The Condition of Oregon's Forests and Woodlands: Implications for the Effective Conservation of Biodiversity

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Introduction

For millennia, fire has played an important role in shaping the composition, structure and processes of most native ecosystems. Suppression of wildland fire over the past 60 to 100 years, along with widespread livestock grazing and logging, has altered the characteristics of most ecosystems in Oregon. When fires occur following long-term fire suppression and other habitat modifying practices, fire behavior can be more intense with more severe ecosystem effects.

Ecosystem changes resulting from alterations in natural fire regimes affect habitat conditions for plants and animals. While changes in habitat suitability for an individual species is certainly nothing out of the ordinary, for native species and ecological systems that are already in decline due to other land use pressures, changes from fire suppression or alternatively unnaturally severe fires may add one more nail to the coffin. Eighty-four percent of places identified by scientists as important for global conservation are estimated to be at risk from changes that have created too much, too little or the wrong kind of fire (The Nature Conservancy 2005).

Over the past ten years, federal agencies have treated thousands of acres of forests and woodlands through application of prescribed fire, thinning, and wildland fire to reduce fuel loads and/or modify fire behavior (National Fire Plan, http://199.134.225.81/index.htm). Despite these efforts the general consensus is that conditions in our fire-prone wildland forests and woodlands are getting worse, not better. Under-investment in the use of fire and forest restoration, lack of or limitations in processing infrastructure, market conditions, fragmented ownership patterns, and long-standing disagreements over how our forests should be managed continue to be barriers to progress in addressing this problem.

To frame this problem at the statewide scale, we analyzed the recently released draft LANDFIRE Rapid Assessment fire regime and condition class data for fire-prone forests and woodlands and lands within the Wildland Urban Interface. We selected forests and woodlands for analysis based on their fire regime characteristics, current condition, and proximity to the Wildland Urban Interface. We then compared our estimates of the acres of forests and woodlands that would need to be treated annually to address uncharacteristic fuel loads, restore fire as a natural process, or reduce fire risk in the Wildland Urban Interface to reported federal treatment accomplishments to get a first approximation of the gap between current and needed restoration efforts.

Recognizing that the LANDFIRE Rapid Assessment data on conditions are coarse and the predictions greatly simplify the problem and solutions, we propose a roadmap for developing a Wildland Restoration and Conservation Plan for Oregon. In addition to the benefits to Oregon's biodiversity, a blueprint such as this would provide critical and timely information and context to evaluate and take advantage of any economic opportunities, such as biomass utilization, associated with restoration.

Background

In Oregon, wildfires maintained extensive grasslands and savanna habitats in the interior valleys, maintained open park-like stands of ponderosa pine forests in southwestern and eastern Oregon, and periodically re-set succession in our climax lodgepole pine and coastal spruce forests. The frequency, intensity, and ultimate size of fires on the landscape depend on elevation, topography, wind characteristics, relative humidity, and fuel loads. When considered together, certain patterns in fire frequency, predictability, seasonality, size, and severity can be grouped into Historic Natural Fire Regimes (Table 1).

Table 1: Fire Regimes from Schmidt et al. (2002) as modified for use by LANDFIRE.

Reference Fire Regime	Fire Severity
I	0–35 year frequency, low and mixed severity
II	0–35 year frequency, stand-replacement severity
III	35–200 year frequency, low and mixed severity
IV	35–200 year frequency, stand-replacement severity
V	200+ year frequency, stand-replacement severity

Fire suppression – as well as logging, domestic livestock grazing, and the introduction and establishment of non-native species – has altered much of the natural vegetation in the United States. In fire-adapted forests and woodlands, exclusion of fire often results in increased density of trees and shrubs, proliferation of ladder fuels, accumulation of dead and down fuels, a shift in composition to less fire-resilient species, and an increase in the vulnerability of older overstory trees to insects and disease; it also contributes to the establishment of invasive non-native species. These changes impact plant and animal populations. For example, acorn woodpeckers have less food and fewer potential nesting sites in the higher density narrow canopy oak and overtopping Douglas-fir than they had in the open-grown trophy-form oaks in our western Oregon oak savannas and woodlands. Sage grouse avoid shrub steppe habitats in southeast and central Oregon where western juniper has become established.

Uncharacteristically severe fires damage soils, increase stream temperatures and sedimentation, cause nutrient loss, and impact vegetation, causing mortality both above and below ground. Unnaturally frequent fires in shrub steppe habitats invaded by cheatgrass consume sagebrush, reducing nesting habitat for sage sparrows, killing or weakening native bunchgrasses and forbs and encouraging cheatgrass expansion. Quigley et al. (1996) estimated that across the inland Northwest the percentage of forests predicted to burn with high severity has increased from 20 to 50 percent from historic to current times.

To evaluate the current condition of lands in relation to their historic or "natural reference condition," the Forest Service developed a three-level classification of Fire Regime *Condition Classes* (Schmidt et al. 2002). Condition Class describes the degree to which factors like vegetation condition and structure, fire frequency, and severity depart from natural or historical ecological reference conditions. Condition Class 1 represents no, minimal, or low departure; Condition Class 2 represents moderate departure; and Condition Class 3 represents high departure (Table 2). The greater the departure, or the more highly departed the vegetation conditions, the more likely wildland fires will be uncharacteristic in relation to the historical fire behavior (severity, intensity and pattern) and further degrade vegetation structure and condition.

Table 2: Fire Regime Condition Classes from Schmidt, et al., (2002) as interpreted by Hann and Strohm (2003).

Condition Class	**Departure from Natural Range of Variation***	**Description**
Class 1	Low	Vegetation composition, structure and fuels are similar to those of the natural regime and do not predispose the system to risk of loss of key ecosystem components. Wildland fires are characteristic of the natural fire regime behavior, severity, and patterns. Disturbance agents, native species habitats, and hydrologic functions are within the natural range of variability.
Class 2	Moderate	Vegetation composition, structure, and fuels have moderate departure from the natural regime and predispose the system to risk of loss of key ecosystem components. Wildland fires are moderately uncharacteristic compared to the natural fire regime behaviors, severity, and patterns. Disturbance agents, native species habitats, and hydrologic functions are outside the natural range of variability.
Class 3	High	Vegetation composition, structure, and fuels have high departure from the natural regime and predispose the system to high risk of loss of key ecosystem components. Wildland fires are highly uncharacteristic compared to the natural fire regime behaviors, severity, and patterns. Disturbance agents, native species habitats, and hydrologic functions are substantially outside the natural range of variability.

* Natural range of variation = the ecological conditions and processes within a specified area, period of time, and climate, and the variation in these conditions that would occur without substantial influence from human mechanisms.

Schmidt et al. (2002) used this classification and remotely sensed vegetation data from the early 1990's to map Fire Regime and Condition Class at a 1-km^2 resolution for all federal and non-federal lands in the conterminous United States, excluding agricultural, barren, and urban/developed lands. They found that 38 percent of the lands assessed were

moderately altered from the natural regime (Condition Class 2) and an additional 15 percent were significantly altered from the natural regime (Condition Class 3).
While Schmidt et al.'s (2002) assessment of conditions was coarse, it identified the significant challenges and opportunities we face in restoring forest resilience, reducing risk of unnaturally severe fires, and managing lands to avoid this problem in the future.

To improve upon Schmidt et al.'s (2002) assessment, the US Forest Service, US Geological Survey, The Nature Conservancy and others are working together on a five-year mapping effort called LANDFIRE (http://www.landfire.gov/). LANDFIRE is charged with developing consistent nationwide data to more precisely identify the extent and location of wildfire risks associated with hazardous fuels, and to better target fuel reduction efforts.

LANDFIRE recently released Rapid Assessment geospatial data and models of potential natural vegetation groups, fire regimes, and fire regime condition classes for Oregon. Rapid Assessment products are mapped at a 30 meter resolution and use the most recent vegetation maps available to classify recent satellite imagery. Reference condition models and descriptions were developed with input from over 250 managers.

The LANDFIRE Rapid Assessment compares the current percent distribution of vegetation in five structural stages to modeled reference distributions. The structural stages are defined as:

- Early Seral: post replacement disturbance such as stand replacement fire, or clear cut;
- Mid Seral Closed: mid successional; mid age; competition stress; fire suppression impacted;
- Mid Seral Open: mid successional; mid age; disturbance maintained;
- Late Seral Open: late successional; mature age; disturbance maintained; and
- Late Seral Closed: late successional; mature age; competition stress.

Condition Class is determined based on the difference in percentages for each vegetation type within large landscapes (averaging 1 million acres in size). A departure between 0 and 33 percent is placed in Condition Class 1; 34-66 percent in Condition Class 2, and a departure of greater than 66 percent in Condition Class 3. For example, a difference in current and modeled reference conditions of 70 percent means that 70 percent of the acres of a given vegetation type within a subsection is not characteristic of the reference condition, so the entire unit would be mapped as Condition Class 3.

Methods

We summarized the draft LANDFIRE Rapid Assessment data to evaluate the scope of restoration needed to return reference conditions to Oregon's fire-prone forests and woodlands and to reduce fuels in the Wildland Urban Interface. Outside the Wildland Urban Interface, we targeted only those forests and woodlands where fire regimes were most likely to have played a significant role in shaping current conditions – forests and woodlands with low or mixed severity Fire Regimes with moderately or highly altered species composition and structure.

Low and Mixed Severity Fire Regimes with altered species composition and structure: We included all but one of the forest and woodland types in Fire Regimes I and III in Condition Classes 2 and 3. Generally, forests and woodlands in Fire Regimes I and III have seen more significant departures in both structure and composition due to fire suppression and are most threatened by uncharacteristically severe wildfires (Agee 1993). Condition Class 3 lands typically have the greatest fuel loads and are the most likely to generate unnaturally severe wildfires[1]. We included lands in Condition Class 2 under the assumption that acting now to restore conditions and ecological processes in these landscapes would be more feasible and less costly. We did not include Douglas-fir-hemlock dry mesic forests common in the West Cascades and parts of the Coast Range. While these forests are in Fire Regime III, they have a relatively long fire return interval of 100+ years. We assumed that changes in the structure and condition of these forests are more likely the result of harvest practices rather than fire suppression.

We did not include forests and woodlands in Fire Regimes II and IV such as lodgepole pine and subalpine fir forests, where stand-replacing fires were the norm, unless they occurred within the Wildland Urban Interface. From an ecological perspective, treating fuels to eliminate severe fires in these systems would produce unnatural habitat conditions with potential negative impact to wildlife and watersheds (Brown et al. 2004).

Wildland Urban Interface: In addition to the lands identified above, we summarized the number of acres of forests and woodlands in Fire Regimes II and IV, and one type in Fire Regime V, in all Condition Classes in the Wildland Urban Interface. We defined the boundaries of the Wildland Urban Interface using data developed by the SILVIS Lab, Department of Forest Ecology and Management, and University of Wisconsin-Madison (Radeloff et al. 2005). The SILVIS Lab used data from the US Census and USGS National Land Cover Data to create a spatially explicit map of the Wildland Urban Interface and Intermix (WUI) corresponding with the Federal Register definition of WUI. In our analysis, we included areas mapped as low-density interface and higher, and low-density intermix and higher. In Fire Regime V, we only included the acres of western juniper pumice woodlands in Eastern Oregon. While these woodlands are classified as having a low frequency of fire, they burn more frequently now, due in part to the presence of invasive species such as cheatgrass.

We did not include any west-side Fire Regime V forests inside or outside the Wildland Urban Interface. These forests are characterized by infrequent (200+ years) stand-replacing fires. Outside of extended drought, Sitka spruce, western hemlock, and mesic Douglas-fir forests are relatively insulated from wildfires and do not require treatments to make them fire safe. Altered conditions in these forests are primarily a result of timber

[1] Some of the lands mapped in both Condition Class 2 and 3 may have been assigned to these classes based on factors other than fire suppression and may not have uncharacteristic fuel accumulations, e.g. Sitka spruce-hemlock and Douglas-fir-hemlock dry-mesic forests.

harvest. While restoration of structural diversity in these second growth west-side forests may advance land management goals and objectives, the issues with these forests were beyond the scope of this paper.

We summarized the acreage data by ownership (private, tribal, FS, BLM, and Other public), and within public lands by management category and accessibility, distinguishing Wilderness and Roadless areas from all other forest designations. The existing ownership and management category layer was derived from a geospatially-explicit statewide coverage developed by the Oregon Natural Heritage Information Center (2005). To bracket our estimates of the total acres in Condition Class 2 and 3 in these forests and woodlands, we further evaluated the Rapid Assessment data to include fire regime departure values.

We calculated the number of forest and woodland acres that would need to be treated annually through the application of wildland fire use, prescribed burning, and thinning to restore reference conditions and to reduce fuels in the Wildland Urban Interface, assuming treatment periods of 20 or 25 years. Current treatment levels for *all habitats* in Oregon were taken from accomplishments reported on the National Fire Plan website (http://www.fireplan.gov/NFP_HFT_YTD.cfm?StateName=Oregon) for fiscal years 2003-2005. We estimated the number of acres of forests and woodlands treated in 2005 based on a more detailed report of accomplishments made available by the Forest Service/Bureau of Land Management's Fire and Aviation Program (2006) and coarse estimates of the percentage of the selected forest and woodland habitats described above in each of the reporting Forests and Districts.

Results

Fires resulting from both lightning and anthropogenic ignitions have played a major but varied role in shaping vegetation structure, composition, and dynamics in Oregon. The most common fire regimes in Oregon are Fire Regimes III, I, and IV, which collectively make up 79 percent of the state (Table 3; Figure 1). Fifty-five percent of Oregon's vegetation historically experienced low or mixed severity fire in Fire Regime I and III.

Forest and woodland habitats are found in each of the Fire Regimes (Table 3; Appendix). Low elevation forests, woodlands, and grasslands across the state are classified in Fire Regime I. The majority of mid-elevation forests and woodlands are classified as Fire Regime III, except in southwestern Oregon where they are also classified in Fire Regime I based on the higher fire frequencies. Forest types dominated by trees with low tolerance to fire such as Sitka spruce dominated forests on the Oregon Coast, subalpine forests at higher elevations in the Cascades, and lodgepole pine forests in Central Oregon are in Fire Regimes IV and V.

Table 3: Distribution of Fire Regimes in Oregon by percent area and major associated vegetation types.

Fire Regime	Percent Area	Common Habitats
I	24	Generally low elevation types including grasslands, oak and pine savannas and woodlands as well as mesic ponderosa pine and drier mixed conifer forests
II	8	Higher elevation and moister grasslands (Idaho fescue) and mountain big sage habitats
III	31	Drier ponderosa pine forests, more mesic Eastern Oregon mixed conifer forests, and dry to mesic Douglas-fir - hemlock forests in western Oregon, as well as juniper steppe woodlands and low sagebrush communities
IV	24	Wyoming big sagebrush and lodgepole pine forests
V	13	Moist forests such as: Douglas-fir - hemlock forests, mountain hemlock, and Sitka spruce – Hemlock; High elevation systems such as Pacific silver fir high elevation; and sparse understory vegetation types such as salt desert shrub.

There are 34,100,000 acres of forest and woodland habitats in Oregon (Figure 2; Appendix). LANDFIRE Rapid Assessment data categorized 31 million acres (91 percent) of forests and woodlands in Condition Class 2 or 3 (Figure 3). Of the 31 million acres of forests and woodlands in Condition Class 2 and 3, 20,970,000 (Figures 4 and 5) acres were classified in Fire Regimes I and III. An additional 55,000 acres of forests and woodlands in Fire Regime II, IV, and V occur within the Wildland Urban Interface[2]. Sixty percent of these forest and woodland acres are managed by public agencies, primarily the Forest Service and Bureau of Land Management (Table 4; Figure 6). The majority (84%) of these public lands (12,976,000 acres) are outside of Wilderness and Roadless Areas.

Table 4: Forest Service, Bureau of Land Management and other state and federal agencies forest and woodland acres (and percentage of each agencies' wooded acres) in select Fire Regime and Condition Classes in Oregon.

Fire Regime and Condition Class	US Forest Service Acres (%)	Bureau of Land Management Acres(%)	Other Public Acres (%)	Total Acres (%)
FR I CC2	2,991,000 (19%)	517,000 (15%)	63,000 (6%)	3,571,000 (18%)
FR I CC3	2,164,000 (14%)	542,000 (16%)	28,000 (3%)	2,734,000 (14%)

[2] WUI acres were not calculated by ownership.

Fire Regime and Condition Class	US Forest Service Acres (%)	Bureau of Land Management Acres(%)	Other Public Acres (%)	Total Acres (%)
FR III CC2	2,657,000 (17%)	750,000 (22%)	86,000 (8%)	3,493,000 (18%)
FR III CC3	3,371,000 (22%)	126,000 (4%)	48,000 (5%)	3,545,000 (18%)
Total Acres Needing Restoration	11,183,000 (72%)	1,935,000 (57%)	225,000 (22%)	13,343,000 (68%)
Total Forested (Wooded) Acres	15,449,000 (100%)	3,431,000 (100%)	1,063,000 (100%)	19,943,000 (100%)

An average of 64 percent of the lands identified in Condition Class 2 and 3 were classified as outside of reference conditions.

To restore conditions to all acres, public and private, in the categories identified above within a 20-25 year treatment period, between 840,000 to 1 million acres would need to be treated through the use of wildland fire use, prescribed fire, and thinning per year in Oregon. Looking just at public lands, annual treatment levels would need to range from 670,000 acres a year over 20 years including wilderness and roadless areas to 447,000 a year over 25 years and not including wilderness and roadless areas (Table 5).

Table 5: Annual acres of Forests and Woodlands needing treatment by category in 20, 25 year restoration timeframes.

Category	**20 Years**	**25 Years**
All lands*	1,051,000	841,000
All public lands, including WUI	670,000	536,000
All non wilderness and non roadless public lands, including WUI	559,000	447,000

* All forest/woodland acres in FR I CC 2+3, FR III CC 2+3, all FR II and IV in WUI.

Over the past three years, the federal agencies have treated between 208,000 and 368,000 acres a year on public lands *across all habitat types* in Oregon – not just forests and woodlands (National Fire Plan 2006). The Bureau of Land Management treated 30 to 48 percent of the total treatment acres over the last three years; the Forest Service treated 48 to 60 percent of the total treatment acres. For the Federal Fiscal Year 2005, of the 215,656 acres treated by the Forest Service and Bureau of Land Management in Oregon, we estimated that approximately 73 percent or 156,475 acres of forest or woodlands were treated (Table 6).

Table 6: Estimate of acres of select forest and woodland habitats treated by the Forest Service and Bureau of Land Management to reduce Hazardous Fuels in fiscal year 2005. (Overall treatment data as reported to by the USFS and BLM (as of 1/3/2006). Percent of Forest Treatments in FR I & III outside the WUI and all forest types inside the WUI coarsely approximated based on percent area in forest or woodland habitats.)

Agency-Area		**Reported Acres**	**Estimated Percentage of Forest Treatments**	**Estimated Forest Treatment Acres**
BLM	Burns District	18,326	35%	6,414
	Coos Bay	840	0%	0
	Eugene	1,248	50%	624
	Lakeview	20,427	80%	16,342
	Medford	25,550	90%	22,995
	Prineville	19,842	50%	9,921
	Roseburg	1,227	90%	1,104
	Salem-Cascades RA	93	90%	84
	Salem-Other RA	576	0%	0
	Vale-Baker RA	728	75%	546
	Vale-Other RA	11,844	10%	1,184
	Undesignated	5,780	90%	5,202
	Subtotal BLM	**106,481**	**60%**	**64,416**
Forest Service	Columbia River Gorge	403	90%	363
	Deschutes	19722	90%	17,750
	Fremont	12,563	90%	11,307
	Malheur	16733	75%	12,550
	Mt. Hood	1,327	75%	995
	Ochoco	17,159	85%	14,585
	Rogue River	2,907	90%	2,616
	Siskiyou	1,832	90%	1,649
	Siuslaw	0	0%	0
	Umatilla	8,294	75%	6,221
	Umpqua	1,077	90%	969
	Wallowa Whitman	17,405	90%	15,665
	Willamette	2	100%	2
	Winema	5,124	90%	4,612
	Undesignated	4,627	60%	2,776
	Subtotal FS	**109,175**	**84%**	**92,059**
Total FS and BLM		**215,656**	**73%**	**156,475**

Reported treatment of acreage includes thinning, prescribed fire, and wildland fires. Agencies report acres each time they are treated. Many acres may take multiple treatments to restore reference conditions over a landscape. Current data are not available on actual acres restored annually to reference conditions.

Discussion

Scope of the Problem: Concern over fuel build-up in our forests has grown in the past 10 years. Understandably, much of the effort to address the problem has focused on reducing fire risks in our Wildland Urban Interface rather than restoring ecosystem processes in our wildland forests and woodlands. While we agree with the importance of improving fire safety around our human communities, our estimates call attention to the much greater restoration needs outside the WUI and the need to take a much more comprehensive look at the problem.

Given the past 60-100 years of fire suppression, our estimated annual treatment needs make sense. Agee (1990) estimated that historically an average of 794,000 acres of Oregon's forests burned each year based on studies of the fire histories of our forests and woodlands. The bulk of the acres, some 650,000 acres, were of the low and mixed severity fire regime Ponderosa pine and mixed conifer forests.

Here we have estimated that the annual rate of treatment needed to restore forest and woodland conditions on public lands and increase safety in the Wildland Urban Interface over the next 20-25 years is 3.3 to 4.6 times current agency treatment rates. The gap between current and needed treatment levels appears to be greater on Forest Service managed forest lands than on Bureau of Land Management holdings.

While our numbers call for a substantial increase in treatment efforts, consideration of several additional factors could further increase the actual annual treatment needs. First, we based our estimate on the assumption that only one treatment is needed per acre. In reality, the Condition Class 3 lands (6,257,000 acres) will, in most cases, need more than one treatment over the course of several years – one or more manual or mechanical treatments to reduce fuel loads and help restore composition and structure, slash disposal or biomass removal, and prescribed fire to reintroduce natural processes. Using the same approach to counting treatment acres currently used by the Forest Service and Bureau of Land Management, and assuming that the Condition Class 3 forests and woodlands we selected would need at least two treatments, our estimates of the annual treatment levels would increase by at least 33 percent.

Added to this, active management is needed to maintain stands in Fire Regime I and III that are currently in Condition Class 1; and for some habitats, re-treatment may be necessary within the 20-25 year treatment period. The Rapid Assessment data identified 780,000 acres of forests and woodlands on public land in Fire Regimes I and III, Condition Class 1. Prescribed fire should be the preferred management tool for initial treatment or re-treatment in these circumstances both based on cost and the added value of restoring the ecological processes. In addition, while we excluded forests in Fire Regime II and IV from our analysis, fire plays an important role in these forests as well. Allowing wildland fire and/or using prescribed fire to periodically burn these forests outside of the Wildland Urban Interface should also be considered in a comprehensive fire management strategy.

Developing a Statewide Strategy: Federal agencies and presumably state and private managers will need to significantly increase current efforts to restore natural conditions and reduce fuels in the Wildland Urban Interface in Oregon, whether we focus on the 13 million acres we identified as priorities for treatment on public land outside of wilderness and roadless areas or consider treatment needs for all habitats in Oregon.

In a report to the Oregon Department of Forestry, the Forest Fuels and Hazardous Mitigation Committee (2004) echoed the General Accounting Office's (1999) call for development of a comprehensive fuels management strategy. The committee recommended the development of a statewide strategy and stated that, "Over the long run, investment in fuels treatments and maintenance may be among the most cost effective uses of the state's limited wildfire protection resources. The greatest return on the investment would be gained by addressing the problem at the landscape level through coordination…" across agencies. We agree with their recommendation. From our perspective such a strategy should:

1) Look beyond the task of reducing the risk of unnaturally severe fires or using excess biomass. Instead, it should work to identify the actions, resources, infrastructure, and human capacity necessary to restore forest conditions and fire. Fire is a critical ecological process and cost effective management tool for maintaining our forests and woodlands once fuel loads have been reduced to safe conditions;
2) Address all ownerships and management categories including wilderness and roadless areas using appropriate treatment tools for each setting. Each ownership and management designation has different resource goals and sensitivities. For private industrial forest lands, reducing the risk of fire by creating fire breaks may be the best prescription. For wilderness and roadless areas, use of prescribed fire and wildland fire use are the best treatment options to restore natural disturbance patterns;
3) Allow for the occurrence of severe fires in the forests and woodlands in Fire Regimes II and IV (and in some cases V), where safety allows, to maintain the structural diversity and dynamics of those systems;
4) Adequately evaluate and address impacts to aquatic habitat conditions through modification of the rate and methods of treatment; and to at-risk species that may now occupy stands where fire suppression has resulted in modified habitat conditions;
5) Include strong monitoring and adaptive management to improve our approach as we go;
6) Adequately finance forest restoration through a combination of business and landowner incentives as well as public investments to minimize the need to compromise ecological goals and treatment criteria; and
7) Keep forest values first by carefully sizing biomass energy production and new milling facilities to avoid over-taxing the surrounding forests.

To do this, first and foremost a collaborative effort should be undertaken to develop a statewide "desired condition" blueprint for the restoration of Oregon's forests and woodlands. In addition to the benefits to Oregon's forests and woodlands, a blueprint such as this would provide a better perspective to evaluate and take advantage of any economic opportunities associated with restoration. In particular it would help to address one of the most often cited constraints to biomass utilization – lack of a predictable long-term biomass supply (Forest Biomass Workgroup 2006, Almquist, B. 2005, BLM, http://www.blm.gov/nhp/efoia/ wo/fy04/im2004-227attach3.pdf).

A statewide blueprint should address four key considerations: (1) the safety of humans and infrastructure, (2) restoration and maintenance of native biodiversity and ecosystem services, (3) potential environmental impacts from treatments, and (4) cost. It should be developed with input from a wide range of experts including scientists, conservationists, public and private land managers, private energy and timber industry interests, and community leaders.

In developing the blueprint, a more detailed evaluation of the upcoming LANDFIRE National data should be done to refine our assessment of the scope of the problem. This assessment should incorporate additional data on stand structure, consider natural variation in fire frequency and fuel conditions, assess reasonable implementation periods based on potential effects on endangered species habitat, air quality, and understory vegetation, and evaluate regional differences in current conditions. In addition, this panel should review and develop a consensus view of the best available science on treatment tools and develop a common approach to the development of landscape level treatment plans and analysis of treatment goals and options.

Second, the more detailed analysis developed above should be combined with additional biological and conservation data and existing conservation plans such as the Oregon Conservation Strategy (ODFW 2005), Northwest Power and Conservation Council Subbasin Plans, agency land and resource management plans, and our own ecoregional conservation assessments to define goals and set priorities related to the ecological outcomes or desired condition for our forests and woodlands.

Third, socio-economic data including data from community fire protection plans, distribution of private lands and existing road networks, energy transmission networks, biomass energy plants and mills, confined airsheds, and workforce capacity should be overlaid on the assessment results and biological and conservation data to: (a) assess the needs for public safety and infrastructure protection, (b) evaluate opportunities and constraints to treatment methods, and (c) evaluate infrastructure and other logistical constraints to implementation.

With this statewide assessment to set the context for forest and woodland restoration in Oregon, entrepreneurs will be able to identify promising opportunities to fill gaps in current infrastructure such as biomass energy facilities to address existing logistical barriers. In addition to the logistical constraints, an analysis should be done of the administrative and legal barriers to implementation using the results of the strategic assessment to guide the proposed changes to best meet the ecological needs of our forests.

Designing Treatments: To be effective, however, the statewide strategy should be detailed out in local to mid-scale (up to 1 million acres) treatment plans that address the unique characteristics of our varied landscapes. Each forest stand has a different combination of species and environmental conditions, with a different history that will require a unique combination of treatment methods and goals. In addition, treatments planned at the landscape-scale may result in lower overall treatment costs. Hann and Strohm (2003) compared predicted costs of no treatment, a Wildland Urban Interface focused treatment approach, and a landscape treatment approach and found that the landscape approach to treatment was the most cost-effective. The LANDFIRE Rapid Assessment data are still too coarse in scale and classification. More detailed assessment data will be needed to set landscape goals and drive landscape restoration and treatment plans.

At the landscape scale, goals for ecological restoration can be shaped from the more detailed LANDFIRE National Fire Regime Condition Class maps and modeling efforts due out in the near future as well as complementary modeling efforts currently in progress in Oregon such as the Interagency Mapping and Analysis Project or IMAP. LANDFIRE models describe the percent area that would be in each of five different structural or successional states for each forest type (early successional, mid seral closed, mid seral open, late seral open, and late seral closed), given a natural fire regime and the absence of human intervention.

The Interagency Mapping and Analysis Project being led by the Forest Service and Oregon Department of Forestry is expanding the five structural or successional classes in the LANDFIRE models to up to 30 structural states for each potential vegetation type in Oregon. This more detailed modeling incorporates vegetation structural states that are important for different wildlife species and provides the ability to predict wildlife response to forest treatments. In addition, by comparing the difference between the existing conditions and the desired conditions described in these more detailed assessments we will be able to estimate how much wood and biomass can be removed to restore each stand to its desired condition.

From these modeled predictions we can lay out initial and long-term treatment plans. At the coarsest scale, treatment priorities and methods should consider Fire Regime, Condition Class, and relationship to the Wildland Urban Interface. In addition, treatment plans should consider site characteristics, the presence of sensitive ecological features such as endangered species or old-growth, and potential impacts to air and water quality (Brown and Aplet 2000; Brown et al. 2004, DellaSala et al. 2004, Forest Fuels and Hazard Mitigation Committee 2004). In particular, the potential impacts of fuel treatments on aquatic habitat conditions need to be evaluated. Thinning intended to remove fuels or to replace fire may remove a legacy of materials that would structure aquatic habitats in the future or result in sedimentation. In few or no cases should new roads be built for the purposes of forest restoration both due to the chronic management costs and chronic or persistent impacts. Fireshed assessments can be done to design the pattern of treatments across the landscape to interrupt fire spread – to get the maximum reduction of fire risk with treatment of a fraction of the landscape (Hann and Strom 2003, Rapp 2005).

Conclusions

We need to dramatically increase our efforts to restore conditions to native habitats over current efforts. To do this we will need to continue to improve data, build capacity and resources, and evaluate and remove barriers to implementation. From both an efficiency and effectiveness standpoint, we need to develop a comprehensive statewide strategy supported by local and mid-scale assessment and implementation plans that addresses all ownerships from an ecological perspective and implement this work in a rigorous adaptive management framework. At the heart of this effort, we need to develop a consensus blueprint that gives us the vision and a roadmap to the future of our forests.

While we can be strategic in our treatment approach, ultimately all acres should be treated to restore ecosystem processes. New data developed nationally and here in Oregon are ready to inform such a process at the state scale, and more detailed data will be ready soon to inform regional scale implementation plans. But, to use the new data to make a difference on our native ecosystems, we will need to engage the support, resources, creativity, and expertise of diverse stakeholders through a collaborative process.

From our perspective of biodiversity conservation, it is critical that Oregonians unite to develop a well-planned, long-term statewide approach that looks well beyond the reduction of catastrophic fires in the Wildland Urban Interface, to achieve the much greater task of restoring our forest and woodland ecosystems. With strong community protection and ecological goals driving the plan, we can then find the most effective ways to build infrastructure and a workforce that can take maximum benefit from the material we take off the forests. For areas identified as high value for conservation, to the greatest extent possible, short-term mechanical removal of biomass to restore forest conditions should be replaced with the use of prescribed fire and in some areas wildland fire to maintain conditions and the dynamic nature of our forests and woodlands into the future.

Over the long run, investments in fuels treatments and maintenance may be among the most cost effective uses of the state's limited wildfire protection resources. The greatest returns on these investments (social, ecological and economic benefits) will be realized through landscape level coordination of treatment funding, equipment and human resources.

We recognize others will have other critical perspectives, resources, and constraints that will need to be brought to the table to develop a workable plan. While there will be a number of difficult challenges, if we are successful we can have improved conditions for biological diversity, create jobs for rural communities, and better use our natural resources to meet societal demands.

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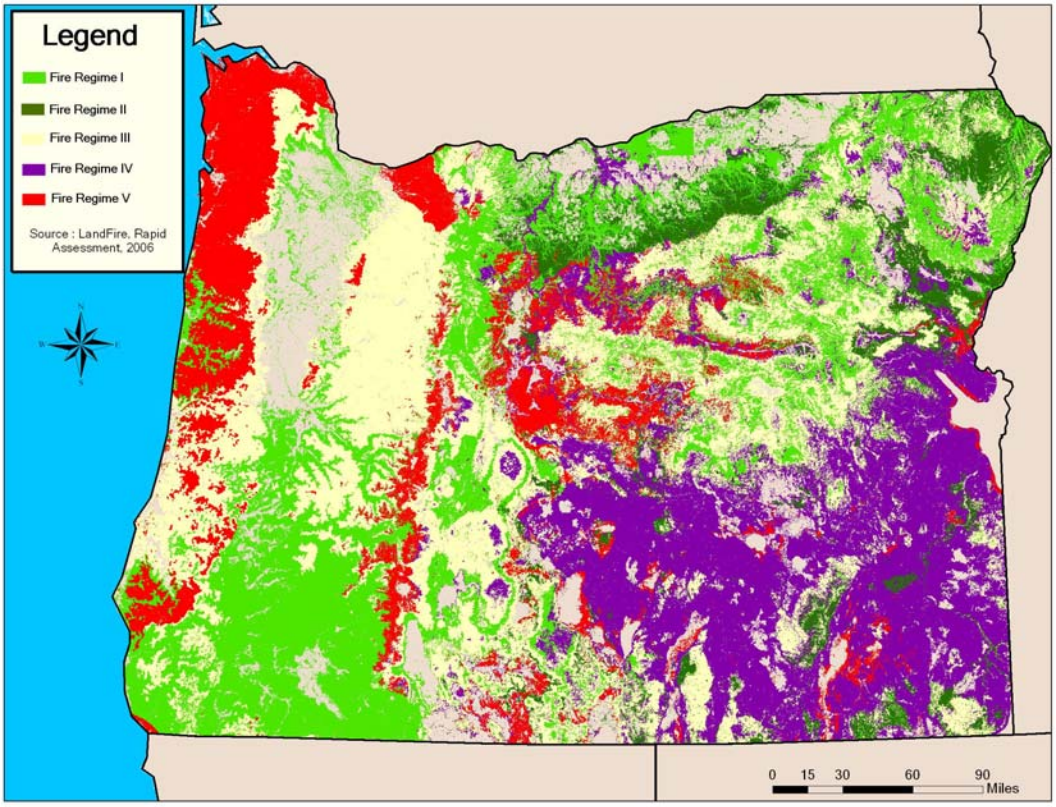

Figure 1: Distribution of Fire Regimes in Oregon (source: LANDFIRE Rapid Assessment)

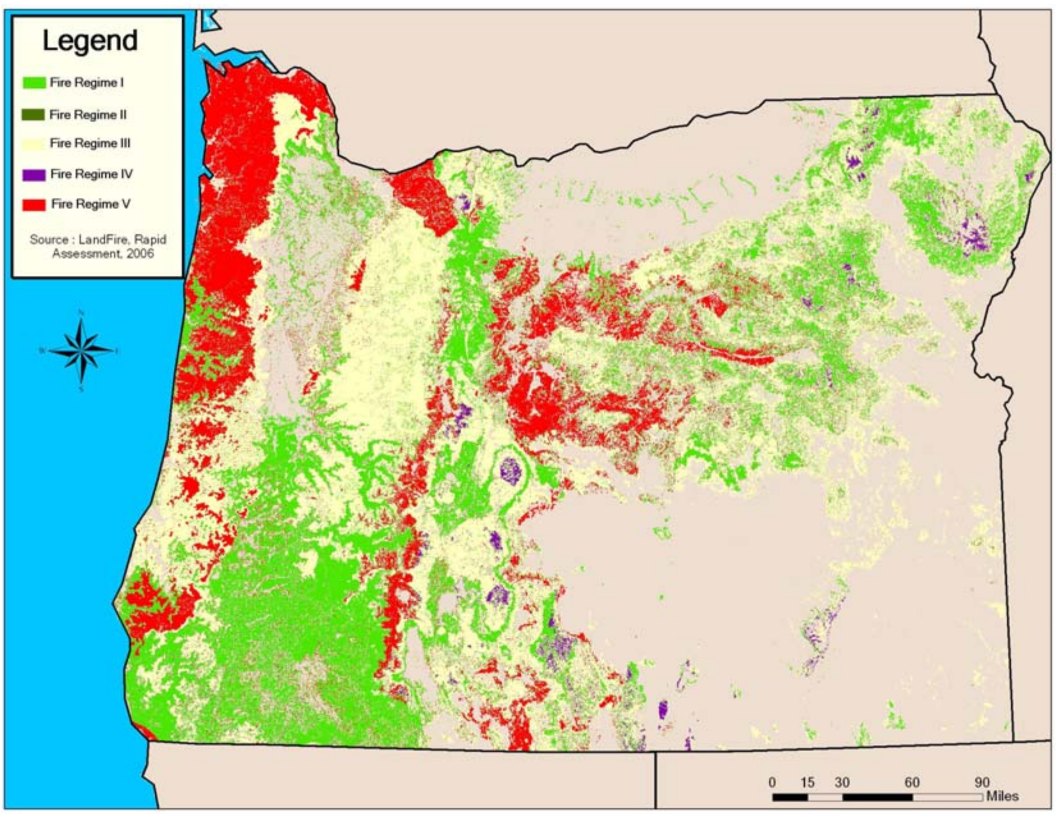

Figure 2: Distribution of forest and woodland habitats in Oregon by Fire Regime (source: LANDFIRE Rapid Assessment)

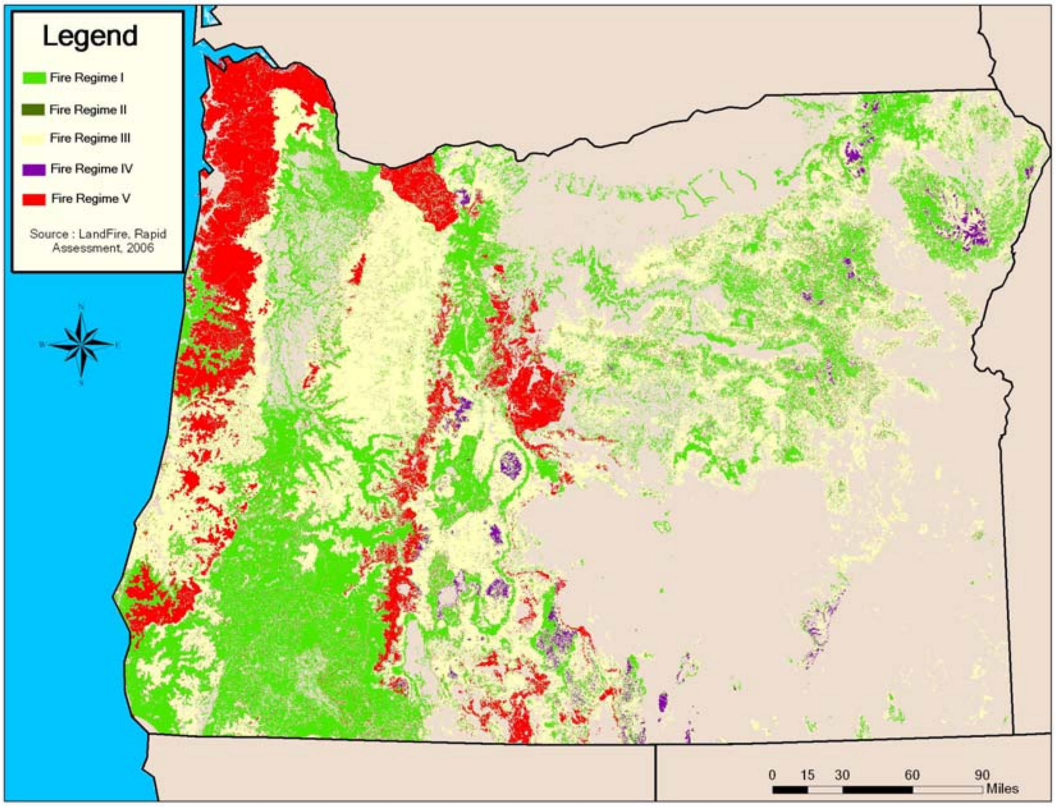

Figure 3: Distribution of all forests and woodlands in Condition Class 2 and 3 by Fire Regime (source: LANDFIRE Rapid Assessment)

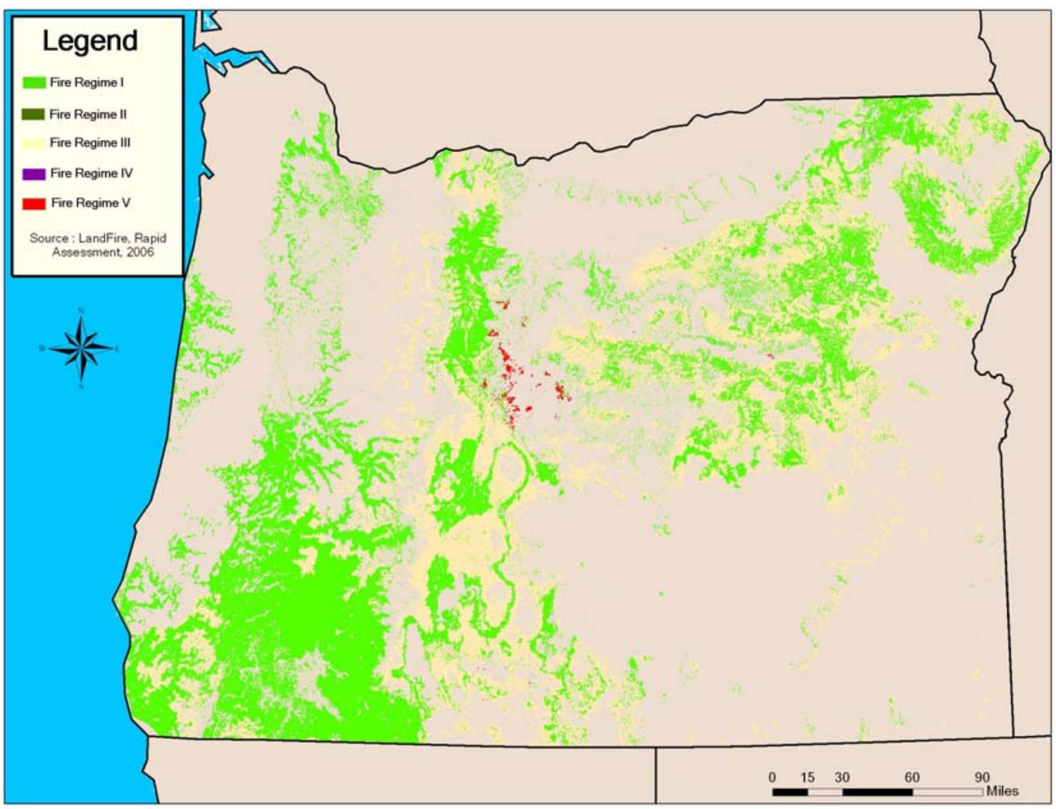

Figure 4: Distribution of forest treatment areas by Fire Regime. Select forest and woodland types include all types in Fire Regimes I and III Condition Class 2 and 3 except Douglas fir dry-mesic forests; all types in Fire Regimes II and IV in the Wildland Urban Interface; and the Western Juniper pumice woodland in Fire Regime 5 in the Wildland Urban Interface and Intermix. (source: Forests and Woodlands Fire Regime Condition Class data from LANDFIRE Rapid Assessment; Wildland Urban Interface and Intermix data from Radeloff et al. (2005); ownership data from ONHIC (2005)).

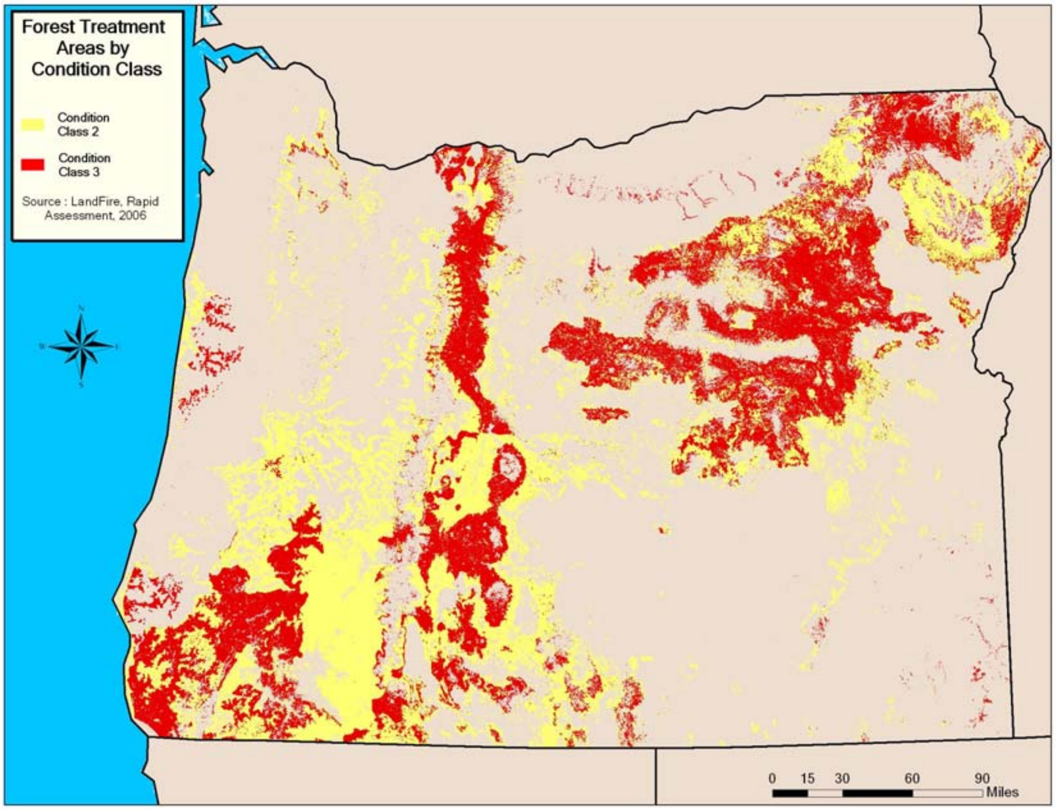

Figure 5: Distribution of forest treatment areas by Condition Class. Select forest and woodland types include all types in Fire Regimes I and III Condition Class 2 and 3 except Douglas fir dry-mesic forests; all types in Fire Regimes II and IV in the Wildland Urban Interface; and the Western Juniper pumice woodland in Fire Regime 5 in the Wildland Urban Interface and Intermix. (source: Forests and Woodlands Fire Regime Condition Class data from LANDFIRE Rapid Assessment; Wildland Urban Interface and Intermix data from Radeloff et al. (2005); ownership data from ONHIC (2005)).

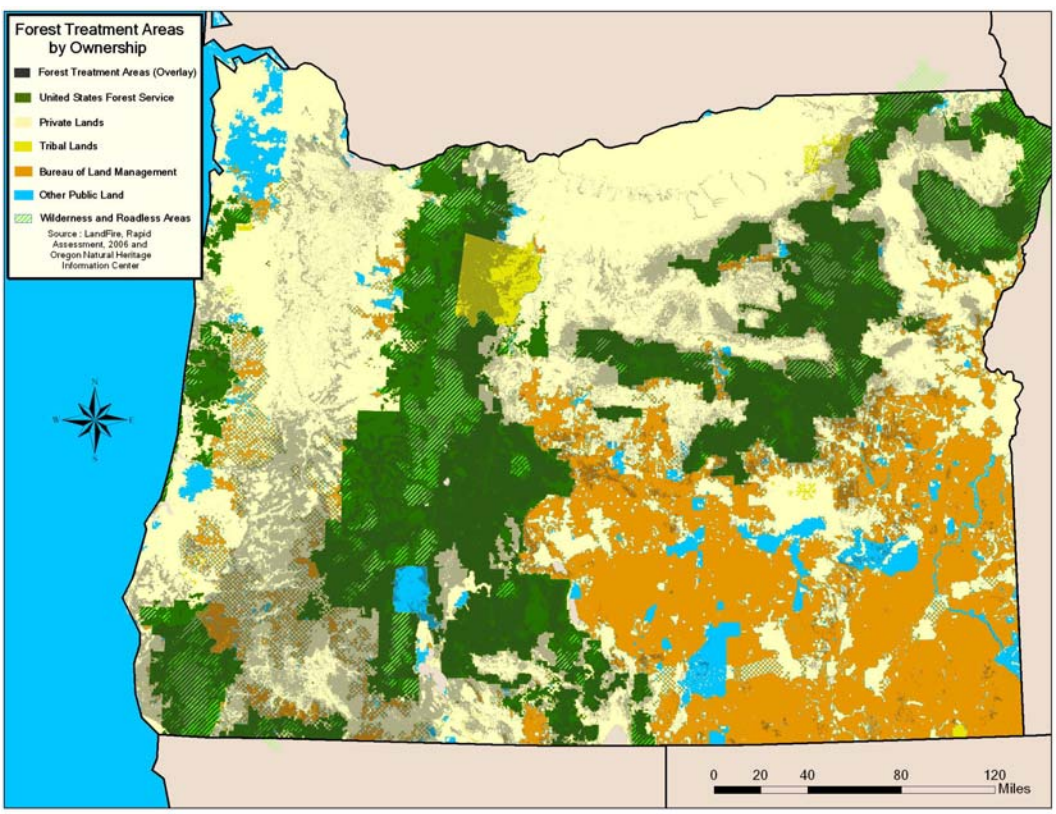

Figure 6: Ownership and management status (Wilderness and Inventoried Roadless Areas) of forest treatment areas

APPENDIX: Potential Natural Vegetation Types by Fire Regime and Condition Class, Ownership and Status (Wildland Urban Interface, Wilderness & Roadless)

PNV	Fire Regime / Condition Class	Total Acres	Ownership (acres)						Wildland Urban Interface		Wilder-ness/Roadless Acres
			BLM	Tribal	USFS	Other Public	Unknown	Private	Interface	Intermix	
Alpine and Subalpine Meadows and Grasslands	FR5_CC1	17,084	13	157	16,850	24		30			15,425
Alpine and Subalpine Meadows and Grasslands	FR5_CC2	1,244			1,058	77		105			911
Alpine and Subalpine Meadows and Grasslands	FR5_CC3	9			9						
Basin Big Sagebrush	FR4_CC2	6						6			
Black and Low Sagebrushes	FR3_CC3	3,555	3,273					277			
Bluebunch Wheatgrass	FR1_CC1	137,774	3,307	1,477	59,563	4,445	588	66,087	80	681	40,949
Bluebunch Wheatgrass	FR1_CC2	763,870	3,790	10,106	636	3,738	136	744,711	87	1,377	57
Bluebunch Wheatgrass	FR1_CC3	482,082	12,940	6,499	8,358	12,113	244	441,124	1,038	6,422	701
California Mixed Evergreen	FR3_CC1	1,277			968			309			
California Mixed Evergreen	FR3_CC2	4,724	86		4,077	31		529		24	2,923
California Mixed Evergreen North	FR1_CC1	2,937	944		396			1,597		220	
California Mixed Evergreen North	FR1_CC2	1,045,276	139,636	828	161,179	7,963	265	735,405	14,733	112,417	7,124
California Mixed Evergreen North	FR1_CC3	1,037,186	385,093		131,256	9,520	26	511,291	895	45,496	15,202
California Oak Woodlands	FR1_CC2	327			256	0		70			181
Coast Redwood	FR1_CC3	619			389	29		201	4	5	395
Coastal Scrub/Coastal Prairie	FR1_CC3	279			236			31			231
Cold Douglas-fir	FR3_CC2	46			46						46
Creosotebush Shrublands With Grasses	FR5_CC2	174	10		105			58		0	
Douglas-fir Hemlock-Dry Mesic	FR2_CC2	7,048				6,860		188			
Douglas-fir Hemlock-Dry Mesic	FR2_CC3	94						94			
Douglas-fir Hemlock-Dry Mesic	FR3_CC3	1,101,428	28,700	27	25,465	19,585		1,027,651	27,856	177,849	8,397
Douglas-fir Hemlock-Dry Mesic	FR3_CC2	3,589,125	476,220	4,111	1,393,330	107,634		1,607,830	3,125	59,679	245,074
Douglas-fir Hemlock-Wet Mesic	FR5_CC2	937,210	168,254	3,969	321,089	63,503		380,395	9	714	25,549
Douglas-fir Hemlock-Wet Mesic	FR5_CC3	2,141,463	84,474	10,336	381,101	462,446	773	1,202,332	3,384	99,342	82,920
Douglas-fir Willamatte Valley Foothills	FR1_CC2	894,002	59,924	425	43	3,807	11	829,792	21,912	159,464	
Douglas-fir Willamatte Valley Foothills	FR1_CC3	22,036	9,748		3			12,285		4	
Dry Ponderosa Pine - Mesic	FR1_CC2	1,815,810	138,027	34,699	967,137	15,869	537	659,541	2,625	18,090	31,836
Grand fir/Douglas-fir/Larch Mix	FR3_CC2	163			163						143
Idaho Fescue Grasslands	FR2_CC1	604,964	8,740	154	240,372	4,125	1,258	348,817	46	119	173,952
Idaho Fescue Grasslands	FR2_CC2	1,336,100	68,669	9,080	52,688		1,356	1,196,142	305	1,266	9,674
Idaho Fescue Grasslands	FR2_CC3	439,830	87,059	8,249	38,547	6,459	93	298,920	254	2,797	1,299
Interior Ponderosa Pine	FR1_CC3	500	495					4			
Juniper and Pinyon Juniper Steppe Woodland	FR2_CC1	4		4							
Juniper and Pinyon Juniper Steppe Woodland	FR2_CC2	21						21			
Juniper and Pinyon Juniper Steppe Woodland	FR3_CC3	35,578	27,822		131	4,503		3,122	0	2	
Juniper and Pinyon Juniper Steppe Woodland	FR3_CC1	907,598	140,303	15,839	323,644	9,179	289	418,344	405	2,549	41,125
Juniper and Pinyon Juniper Steppe Woodland	FR3_CC2	1,183,083	438,065	9,489	296,683	40,227	735	397,885	213	4,843	130,700
Lodgepole Pine - Pumice Soils	FR4_CC2	79,168	106	37	70,305	531		8,189		17	28,405
Lodgepole Pine - Pumice Soils	FR4_CC3	31,304	271		28,343	209		2,481			10,033
Low Sagebrush	FR3_CC1	6,666	3,546		234	0	48	2,551		99	
Low Sagebrush	FR3_CC3	297,051	251,351	1,521	2,374	2,777		38,552	21	249	353
Low Sagebrush	FR3_CC2	1,072,667	773,619	8,003	13,427	137,083	100	138,602	77	401	658
Marsh	FR2_CC1	1,582	16		101	16		1,364	8	196	64
Marsh	FR2_CC2	6,285	846	22	175	624	29	4,273	72	111	92
Marsh	FR2_CC3	19,141	1,601	32	3,985	1,950	351	11,134	70	97	72
Mixed Conifer - Eastside Dry	FR1_CC1	7,690	251	1,144	1,544			4,751	50	1,986	4
Mixed Conifer - Eastside Dry	FR1_CC2	1,366,944	14,960	37,530	963,504	16,043	1,463	333,445	2,542	9,876	238,514
Mixed Conifer - Eastside Dry	FR1_CC3	1,822,786	6,626	212,616	1,408,463	6,175	341	188,566	46	2,768	448,173
Mixed Conifer - Eastside Mesic	FR3_CC1	122,644	104	10	88,758	39	9	33,724	4	1,822	40,809
Mixed Conifer - Eastside Mesic	FR3_CC2	795,056	1,939	37,747	635,347	22,882	228	96,912	20	814	233,516
Mixed Conifer - Eastside Mesic	FR3_CC3	1,738,948	34,451	246	1,395,723	20,237	87	285,905	3	2,612	85,140
Mixed Conifer - North Slopes	FR1_CC3	3,807	17		3,659			131			26
Mixed Conifer - South Slopes	FR1_CC3	3,696	0		3,558			138			19
Mixed Conifer - Southwest Oregon	FR1_CC2	1,241,936	130,506		866,417	5,994		239,019	1,382	13,768	97,285
Mixed Conifer - Southwest Oregon	FR1_CC3	297,565	49,458	10,389	166,686	7,248	1	63,781	7	85	61,273
Montane Chaparral	FR1_CC1	19	10		7			2			
Montane Chaparral	FR1_CC2	8,692	1,672	3	2,625	4	12	4,368		25	82
Mountain Big Sagebrush	FR4_CC1	22,744	22,494					214			
Mountain Big Sagebrush (Cool Sagebrush)	FR2_CC2	1,083,169	624,561	9,665	7,583	70,686	598	368,452	1,182	2,158	870
Mountain Big Sagebrush (Cool Sagebrush)	FR2_CC3	527,818	43,348	3,021	161,398	5,575	42	312,894	4,876	10,047	7,015
Mountain Big Sagebrush Steppe and Shrubland	FR4_CC2	72			33						27
Mountain Grassland	FR2_CC2	13,537			9,037						5,655
Mountain Hemlock	FR5_CC2	16,117	29	431	15,656			1			8,877
Mountain Hemlock	FR5_CC3	500,093	62	8,550	387,952	103,359	78	92			302,793
Mountain Shrub--non Sagebrushes	FR4_CC2	40			13						13
Oregon Coastal Tanoak	FR1_CC1	13						13	0	1	
Oregon Coastal Tanoak	FR1_CC2	242,386	6,874	86	18,045	6,769		210,612	1,681	49,966	1,558
Oregon Coastal Tanoak	FR1_CC3	867,284	90,419	403	446,378	3,336	4	326,743	363	11,774	209,574
Oregon White Oak	FR1_CC1	105			6	11		88			
Oregon White Oak	FR1_CC2	370,685	25,252	54	5,090	3,934	106	336,248	13,274	70,419	784
Oregon White Oak	FR1_CC3	49,516	54		12	718		48,730	3,855	20,686	12
Oregon White Oak/Ponderosa Pine	FR1_CC1	15,316	276	10,013	1,834	621	49	2,509	2	334	704
Oregon White Oak/Ponderosa Pine	FR1_CC2	58,386	912	27,730	8,271	2,489	86	18,898	187	1,419	1,954
Oregon White Oak/Ponderosa Pine	FR1_CC3	85,487	26	1,575	1,085	646		82,155	240	292	709
Pacific Silver Fir--High Elevation	FR5_CC2	326,993	73	1,032	318,046	3,871	5	3,966			176,742
Pacific Silver Fir--High Elevation	FR5_CC3	30,380			28,660	1,720					8,360
Pacific Silver Fir--Low Elevation	FR3_CC3	42	15		3			24			
Pacific Silver Fir--Low Elevation	FR3_CC2	565,115	7,445	3,520	543,096	1,154		9,900			180,439
Pine Savannah - Ultramafic	FR1_CC1	335,841	51,274		156,940	2,543	129	124,955	1,252	33,557	104,951
Pine Savannah - Ultramafic	FR1_CC2	2,295	596		663			1,035		5	6
Ponderosa Pine - Douglas-Fir	FR1_CC2	99			99						21
Ponderosa Pine - Xeric	FR3_CC2	1,509,074	198,857	16,837	753,448	12,102	756	527,076	1,800	16,329	12,073
Ponderosa Pine - Xeric	FR3_CC3	3,217,286	55,103	65,760	1,887,580	22,027	1,469	1,185,348	1,611	18,577	192,009

Ponderosa Pine Northern and Central Rockies	FR1_CC3	1,934			1,934						1,511
Ponderosa Pine-Black Hills-Low Elevation	FR1_CC1	16			16						16
Ponderosa Pine-Northern Great Plains	FR1_CC1	1			1						1
Red Fir	FR3_CC2	587,538	103,637		418,524	9,460		55,916			181,314
Red Fir / Western White Pine	FR3_CC3	611			538	20		53			491
Red Fir / White Fir	FR3_CC3	22			21	2					14
Red Fir / White Fir	FR3_CC2	5,307			5,295			12			58
Salt Desert Shrub	FR5_CC2	256,333	190,523	38	82	10,168	134	55,016	15	50	4
Salt Desert Shrub	FR5_CC3	297,750	162,376	21	325	15,189	4,853	114,191	111	663	62
Saltbush	FR4_CC2	47	7					39			
Sierra Nevada Lodgepole Pine - Dry Subalpine	FR1_CC3	114			112			1			112
Sitka Spruce - Hemlock	FR5_CC1	356,292	2,642	439	58,654	29,896	45	264,615	4,751	50,331	8,541
Sitka Spruce - Hemlock	FR5_CC2	12,564	55		360	2,099		9,666	128	1,608	248
Sitka Spruce - Hemlock	FR5_CC3	82			62	20		26		12	
Spruce - Fir	FR4_CC2	510,453	28,115	351	455,933	6,559	13	19,481		253	249,032
Spruce - Fir	FR4_CC3	12,754	5,182		22	2,603		4,946			5
Subalpine Fir	FR4_CC2	5,792		6	5,786						3,026
Subalpine Woodland	FR3_CC2	329	3		11	257		58		2	9
Subalpine Woodland	FR3_CC3	98,889	9,061	5	86,825	835	2	2,163			81,974
Western Juniper Pumice	FR5_CC1	1,207,793	223,612	73,375	56,597	10,061	275	843,872	46	2,688	2,990
Western Juniper Pumice	FR5_CC2	868,384	284,630	43,217	144,765	5,435	643	389,695	2,370	49,021	6,545
Western Juniper Pumice	FR5_CC3	1,098		10	1,029		59				
Wyoming Big Sagebrush	FR4_CC3	1,476			1,298			0			1,281
Wyoming Big Sagebrush Semi Desert with Trees	FR4_CC3	116			116						98
Wyoming Big Sagebrush Semi-Desert	FR4_CC1	1,350,286	819,954	1,911	1,277	47,390	234	477,493	151	794	59
Wyoming Big Sagebrush Semi-Desert	FR4_CC2	2,451,611	1,835,223	2,056	5,589	178,620	289	426,939	253	448	5
Wyoming Big Sagebrush Semi-Desert	FR4_CC3	111,875	59,819			16,835		35,018		7	
Wyoming Sagebrush Steppe	FR4_CC1	274,484	164,852		202	6,608		102,392		2	
Wyoming Sagebrush Steppe	FR4_CC2	6,733,646	5,003,233	30,293	13,820	436,077	1,057	1,241,256	1,438	6,176	1,647
Wyoming Sagebrush Steppe	FR4_CC3	1,117,806	48,791	19,476	90,180	14,934	1,559	940,469	9,352	19,812	12,939
		53,543,467	13,626,327	744,623	16,181,315	2,038,581	21,467	20,886,356	130,212	1,095,717	3,846,460

Calculation of acres needing restoration

		FS	BLM	Other Pub	Private	Tribal	Unknown	Wilderness/ Roadless Acres
Total Forest in FR I CC2	7,038,144	2,990,703	516,687	62,869	3,364,065	101,353	2,468	379,263
Total Forest in FR I CC3	4,192,528	2,163,536	541,937	27,673	1,234,028	224,983	373	737,006
Total Forest in FR III CC2*	4,650,435	2,656,691	750,031	86,113	1,088,288	67,593	1,718	741,221
Total Forest in FR III CC3*	5,089,078	3,370,821	126,451	47,623	1,476,614	66,011	1,558	359,628
Total Forest veg in FR II in WUI	0							
Total Forest veg in FR IV in WUI	270							
Total Forest veg in FR V in WUI	54,395	45,692	8,703					
Total Priority Treatment acres	**21,024,850**							

Total Priority Treatment acres by Ownership:	
Forest Service	11,227,442
Bureau of Land Management	1,943,810
Other Public	224,278
Private	7,162,994
Tribal	459,939
Unknown	6,387
Priority Treatment acres on public land	**13,395,530**
Priority Treatment acres on public land outside of wilderness and roadless areas	**11,178,412**

Acres needing treatment each year if all acres are to be treated within:	***15 years***	***20 years***	***25 years***
Total Priority Treatment acres	**1,401,657**	**1,051,242**	**840,994**
Priority Treatment acres on public land	**893,035**	**669,776**	**535,821**
Priority Treatment acres on public land outside of wilderness and roadless areas	**745,227**	**558,921**	**447,136**

*** Douglas fir-Hemlock - Dry Mesic forest NOT included in calculation.** **See page 5.**

Total vegetation and forest/woodland vegetation by Fire Regime and by Condition Class

Category	**Acres**	**%**	**Category**	**Acres**	**%**		
Total veg in FRCC1	5,373,129	10%	Total Forest veg in FRCC1	2,957,526	9%		
Total veg in FRCC2	31,768,949	59%	Total Forest veg in FRCC2	18,041,455	53%		
Total veg in FRCC3	16,401,389	31%	Total Forest veg in FRCC3	13,102,601	38%		
Total veg in OR	53,543,467		Total Forest (and woodland) veg in OR*	34,101,581			
Total veg in FR I	12,985,307	24%	Total Forest veg in FR I	11,592,591	34%	**Category**	**Acres**
Total veg in FR II	4,039,592	8%	Total Forest veg in FR II	7,167	0%	Total Forest veg in FR II in WUI	0
Total veg in FR III	16,843,822	31%	Total Forest veg in FR III*	15,463,884	45%		
Total veg in FR IV	12,703,683	24%	Total Forest veg in FR IV	639,471	2%	Total Forest veg in FR IV in WUI	270
Total veg in FR V	6,971,063	13%	Total Forest veg in FR V	6,398,469	19%	Total Forest veg in FR V in WUI	54,125
Total veg in OR	53,543,467		Total Forest (and woodland) veg in OR	34,101,581			

*** Douglas fir-Hemlock-dry mesic forest INCLUDED in the calculation**