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 almost 20 years. I also provide strategic planning support to the Oregon Department of Forestry (ODF) on the Tillamook and Elliott state forests.I 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. Recently 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.

Protection of forested ecosystems and communities over time from uncharacteristic wildfire effects involves (1) creating forest conditions that reduce the risk of uncharacteristically intense wildfire effects and change the behavior of fires so they are easier, safer and less costly to manage, (2) aggressive control if wildfires occur under uncharacteristic conditions and threaten life, property or resource values, and (3) rapid restoration of forests that burn with such intense effects that natural recovery of forests will be impeded by lack of seed source or competing vegetation. All three are important. I am going to concentrate on 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 six points I will make are:

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

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

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

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

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

6) 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 large 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.

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 (1800-1850). 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. 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 faster the tree can grow 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. We estimate that the cost for replanting the conifer forests on national forest lands within the Biscuit fire outside of Wilderness and outside of the low-productivity serpentine-derived soils will increase from $28 million in 2004 to $148 million in 2007. 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 and, when combined with wind, can result in spot fires up to 1 mile away; (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; and (6) lack of access that can delay or prevent suppression. 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 as much timber was killed in the Biscuit Fire as is harvested in the state of Oregon in a year, and is comparable to the entire annual export of timber producing countries such as New Zealand and Chile. 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 2003, we estimate that the economic loss due to timber deterioration will already be in the tens of millions of dollars.

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.

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).

Time is not neutral. If society or agency managers do not choose to expedite post-Biscuit-fire restoration so that action can begin by 2004 and end by 2006 or 2007, then nature alone will determine the future habitats in as much as 400,000 acres of burned federal forests (nature alone will already determine the future of ecosystems in the 153,000 acres burned inside the Kalmiopsis Wilderness Area). Without human intervention on the most intensely burned areas, future fire-burned landscapes, regardless of congressional or administrative intent, will likely be dominated by cycles of shrubs, hardwoods, and fires for a long time.

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