreatment priorities for specific locations. Most likely a fuels working group, comprised of state, federal, private, and community representatives, is needed to work these details out. The primary outcome from this group would be to have a common fuels treatment database that any group can access for planning purposes and to input treatment acres by location. Funding and personnel to support this collaborative effort needs to be an agency priority in order to make this important endeavor happen.

Fuels Treatment Recommendations

1. Develop fuels team comprised of state and federal land management agencies, along with private and community representatives to develop a fuels treatment/maintenance GIS database.
Priority: High
Timeline: 2006
Whose task? ODF, USFS, BLM, private landowners, communities at risk
New authority needed? No
Additional staff and/or funding needed? .25 FTE, ~$75,000.

2. Integrate community level fuels data with the statewide fuel treatment database to produce a comprehensive risk assessment linked to the fuel treatment/maintenance database.
Priority: Medium
Timeline: 2008
Whose task? ODF
New authority needed? No
Additional staff and/or funding needed? .25 FTE, $100,000 (Federal grant.)

overstory trees species and understory shrub and herb layers. Franklin and Agee (2004) point out that plant association groups provide an important basis for differentiating between forest types and their inherent ecological characteristics and processes. Knowing the plant association for a particular area, managers can infer a number of the items on the above list including, climate, site productivity, fire regime, rate of fuel accumulation, and successional patterns following disturbance (i.e., fuel treatments). For example, more productive dry grand fir plant associations accumulate living ladder fuels and dead fuels at a greater rate than less productive plant associations (e.g., ponderosa pine associations), and thus will move from condition class 1 to class 2 faster and require re-treatment sooner. Plant association groups have been mapped on federal lands and have been entered into GIS systems. Retrieval of this information for a particular location on federal lands would be relatively easy, but this information is lacking for private lands.

Desired Fire Behavior

A key element in prioritizing areas for retreatment is having managers specify *desired* fire behavior (e.g. flame length, rate of spread) for a given set of fuel moisture and weather conditions, such as “average worst fire condition”, by geographic regions of the state. Average worst fire condition is defined as the number of days during the fire season in which seasonal dryness and wind exceed the 90th percentile for cumulative weather observations for the past decade. In other words, this would be the point where fire conditions are classified as “very high.” Naturally, this would vary across the state due to differences in prevailing climate. For example, this may range from as little as 7 days in the Coast Range to 47 days in eastern Oregon.

Thus, managers might specify a desired flame length in treated areas of 2-3 feet under the average worst fire conditions. When fuel conditions change over time enough to support flame lengths greater than 3 feet, retreatment is triggered and the site is prioritized for re-treatment. The retreatment trigger point can be estimated using existing fire behavior models. For areas adjacent to the WUI, the maximum desired flame length should be less than 4 feet because greater flame lengths are too intense for direct attack by firefighters with hand tools (Schmidt et al. 2002).

Fuel accumulation rates and the length of time to reach the trigger point vary by plant association group, so it can be difficult to pinpoint the number of years before re-treatment is necessary. The Forest Vegetation Simulator (FVS, Stage 1973; Wykoff et al. 1982) can be used to project stand development and fuel accumulation following fuels treatments, and model output can be fed into a variety of fire behavior subroutines (e.g., Fire and Fuel Extension to FVS (Reinhardt and Crookston 2003)) to provide managers with an estimate of when re-treatment would be necessary. After specifying desired fire behavior, several model runs can be conducted for various plant association groups (ponderosa pine, lodgepole pine, mixed conifer) and for different desired fire behavior parameters.

Summary

Developing a fuels reduction maintenance program will entail knowing plant association groups for an area and defining acceptable fire behavior parameters. We suggest that a flame length of 4 feet <u>or</u> <u>less</u>, particularly in or near WUI areas, is appropriate. Information on plant association larger size) to the forest floor. In the absence of fire, such as in Fire Regime I, fuel loading continues to increase with the potential to fuel intense wildfires.

This dead biomass accumulates faster than it decays in the drier forests types of southwest, central and eastern Oregon. Thus, dry forests treated for fuel reduction now will need to be retreated at some point in the future to maintain their effectiveness. The rate at which wildfire fuels re-accumulate and the length of time before retreatment is needed depends on several interrelated factors, including:

- Initial treatment level (how much biomass (fuel) was removed initially in the understory and overstory);
- Plant association group;
- Site productivity;
- Rate of fuel accumulation;
- Fuel structure (i.e., condition class)
- Historic fire regime;
- Desired fire behavior (for effective control)
- Climatic regime

As previously mentioned, fire regime and condition class is the primary framework for prioritizing areas for *initial* fuel treatment, particularly on federal lands. However, this framework may be less useful to resource managers and communities for prioritizing areas for future *retreatment* because current condition class maps are too coarse-scale to be useful on the ground, the line between classifying a given area as condition class 1, 2 or 3, is not exact or distinct, and fire behavior within just one condition class can be highly variable.

From the list above, initial treatment level, plant association group, and desired fire behavior may be the most meaningful parameters for prioritizing or scheduling areas for retreatment. In addition, strategic location (i.e., proximity of treated areas to the WUI) must also be considered because of the element of risk to human values and infrastructure. Considerations for each parameter are discussed below.

Initial Treatment Level

The more fuel removed (living and dead) during the initial treatment or suite of treatments, the longer it takes for the site to re-accumulate fuel to a level triggering retreatment. Not all fuel layers may require retreatment within a given timeframe, however. For example, a ponderosa pine stand on a ponderosa pine/bitterbrush/Idaho fescue plant association thinned from below and then underburned to reduce slash and flammable bitterbrush may require retreatment after 10 years in the shrub layer only as the shrubs recover to pretreatment levels. If the overstory trees were thinned wide enough in the initial treatment, retreatment of the tree layer may not occur for 20 years or more.

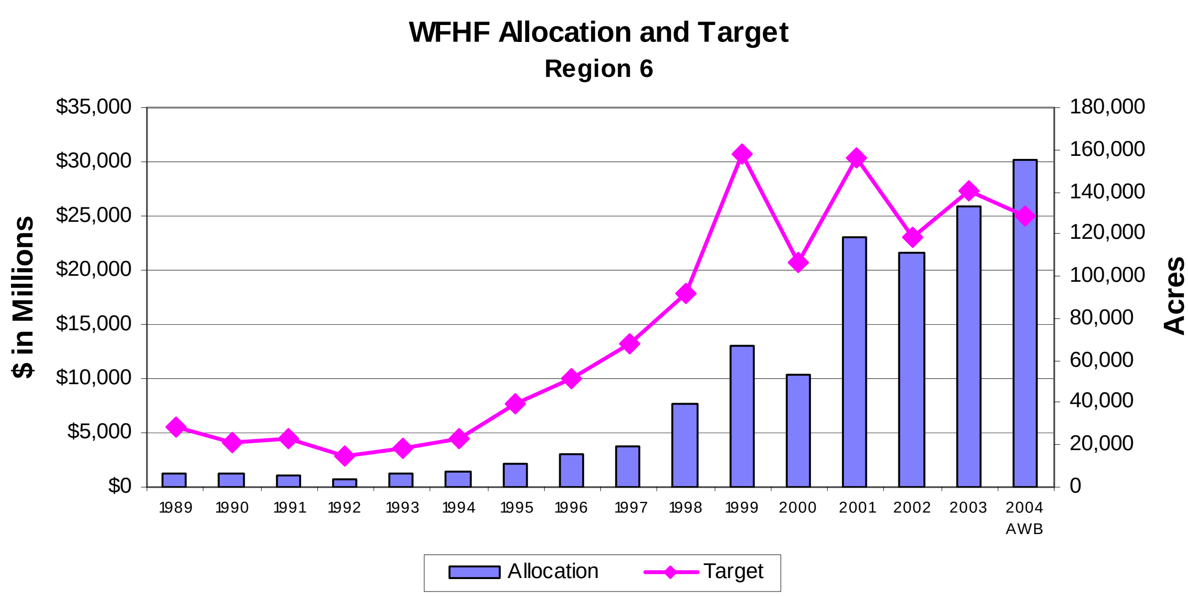
Plant Association Groups

Plant associations are grouping of plants species which reoccur on the landscape within particular environmental conditions. Plant association groups are named based on the dominant

Tens of millions of dollars have been invested (Figure 1) to protect human values and key ecosystem elements within and outside the WUI through NFP and other funding sources. In addition, a great deal of effort and dollars have been expended on fuel reduction project planning.

Over the next 10-15 years treated areas shown in Figure 1 and areas treated on state and private lands (not shown) will require retreatment to maintain their effectiveness as fuel breaks and fire resilient ecosystems. It is unclear whether funding will be available in the future to retreat these areas as they move away from a desirable condition, or whether maintenance costs will be absorbed into existing agencies budgets and out of the pockets of private landowners. Future retreatments should cost less per acre than the initial suite of fuel treatments applied if they are conducted before fuels have re-accumulated to pretreatment levels. Therefore it is critical for Oregon to develop a maintenance strategy that protects initial investments in fuel reduction work.

Figure 1: USFS Region 6 Wildfire hazardous fuel (WFHF) treatment funding allocations and targets for 1989-2004.



Considerations when developing a fuels maintenance program

Once treated, stands undergo the process of ecological succession in which understory and overstory vegetation changes over time. This results in incremental changes (often increases) in herbs, grasses, shrubs, and tree seedlings because more growing space has been created and thus more soil nutrients and water have been made available by partial removal of competing overstory trees and other vegetation. Overstory structure also changes as residual trees expand their crowns and increase in diameter, while continually adding more standing biomass (wood) and biomass to the forest floor from annually shed needles and branches. Subsequent insect and disease disturbances can kill trees creating snags and downed logs, which add more biomass (of

Table 1: Fire Regime Group Descriptions (from Schmidt and others 2002.)

Fire Regime Group	Frequency[1] (Fire Return Interval)	Severity[2]
I	0–35 years	low severity
II	0–35 years	stand replacement severity
III	35–100+ years	mixed severity
IV	35–100+ years	stand replacement severity
V	>200 years	stand replacement severity

[1]Fire frequency is the average number of years between fires
[2]Severity is the effect of the fire on the dominant overstory vegetation

Table 2: Fire Regime Current Condition Class[1] Descriptions (Schmidt and others 2002.)

Condition class	Fire regime	Example management options
Condition Class 1	Fire regimes are within an historical range, and the risk of losing key ecosystem components is low. Vegetation attributes (species composition and structure) are intact and functioning within an historical range.	Where appropriate, these areas can be maintained within the historical fire regime by treatments such as fire use.
Condition Class 2	Fire regimes have been moderately altered from their historical range. The risk of losing key ecosystem components is moderate. Fire frequencies have departed from historical frequencies by one or more return intervals (either increased or decreased). This results in moderate changes to one or more of the following: fire size, intensity and severity, and landscape patterns. Vegetation attributes have been moderately altered from their historical range	Where appropriate, these areas may need moderate levels of restoration treatments, such as fire use and hand or mechanical treatments, to be restored to the historical fire regime
Condition Class 3	Fire regimes have been significantly altered from their historical range. The risk of losing key ecosystem components is high. Fire frequencies have departed from historical frequencies by multiple return intervals. This results in dramatic changes to one or more of the following: fire size, intensity, severity, and landscape patterns. Vegetation attributes have been significantly altered from their historical range.	Where appropriate, these areas may need high levels of restoration treatments, such as hand or mechanical treatments, before fire can be used to restore the historical fire regime

[1]*Fire Regime Current Condition Classes* (FRCC) are a qualitative measure describing degree of departure from historical fire regimes, possibly resulting in alterations of key ecosystem components, e.g. species composition, structural stage, stand age, canopy closure, and fuel loadings. One or more of the following activities may have caused this departure: fire suppression, timber harvesting, livestock grazing, introduction and establishment of exotic plant species, introduced insects or disease, or other management activities.

Table 3: Principles of Fire-Resilient Forests (from Agee 2002.)

Principle	Effect	Advantage	Concerns
Reduce surface fuels	Reduces potential flame length	Control easier, less torching	Surface disturbance, less with fire than with other techniques
Increase height to live crown	Requires longer flame length to begin torching	Less torching	Opens understory, may allow surface wind to increase
Decrease crown density	Makes tree-to-tree crown fires less probable	Reduces crown fire potential	Surface wind may increase and surface fuels may be drier
Keep larger trees	Thicker bark and taller crowns	Increases tree survivability	Removing smaller trees is economically less profitable

<u>3. Develop a protocol for fuels retreatment. Develop triggering criteria based on desired fire behavior, vegetation conditions, and strategic location.</u>
Priority: High
Timeline: 2007
Whose task? ODF, USFS, BLM and communities at risk
New authority needed? No (Memorandum of Understanding.)
Additional staff and/or funding needed? .25 FTE, $50,000 (Federal grant.)