Abstracts

Restoring Ecosystems: Fire Ecology, Planning, and Application in Western Oregon

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Fire in western Oregon – new challenges from the past, new challenges for the future.

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Recent syntheses of tree-ring-based, fire history studies covering the past 500 years in western Oregon reveal a pattern of more extensive fire in the ca. 1500s and the 1800s, probably reflecting climate and some human influences particularly since 1850 AD in the latter case (Berkley 2000; Weisberg and Swanson in press). The apparent extensive burning in the ca. 1500s period does not appear as an anomaly in the multi-millennial pollen and charcoal record from several western Oregon lakes. Together these observations suggest continuity of fire as a significant component of the western Oregon forest landscape over the past few millennia, but also a pattern of substantial inter-century variability.

Our knowledge of fire regimes, including aspects of time, spatial pattern, and severity, is limited in several important respects. For example, we know little about the character of fire within the periods of more extensive burning, in part because of limited dating resolution. However, field counts of tree rings suggest that multiple fires occurred in individual landscape study areas with moderate and low-severity fire regimes during the century-long periods of extensive burning. We also know little about the temporal variability of fire severity, which raises interesting questions about interactions of severity with long-term climate fluctuations; for example, was fire less severe in periods of presumably less favorable climate for fire?

Aspects of the fire history of the region raise interesting questions concerning current perspectives on forest preservation and management. How would the old-growth forest issue be viewed at times in the past with other distributions of age classes of forest? At present we see a strong differentiation of old growth (much of the remaining old growth is in the 400-500 age class) and mature stands (mainly 80-150 years in age). The widespread old-growth age class is old enough to have well developed features considered indicative of old growth, yet in many cases these old-growth forests are young enough to retain a canopy with a strong component of shade-intolerant trees. Today's extensive areas of the mature age class reflect in part the influences of European settlers, travels, sheepherders, and other land users as ignition sources. Blanket protection of this

age class on Federal lands might create a shadow of early Euro influence rather than a reflection of natural disturbance processes.

How is an understanding of fire history and native fire regimes relevant to restoration and management of forests, landscapes, and watersheds? Fire regimes have been considered in planning management of forest stands (e.g., restoring fire to sustain valued trees, such as giant sequoia), landscape patterns (e.g., Blue River Landscape Plan (Cissel et al. 1999)), and interpretation of historic patterns of aquatic habitat conditions over watersheds in time and space (e.g., Reeves et al. 1995).

Further work is needed (and in some cases underway) to improve understanding of past fire regimes and their relation to climate variability in the Pacific Northwest. This work should be conducted in concert with people studying other regions of the western U.S. We need to address, for example, the tree-ring record of fire dating from before 1500 AD, refine dating of fires with high resolution techniques, extend tree-ring and charcoal analyses to areas with fire regimes not yet sampled, examine the dendroclimatological record of western Oregon for as deep a record as can be achieved, unravel to the extent possible the varied effects of native people on fire regimes across western Oregon ecosystems, and attempt to anticipate the effects of fire management and climate variability in the future. A particularly vexing question concerning efforts to use historic disturbance regimes in landscape management is: What are the consequences of different types and degrees of deviation of managed landscapes from conditions in natural, dynamic landscapes? Answers to this question would guide future management and policy decisions concerning the relevance of the past to managing the future.

The Central Cascades Adaptive Management Area and Andrews Forest ecosystem research program are examining several dimensions of fire ecology and use of fire-related information. A collection of studies is underway or planned to examine effects of fire used with several management objectives in various forest conditions: clearcut/burn, underburn in mature stands, fire in stands with various live tree retention levels (15, 30, and 50%), and fire as part of meadow restoration and maintenance. The Blue River and Augusta Landscape Plans explore use of information about fire regimes in landscape management.

Variability of fire extent over the period of good dendrochronologic records (the past 500 years) creates several difficulties for using fire-related disturbance regimes as a template for landscape management. For example, our record of historic fire is quite limited in terms of number of major episodes of burning sampled. Furthermore, the apparent high temporal variability of fire results in temporal variation in extent of different forest age classes, which is not consistent with the continuous flow of wood from forest landscapes.

Despite these uncertainties and limits to knowledge, I believe that incorporating elements of historical disturbance regimes in landscape planning is an important means of developing coarse-filter management approaches that incorporate greater, more natural variability in landscape structure and composition than do other common management

systems. Given the uncertainties, it is important to continue studies of the application of historical dynamics and to adjust plans as we learn more.

The complexity of ecosystems argues for the value of using a coarse-filter approach to management of ecosystems where we expect to practice forestry and/or restore native ecosystem properties. Where fire has been a keystone process knowledge of fire is integral to management. However, social factors prevent use of fire as the exclusive tool to carry out that management. The challenge from the past is to know our limits in understanding the roles of fire; the challenge for the future is to understand implications of those limits as we attempt to manage dynamic systems in changing societal and climate contexts.

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Fire occurrence since the ice ages—what do we know?

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Fire has been a part of the disturbance regime of northwestern U.S. forests since their establishment at the end of the last ice age, and its role in both maintaining and altering vegetation is evident in the paleoecologic record. Long-term reconstructions of Holocene fire history, provided by the analysis of charcoal in lake records, indicate that the Pacific Northwest experienced highest fire activity in the early Holocene (7000-11,000 years ago) and the Medieval Period (ca. 1000 years ago) when drought conditions were more severe than today. When synthesized across the entire northwestern U.S., the paleoecologic record reveals that present fire regimes are the result of climate changes occurring on multiple time scales. No long-term fire return interval is evident. The spatial patterns of fire occurrence are also highly variable, reflecting the environmental

and climatic complexity of the region. The absence of fires in the 20th century in dry forests may be the result of successful fire suppression policies, but in wetter forests this absence is consistent with long-term patterns in fire regimes. An analysis of potential future climate and vegetation simulations indicates that future fire conditions in some parts of the northwestern U.S. could be more severe than they are today. The Holocene record provides a useful comparison for assessing the nature of forthcoming fire-climate linkages.

Restoring southwest Oregon forest ecosystems using prescribed fire: ecological conditions

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A new federal fire policy was issued in 1995, a year after the Record of Decision for the Northwest Forest Plan. This new policy directed federal land managers to expand the use of prescribed fire to reduce the risks of large wildfires from unnaturally high fuel loads and to restore and maintain healthy ecosystems. Prescribed fires are usually done to ameliorate hazardous fuel conditions; however, the scientific basis for doing fuel treatments that are ecologically sound (for example, maintaining viable populations of survey and manage species in Northwest Forest Plan) is not well documented. The purpose of this presentation is to define the historical ecological role of fire in southwestern Oregon forest ecosystems, emphasizing the low- to moderate-severity fire regimes. The presentation is organized into major forest types and fire regimes, landscape-scale and special vegetation considerations, and ecological changes. The management situation for using prescribed fire in context of the Northwest Forest Plan will be discussed.

Historical riparian forest fires in the southern Cascades of Oregon

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Despite the ecological importance of fire in Pacific Northwest forests, its role in riparian forests is not well documented. This study reconstructed the historical occurrence of fire within riparian forests along different stream sizes in Douglas-fir (*Pseudotsuga menziesii*) dominated forests within the drier western hemlock (*Tsuga heterophylla*) forest series of the Upper Steamboat Creek watershed of the Umpqua National Forest, Oregon. Fire dates were determined from a total of 194 fire-scarred wedges from stumps in 28 riparian and upslope plots. Based on the data from this study, fire was common historically in both the riparian zones and upslope forests of this study area. Riparian Weibull median probability fire return intervals (WMPIs) were somewhat longer (ranging from 35-39

years) than upslope WMPIs (ranging from 27-36), but these differences were not significant. Fires were probably moderate in severity and likely patchy, considering the incidence of fires occurring only at a riparian plot or an upslope plot within a pair, but not at both. Finally, fire return intervals showed a non-significant trend of decreasing length from west to east to north aspects. An increased sampling effort may have shown this decrease to be significant. Based on the results from this study, it is evident that: 1) restoring fire, or at least conducting fuel reduction treatments, will be necessary to protect riparian forests in comparable forest ecosystems, 2) historical recruitment of large woody debris was likely patchy and pulsed for these moderate-severity fire regime forests.

Forest structure and regeneration in the first seven years after the Warner Creek fire.

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We studied living vegetation and coarse woody debris on Warner Creek fire sites in the Western Cascades of Oregon, visiting several times during the first seven years postfire. The plots studied were not a random sample, but a survey that intentionally crossed a number of different fire intensities. Thus these results demonstrate the range of postfire conditions at Warner, but cannot be summarized to represent the total effect of the fire on the Warner landscape. Results: Tree mortality was high during the fire. Typically, about 50-70% of trees alive in each plot before the fire were dead by 1 year postfire. Surviving trees at 1 year postfire showed considerable mortality by 7 years postfire, suggesting that the destructive effects of the fires on living trees are not always immediately apparent. This ongoing tree mortality added large amounts of wood to the population of snags. Snags fell and broke at considerable rates, adding more dead wood to the forest floor.

Meanwhile, revegetation proceeded in some fashion on nearly all plots. Shrub cover was generally about 5% one year postfire, and 25% seven years postfire, but there was considerable variation around these means. Herb cover was generally about 10-30%, and seedling densities were often 10,000-70,000 per hectare, both one and seven years postfire, but there was considerable variation between plots. Postfire seedling density seemed to increase with higher fire intensity, unless the site had experienced a crown fire. Crown fire sites had low postfire seedling densities. Seedlings were also highly variable in density within plots. Altogether, the results suggest that regeneration of forest cover after fire is not uniform and will not always be quick. Our projections suggest that most study sites will be well-stocked with trees by one or two decades postfire, while a few study sites may take five or more decades. Revisiting the Warner plots in the future could help test these projections.

Burning questions: did the Little River Indians use broadcast fire to influence historic landscape patterns?

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This study investigates the impacts of Indian habitation patterns and cultural practices on pre-European fire regimes in the Little River Watershed, a 53,000 ha forested landscape in SW Oregon.

Although lightning fire is currently a major environmental driver of landscape pattern in the Pacific Northwest, ethno-historical records leave little doubt that indigenous people of the region employed fire to maintain the grassland, savanna, and parklands from which they harvested much of the food and fiber that sustained their culture. Much recent effort has gone into mapping fire regimes in various forest ecosystems, but little work has been done to spatially investigate the influence of Indian burning practices on lightning driven fire patterns. To test the hypothesis that Indian resource use areas were spatially correlated with historic meadows and parkland habitat, I first digitized archaeological sites recorded by the Umpqua National Forest in the Little River Watershed and surrounding region into a GIS. From that layer, I developed mapping rules to generate a network of least-cost pathways from sites interpreted as winter villages to those believed to be upland summer camps. I then used a layer of historic habitats digitized at the North Umpqua R.D. from 1946 aerial photos to query the GIS for spatial correlations between historic meadow and parkland patches and archaeological sites and least-cost pathways. Statistical analysis revealed highly significant spatial associations between fire responsive vegetation patches, archaeological sites, and least-cost path networks across the Little River Watershed.

National Fire Plan: A cohesive strategy

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As one of the lead authors, Peter will discuss some aspects of the Cohesive Strategy under the National Fire Plan.

The cohesive fuels strategy specifically aligns resource and fire programs within the Department of the Interior bureaus and the USDA Forest Service with a common purpose of *reducing risks to human communities and improving land health.* To ensure these actions are coordinated on the ground, the strategy establishes common priorities for fuel treatment. This collaboration will improve our ability to address fuel hazards and land health across Federal, State, Tribal, and local administrative boundaries.

National Fire Plan: Fire regimes and condition class

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Objectives:

- Introduce concept of fire regimes and condition classes
- Describe national fire regimes and condition classes with Pacific Northwest variant
- Discuss effects of fire exclusion on fire regimes and condition classes

Using prescribed fire as a restoration tool: lessons from Thorn Prairie
Jeff Bohler
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Thorn Prairie is an historical shrubland within the Diamond Lake District of the Umpqua National Forest in southwestern Oregon. Fire suppression and vegetative succession have severely reduced the quality and quantity of available shrubland habitat. Starting in 1995, prescribed fire has been used within the area to reduce conifers, stimulate shrub regeneration and reduce natural fuel accumulations. This presentation summarizes the objectives and techniques of restoration burning, and concludes with a list of lessons for land managers who are contemplating using prescribed fire in restoration activities.

Fuels management on a landscape level in the Applegate Adaptive Management Area
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Forest ecosystems in southwest Oregon are increasingly threatened by large, high intensity wildfires. These forests have become dense with stressed, slow-growing trees because of changes induced by the past actions of wildfire suppression, logging, mining, and livestock grazing. The "Applegate Ecological Health Assessment (1994)," identified a need to actively pursue landscape treatments to reduce stand densities and reduce fire hazard on a broad scale. The Ashland Resource Area embarked on numerous landscape level projects to address this problem.

- Active management through thinning of commercial-size trees has been undertaken. Four projects are in the implementation stage and numerous projects are in the planning phase.

- Oak woodland, shrub and grass communities are analyzed and studied for treatment (thinning) needs. Numerous projects are being implemented and monitored to analyze the effects of on-the- ground treatments.

- Understory treatments of noncommercial trees have been implemented throughout the Ashland Resource Area. In the past, these projects, along with woodland treatments, have been

difficult to fund. Funding sources have been successfully procured for current and future treatments.

- Fuel hazard reduction strategies are being implemented across the landscape and analyzed for their potential effect on wildfire behavior. This work is intended to increase our ability to protect landscape resources from the effect of high intensity wildfires.

In striving to achieve both social and ecological objectives, the Ashland Resource Area invites public participation throughout its planning processes. Perhaps most challenging. is seeking and incorporating public input into management strategies and still meeting ecological objectives.

The Ashland Resource Area, Bureau of Land Management is working cooperatively with all interested local neighbors, grass roots organizations (e.g.. Applegate Partnership), rural fire districts, US Forest Service, Oregon Department of Forestry, Oregon State University, and US Fish and Wildlife Service, to accomplish our management, such as monitoring and restoration projects

From analysis paralysis to agency-community collaboration in fuels reduction for fire restoration: a success story

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In February, 1997, the Rogue River National Forest proposed the HazRed Project to expand a shaded fuelbreak system within the Ashland municipal watershed. The original proposal sparked intense community opposition, and was withdrawn following administrative appeals. The Forest then proposed the Ashland Watershed Protection Project, and used collaborative methods to generate continuous substantive public input. When a final decision was issued in May, 2001, the Project had been transformed from a fire suppression-oriented timber sale into a fire restoration-oriented fuels reduction project. However, this time the Project had gained enthusiastic community endorsement with volunteer civic groups currently helping to implement it on-the-ground as one of the Region's top priorities for funding under the National Fire Plan. This presentation will offer useful lessons describing how progressive federal managers used collaborative processes to overcome "analysis paralysis" and produce a fuels reduction for fire restoration project enjoying widespread public support and community involvement.