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The Biscuit Fire – Comments on Opportunities to Hasten Forest Regrowth and the Costs of Management Delay

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Introduction

Mr. Chair, I am John Sessions, University Distinguished Professor of Forestry and Stewart Professor of Forest Engineering at Oregon State University. I have advanced degrees in civil engineering, forest engineering and a PhD in forest management. I have been teaching and doing research in forest planning and transportation planning at Oregon State University for 20 years. I also provide strategic planning support to the Oregon Department of Forestry (ODF) on the Tillamook and Elliott state forests. I have prior experience in harvesting operations and management with the forest industry and 10 years experience with the USDA Forest Service at the district, forest, regional office, research station and Washington Office levels. I have provided planning advice and services to companies and agencies in 16 countries on five continents. Specific experience relevant to my testimony includes hot shot crew fire operations experience, forest planning and fire modeling on the Congressionally mandated Sierra Nevada Ecosystem Project, the Applegate Project, and currently the Jackson County Wood Utilization and Fire Risk Reduction Project. In 2003 I was lead author of a study on management options on the Biscuit Fire that originated with a request by the Douglas County Commissioners, concerned about the large wildfires that occurred in southwest Oregon during 2002.

Wildfires that burn with uncharacteristic intensity can affect the natural recovery of conifer-dominated forests by elimination of conifer seed sources, creation of conditions for dominance by competing vegetation, and lock in cycles of fire and shrubs and hardwoods for long periods. There is a short window of time in which cost efficient management actions can be taken if rapid restoration of conifer-dominated forest is desired.

I am going to discuss the rapid restoration of conifer-dominated forests in fire-prone landscapes after uncharacteristically intense wildfire in order to describe the significant ecological and economic costs that can result from management delays in decision-making and implementation. I use the southwest Oregon Biscuit Fire of 2002 as a case study.

During the summer of 2002, the Biscuit Fire, the largest fire in recorded Oregon history, burned more than 400,000 acres over 54 days and cost more than $150 million in direct suppression costs. Most of this land was being managed for wilderness and old forest conditions to provide habitat for species that live in older conifer-dominated forests and for recreation and watershed protection purposes.

The seven points I will make are:

1) natural recovery of large, intensively burned areas of forest in southwest Oregon to mature conifer-dominated forest is typically slow and uncertain

2) under natural recovery, most or all the standing fire-killed trees will be on the ground many years before the new conifer forest can produce green trees and future snags to replace those now used by snag dependent wildlife

3) well-established silvicultural techniques can hasten conifer forest regrowth

4) conifer regeneration costs rise rapidly as a function of time since wildfire

5) standing fire-killed trees contribute to future fire risk

6) salvage value of standing fire-killed trees declines rapidly

7) the window of opportunity to rapidly restore conifer forests is closing

Natural Recovery

Historically, large areas of conifer forests that burned light to moderate in intensity reseeded naturally. Where seed is readily available and site conditions are conducive to Douglas-fir, the most common conifer in the Biscuit area, natural stands begin with seedfall of 100,000 or more seeds per acre yielding more than 1000 seedlings per acre. Over time, through inter-tree competition, the new forests self-thin themselves to often fewer than 100 trees per acre by age 160. Seed crops occur naturally at irregular intervals. Most conifer seeds are wind dispersed and the majority fall within one tree height; 90% within two tree heights with some seeds being found at distances of 800 feet or greater. Given that a seed falls, the chance of it developing into a successful seedling is less than one in a hundred.

On drier sites, with long distances to seed trees, naturally-seeded areas may develop slowly and restocking by conifers may require 100 years or more. Thus, natural recovery to the pre-fire conifer-dominated forest can be a slow process. Although Douglas-fir is the most common conifer in the Biscuit fire area, other conifers also occur. Three important conifers in the area, Port-Orford-Cedar, Sugar Pine and Western White Pine, are threatened by non-native diseases. Disease resistant strains have been developed. Nature, alone, will not guarantee the long-term survival of these species without planting disease resistant stock.

Snag Dependent Wildlife

Green conifers are now absent from large areas burned by the Biscuit Fire and snags are abundant for those wildlife species that utilize snags. On these areas, most or all of the fire-killed trees will be on the ground many years before green conifers return under natural recovery. Planting conifers followed by vegetation control could reduce the large conifer tree recovery time by half, thus hastening the return of green trees and replacement snags before the current snags have fallen.

There are tradeoffs between leaving many large fire-killed trees for wildlife and the impact that might have on conifer regrowth and future fire risk. There is no question the large dead trees are the most significant for snag-dependent wildlife and no question that they pose future risk from lightening strikes. The tradeoff entails how many to leave standing, where and how decisions for snag retention will both serve wildlife and reduce future fire and insect risks. More than half of the intensely burned area is in Wilderness and will be left with high snag densities and natural recovery regardless of management decisions in the other burned areas.

Hastening Conifer Forest Regrowth

By far, the most significant problem facing young conifer regeneration in the southwest Oregon region is competing vegetation. Following wildfire, shrubs and hardwoods reoccupy sites rapidly from seed stored in the soil and scarified by the fire and from sprouting. At lower elevations, grass can aggressively reoccupy sites. All three are vigorous competitors to conifers. Grasses and shrubs also provide habitat for birds and seed-eating rodents. Much of the conifer-dominated forest that burned in the Biscuit fire was established during the waning years of the Little Ice Age. Current and likely future climates are more favorable to root-sprouting shrubs and hardwoods than when the burned forests originated. With limited amounts of soil moisture, competition from woody and herbaceous vegetation greatly reduces the survival and growth of conifers.

At the request of community leaders in the late 1970's, a major cooperative research and technology transfer effort called the Forestry Intensified Research Program (FIR) was initiated by Oregon State University and USDA Forest Pacific Northwest Research Station, with strong support from Senator Mark Hatfield and Congressman Les AuCoin. The ensuing basic and applied research greatly expanded our knowledge of forest ecosystems in the region and identified silvicultural practices for successful reforestation after wildfire or timber harvests. Some experimental treatments have now been continuously monitored for 23 years. It has been demonstrated that rapid planting of conifers after wildfire can have more than a 90% success rate, and with control of competing vegetation, it is possible to double conifer diameter growth rates and to increase height growth. This can substantially reduce the time necessary to regrow a conifer-dominated forest with large tree characteristics, which is precisely the forest conditions called for in the Northwest Forest Plan for much of the burned area. A tree's resistance to death by fire is related strongly to its diameter and height to the live crown. The more rapid the height growth, and the larger its diameter, the greater its chance of survival.

In the absence of human assistance, we estimate that the larger conifer trees (>18 inches diameter) that provide much of the character of mature conifer forest and most of the habitat for old-growth-dependent wildlife will take much longer to grow. On many sites, it will take 50 years or more to supplement the surviving larger trees, even with prompt regeneration, and up to 100 years to approach pre-fire conditions for 18-inch or larger trees. Without planting and subsequent shrub control, it could take more than 100 years to even re-establish conifer forests that will be anything like the pre-fire forests.

Conifer Regeneration Costs

As an outgrowth of the FIR Program and related regeneration studies in the Northwest, OSU researchers have estimated (1) the initial cost of a variety of regeneration options, (2) the declining probability of success related to time, and (3) the differences of success on north- versus south-facing slopes. Immediately following intense fires, conifer forests can be re-established at one-quarter to one-eighth the cost that will be required if planting is delayed five years. Three important conclusions can be drawn from examining regeneration costs: (1) the most cost-efficient method of establishing conifers is immediate regeneration; (2) planting delays beyond the first three years (or less with aggressive sprouting) can substantially increase costs through poor survival and high restocking costs if competition from weeds and shrubs is not adequately addressed; (3) when delays are unavoidable, herbicides for site preparation and release will dramatically reduce costs of establishment over other reforestation options. The use of herbicides could substantially reduce the out-year establishment costs and increase forest restoration success.

Future Fire Risk

The adage "lightning never strikes twice in the same place" is not true. Lightning frequency tends to be higher in certain areas, such as southwestern Oregon. Although we do not know when fires will start, we do know what conditions create fire hazards. These conditions include (1) availability of snags that are easily ignited ; (2) forest litter (fine fuels) and shrubs that provide opportunities for rapid fire spread; (3) down wood derived from decaying dead trees that contributes to high-intensity fires; (4) tree canopies that extend to the ground, providing fuel ladders to the tree crowns; (5) dense forest canopies that provide conditions for spread of crown fire; (6) lack of access that can delay or prevent suppression, and (7) falling snags that create danger for firefighters. All of these contribute greatly to the difficulty in developing control strategies for new fires.

We estimate there is an average of more than 160 fire-killed trees per acre in the Biscuit fire area. These trees will fall over time and create small and large logs that, while providing habitat for many different species and slowly returning organic matter to soils, also will fuel the intensity of future fires. We estimate that high numbers of snags will persist for several decades and that down wood accumulations on the forest floor will grow as snags fall and/or deteriorate, reaching maximum levels in 40 years and remaining at those levels for several decades. The numbers of snags and amount of down wood will be higher in more severely burned areas and lower in less severely burned areas, but are indicative of the trend. Significant concentrations of dead and dying trees in the Biscuit area will leave the landscape prone to large, intense wildfires for at least 60 years into the future, further jeopardizing any potential for the forest to return to mature conifer dominated forest.

Salvage Value

If decisions are made to assist nature in forest recovery and reduce future fire and insect risks, actions could involve the removal of some fire-killed and fire-stressed trees. This is often referred to as salvage logging. We estimate that timber containing several billion board feet was killed in the Biscuit Fire. Much of the timber in this condition that is located outside of designated Wilderness is accessible and could provide funds to offset restoration costs. Past experience indicates that the recovery value of fire-killed timber will decrease as trees deteriorate from checking, fungal decay, and woodborer activity. Based on studies throughout the West, we estimate that approximately 22% of the fire-killed volume that existed immediately after the fire will be lost during the first year and by the fifth year, only volume in the lower logs of the larger trees will have economic value. By the summer of 2004, we estimate that the economic loss due to timber deterioration will already be in the tens of millions of dollars. Delay results in lost opportunities to provide materials for society, employment, and to provide funds for restoration. Often by the time decisions are made and implemented, only the largest trees of the most commercially valuable species have remaining economic value. More rapid decision making and implementation could provide a win-win situation where smaller trees could be salvaged while they have economic value while larger trees are left on site for other values. Consideration might be given to a national policy on post-fire restoration so that agencies can move ahead quickly and have the opportunity to utilize the smaller trees that the industry is now geared for and reduce the debate over the large trees.

In areas of limited access such as the Biscuit fire area, helicopter logging provides an opportunity to quickly remove fire-killed timber with little soil disturbance, and it can be done without the construction of any new roads, thus keeping roadless areas, roadless. Oregon is home to the majority of helicopter logging capacity in North America and the capacity exists to remove more than 2 million board feet per day. Helicopters were used to salvage significant volumes in the 1987 Silver Fire (within the Biscuit fire area) and the Rodeo-Chediski fire (White Mountain Apache Reservation, Arizona, 2002). Logs from fire-killed trees at the Slater Creek Salvage Sale (Boise National Forest, Idaho, 1993) were flown as far as 4 miles. Eight years of monitoring after the Silver Fire salvage showed no adverse effects on water quality.

Time is Not Neutral

Typical NEPA and sale preparation procedures now take up to 2 years. For green timber sales, this time investment may be reasonable given the costs and benefits of the proposed actions. After wildfire, however, the costs of delay are extreme. Green timber may increase 2%-6% in volume and value over the 2-year plan preparation and decision- making period. But, after a wildfire, fire-killed trees will lose more than 40% of their value during the same period, and delays in subsequent forest regeneration will further increase costs (Figure 1).

The Record of Decision for the Biscuit is now out, almost exactly two years after the first trees burned. The federal agencies propose to reforest 31,000 acres (about 7 % of the burned area) and salvage 372 million board feet from 19,000 acres (about 4 % of the burned area), primarily by helicopter. The effectiveness of these efforts now depends upon the speed of agency implementation, whether wood products firms will take the risk of investing in fire-killed timber entering its third summer, and whether groups opposed to reforestation and utilization of a small portion of the trees killed by the fire try to obstruct agency action.

There is evidence that agencies have begun to react to the urgency for restoration after wildfire. On June 28, 2003 the 21,000 Davis Fire started on the Deschutes National Forest in eastern Oregon. The Draft EIS was issued in May, 2004, less than one year after the first trees burned. The agency rationale for the aggressive timeline – (1) rapid restoration of late successional reserves and (2) more timely salvage to finance restoration and to reduce future fire risk.

Figure1. Average salvage value of fire-killed trees as a function of distance from road and year, using helicopter logging, and cost of reforestation.