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Field Hearing
"In the Aftermath of Catastrophic Events:
Restoring and Protecting Communities, Water, Wildlife, and Forests"
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Good afternoon. Thank you for inviting me to testify on this very important forest resource issue. I am Paul Adams, a Professor and Extension Specialist in the College of Forestry at Oregon State University.

I have been a faculty member at Oregon State for 24 years, serving as an educator and researcher on the effects of forest practices on soil and water resources. For the last 5 years I have also served as chair of the Policy and Legislation Committee of the Oregon chapter of the Society of American Foresters. I have been a member of the Society of American Foresters (SAF) for nearly 30 years, and I am a Certified Forester (#2064) through the SAF.

Although I will not be speaking specifically on behalf of these institutions, my experience with them clearly has helped shape my perspective. I should also point out that while my primary residence is in Corvallis, our family has a second home just a few miles from here in Camp Sherman. In fact, my wife and were staying there last August when the B&B Fire made its initial advance and the community was ordered to evacuate.

Thus, I speak from a technical, professional, and personal perspective.

I would like to first share some of my experience and observations about the effects of both severe wildfire and the restoration and protection practices that may follow. I will then highlight some points that I believe are important to consider as you examine specific policies that involve or affect these practices.

Although my focus will be on major wildfires, many of these points should apply to other unusual major events such as extensive wind or ice storms. For example, the Columbus Day windstorm of 1962 downed 3 to 4 times more timber (15 billion board feet) than was killed by the Biscuit Fire two years ago.

Watershed Effects of Wildfire

Recently, I co-authored a peer-reviewed publication (Ice and others 2004) summarizing our current knowledge of the effects of wildfire on soil and water resources. I have also given

several presentations related to this topic at recent professional conferences in the region. From this work and other experience it is clear that major wildfires can have serious watershed effects, although within the perimeter of a large fire the local impacts can vary widely.

First, the local watershed effects of any major disturbance (including management practices) will vary in their nature and importance depending on the specific soil types, slope and other terrain features, stream channel characteristics, and climate. Where these conditions increase the risk of significant soil and water impacts, local fire severity typically is the most important fire-related factor influencing these effects. And even where a wildfire has been generally characterized as large and destructive, often there are areas within the perimeter that show a wide range in fire severity.

For example, it has been estimated that about 9,000 acres (about 14 square miles) of the B&B Fire area was severely burned. It is not unusual to see such data reported as a percent of the entire burn area, with values for severely burned areas that sound relatively small (10 percent in the case of the B&B). However, for these major wildfires very substantial areas can be involved and their watershed effects can be much greater than indicated by a simple area percentage.

Severely burned areas show the greatest watershed effects because this is where soils are widely exposed and most vegetation is killed. For example, greater stream runoff often results because the forest and plant canopy no longer lose rain and snow water to the atmosphere by interception and transpiration, so more is left to move to streams. Greater streamflow can be beneficial for fish and people during the dry season, but during large storms or rapid snowmelt it can cause serious channel erosion and damaging debris flows.

In sloping terrain, areas of exposed soils are more vulnerable to surface runoff and erosion, which can add large amounts of sediment to nearby streams. Substantial erosion and sedimentation has been documented in domestic watersheds and other important areas in several western states. In addition, when forest vegetation and surface organic material are consumed by fire, compounds leached from the ash can change the chemistry and nutrient levels of streams and other water bodies. Where streamside shade is lost, water temperatures often increase, sometimes to levels that can be harmful to aquatic life.

Some of the soil effects of severe wildfire can impact the capacity of forest lands to recover. Nitrogen, often the most important nutrient for forest productivity, can be lost in large amounts with the gases released during burning. And although soils exposed by fire may initially provide a good seedbed, natural regeneration of tree species can be impeded by hot, harsh conditions and competing vegetation.

Although severely burned areas show the most profound soil and water effects, moderately burned areas can show similar effects, but to a lesser degree. And regardless of the burn severity in a given area, a major but unpredictable influence will be the weather in the first few years after wildfire, before the area is well-stabilized by new vegetation. If a severe rainstorm or unusually rapid snowmelt occur while there is still little soil and plant cover, substantial increases in erosion and runoff are much more likely.

Effects of Restoration Practices

Because of the vulnerable state of soil and water resources following major wildfire, forest managers give considerable attention to practices that can protect and restore watershed functions and benefits. Some of these practices target short-term concerns (e.g., erosion and runoff immediately after fire) while others address long-term needs and strategies. An overall guiding principle for the latter is that watershed restoration rests primarily on forest restoration, since forest cover promotes favorable conditions for most watershed functions and values.

Forest vegetation will recover naturally after major wildfires, but the nature and timing of natural recovery may not match the local needs for resource benefits. Prompt tree planting, with control of competing vegetation where needed, is a proven approach for rapid reforestation in Oregon.

After major fires, immediate concerns about increased erosion and runoff often prompt public resource managers to quickly assess burned areas and prescribe various practices. Culverts and bridges may be upgraded to handle higher flows and avoid damage. Exposed soils may be seeded or covered with straw or other mulch. Physical structures may be used to reduce the erosive power of runoff on slopes or stream channels. These practices can be effective, but the results have been variable enough to raise some questions about the time and expense involved.

Salvage harvesting of dead trees for commercial uses can be considered a restoration practice for a portion of the socio-economic foundation of local communities impacted by wildfire. However, it can also be a part of ecological restoration in areas where pre-fire forest conditions were so different from the natural historical forests that harvesting is used to initiate a transition towards more natural forest conditions.

Because wildfire has already impacted watershed conditions, it is not unusual to hear concerns that salvage harvest will only exacerbate local soil and water problems. Although this potential exists, careful harvest planning and use of improved practices and technologies have been shown to substantially reduce or avoid negative watershed effects (Table 1). It is also important to note that advanced cable logging systems can often achieve environmental performance comparable to helicopter logging, at a substantially lower cost. Similarly, in more favorable terrain, economical ground-based logging can be carefully planned and supervised to limit undesirable soil and water effects.

Key Policy Considerations

There is little question that Oregon's forests will continue to be impacted significantly by important events like major wildfires. The primary uncertainty is exactly when and where, although current inventories of forest fuel and health conditions show us where many of the greatest risks and hazards exist. Both research and experience also show that the watershed effects of severe wildfire are great enough to merit our serious attention, including the public policies relating to this issue.

I will conclude my remarks with some important points about such policies.

1. **Recognize philosophical vs. scientific debates.** Some scientists in the region have argued publicly against active restoration following wildfires, including salvage harvesting. These arguments often have been couched in the language of science, and some have appeared in peer-reviewed publications. I have studied and written about the use of science in natural resource policy (e.g., Adams and Hairston 1996) and in my opinion, these views have much more to do with personal philosophy and preferences than science. Objective science provides little support for the view that natural recovery is inherently "better" than managed recovery, particularly if the latter is done with careful consideration of natural patterns and processes.

   Scientists are not computer-powered robots - they have hearts and minds that shape the way they feel the world should be. Even when discussing technical issues, policy makers should be alert for views by scientists that are based largely on values rather than science. In some cases, this may require independent reviews or pointed questions about the scientific evidence for these views. Certainly, values and philosophy are an important part of any policy decision, but the public is not well served when such factors are confused with objective science.

2. **We know enough to do a good job of restoration, but...** federal managers often are greatly hindered in time and space by current policies and procedures. A recent analysis by several colleagues at Oregon State University (Sessions and others 2003) indicates that during the nearly 2-year process of developing the federal restoration and salvage plan for the Biscuit Fire area, about 40 percent of the timber value was lost to decay and insect damage. Also during this extended period, competing vegetation has taken hold in many areas and will make reforestation efforts much more difficult and costly. Thus, even before the Biscuit plan has been implemented, the cumbersome policies and lengthy process leading to its development have greatly impacted the final outcome.

   This problem is not unique to the Biscuit. Here on the Sisters Ranger District the salvage plan for the Eyerly Fire, which also burned in 2002, took equally long to develop and receive final approval. Undoubtedly, the planning requirements presented added challenges during a time when available staff resources were limited by the B&B and other major fires. The 2-year period also reflects only the planning process itself, and despite some streamlining provided by Healthy Forest Restoration Act, plan implementation may be impacted further by appeals and lawsuits. Even if ultimately unsuccessful in court or administrative review, those opposed to salvage and restoration believe they have a clear incentive to delay implementation because of the negative economic impacts. However, this tactic can be counterproductive for forest restoration because the trees that will retain the most value for salvage are the largest ones, whereas the most rapid losses occur in the smallest trees that often are least characteristic of the forests historically.

   As an extension educator and active member of the Society of American Foresters, I have come to know dozens of professional foresters and resource specialists who work for federal agencies in the region. Most of these fine people would like nothing better than to use their training and experience to actively restore the values that have been so greatly impacted by wildfire. But other than some initial emergency measures, they are frustrated by both a lack

of resources and the time-consuming policies and processes that now produce very limited results out on the ground. This frustration is shared widely within the professional forestry community in Oregon, and provided incentive for recent position statements on salvage harvesting as well as the broader problem of forest health on federal lands (Oregon SAF 2003a, 2003b).

3. **Applied research and outreach can help us do an even better job.** The science of forest and watershed restoration following severe wildfire has not stood still and the available technologies and experience continue to grow. Yet studies show both a wide range in the cost-effectiveness of different restoration practices that are prescribed (Robichaud and others 2000), as well as some important limitations in the monitoring and record keeping that provide the primary means for assessing such practices (General Accounting Office 2003).

   It is human nature to want to provide a rapid and widespread response after a severe event has impacted an area. However, further research can help us better identify and prescribe the most cost-effective restoration practices over a wide range of site conditions. Earlier I mentioned the diversity of burn severities within a large wildfire area. When combined with the broad range of soil and plant types, slope, climate, and other conditions that exists both within and among wildfire areas, the array of variables that may influence the success of restoration prescriptions becomes daunting. Within the B&B area, for example, precipitation levels vary by about four-fold and there are dozens of soil and vegetation types. Well-designed applied research studies have the ability to reveal the most important factors that should be considered when prescribing restoration practices.

   As an extension specialist, I cannot mention applied research without also talking about its natural complement, outreach education. Although resource managers can learn about research and related developments on restoration practices informally, designed programs to extend this new knowledge and information can be much more effective. Tours and demonstrations can play a key role in showing how on-the-ground practices can be implemented, including a clear picture of the environmental context. And highly visible and accessible areas like the B&B Fire provide an ideal setting for both research and outreach education, including efforts to provide the public with a better understanding of wildfire problems and solutions.

4. **Preliminary plans and flexible resources for at-risk areas are needed.** Federal units like the Sisters Ranger District work very hard to develop detailed management plans for the forest lands they are responsible for. Although maps showing wildfire hazards and other concerns are often included, plans for specific actions in the aftermath of large wildfires and other severe events are not a routine component. The unpredictable nature of such events clearly precludes comprehensive planning of restoration actions, but some preliminary planning could be very helpful. For example, both timber harvest systems and reforestation prescriptions can be pre-assigned according to local site characteristics (soils, slope, climate, etc.), whether or not the need for such actions actually arises.

   An alternative or complement to this approach would be to have interdisciplinary teams available to assist local managers in their restoration planning. Such teams (e.g., BAER)

already exist for assessing and planning the emergency measures that immediately follow wildfire, but similar resources usually are lacking for the broader restoration activities that often extend over several years. It should be noted that as wildfires have become more common, the growing experience in restoration planning has contributed to some improvements. For example, elsewhere on the Deschutes National Forest, draft restoration plans for the Davis Fire and the 18 Fire were developed within a year. However, further improvements are likely to require greater and more flexible planning resources.

5. **Sustainable forest management must address economic and social concerns.** Federal forest management in the Pacific Northwest has changed dramatically over the past decade. In that time, environmental concerns have been given top priority and attention in agency plans and actions. Although the basis for this re-focus is very complex and includes important legal constraints, the degree and scope of this shift are inconsistent with the contemporary concept of sustainability. More specifically, major human endeavors such as federal forest management are more likely to be sustainable if they give similarly careful consideration to environmental, economic, and social concerns.

   Restoration after wildfire represents a unique situation in which environmental concerns on federal lands continue to strongly outweigh socio-economic considerations. The irony is that, all too often, these three elements are seen as mutually exclusive rather than mutually supporting elements (Oregon SAF 2002). For example, the commercial products and income generated by salvage harvesting can have cascading benefits: viable markets and mills, diverse employment, skilled woodsworkers, revenues and equipment for timely and effective restoration, etc. Because most of these benefits accrue at the community level, it is highly misleading for those opposed to salvage to suggest that only the "timber industry" benefits from this and other commercial harvesting on public lands.

   The irony extends further. Here in one of world's richest forest regions, our federal policies are actively discouraging the local production and use of a highly renewable, recyclable, and biodegradable resource. One of my colleagues who is building a home in the Portland area told me that much of the wood being used was imported from Canada. This, while mills and millworkers in communities like Prineville and John Day close their doors or struggle to survive. This, while billions of board feet of dead timber stand in recently burned areas, much more than enough to provide for both environmental and socio-economic needs.

   Finally, on a more positive note, I believe that if our federal leaders embrace the concept of sustainable forest management and develop or revise policies accordingly, it can rekindle a spirit of optimism about our federal lands and nearby communities. Forest restoration after wildfire would be a fine place to start. Decades ago the Tillamook Forest was reborn through an active effort involving both public agencies and everyday citizens. Today, Oregonians look at this thriving, green forest with a great sense of pride and accomplishment. Few things inspire and unite people better than successfully rebuilding after a major loss.

Thank you for your attention and again for inviting me to speak to you today. If we have time I would be pleased to address any questions or comments you may have.

References Cited

Adams, P.W. and A.B. Hairston. 1996. Calling all experts: Using science to direct policy. Journal of Forestry 94(4):27-30.

Chou, Y.H., S.G. Conard and P.M. Wohlgemuth. 1994. Analysis of postfire salvage logging, watershed characteristics, and sedimentation in the Stanislaus National Forest. Pages 492-499 in Proceedings of the 1994 ESRI Users Conference, Palm Springs, CA.

General Accounting Office. 2003. Wildland fires: Better information needed on effectiveness of emergency stabilization and rehabilitation treatments. GAO-03-430. U.S. General Accounting Office, Washington, DC.

Helvey, J.D. 1980. Effects of a north central Washington wildfire on runoff and sediment production. Water Resources Bulletin 16(4):627-634.

Ice, G.G., D.G. Neary and P.W. Adams. 2004. Effects of wildfire on soils and watershed processes. Journal of Forestry, September 2004 (in press).

Klock, G.O. 1975. Impact of five postfire salvage logging systems on soils and vegetation. Journal of Soil and Water Conservation. 30(2):78-81.

Maloney, P.C., J.L. Thornton and E. Lesch. 1995. Implementation and effectiveness monitoring of best management practices and water protection measures within the Foothills Fire salvage logging area 1992-1995. Boise National Forest, USDA Forest Service, Boise, ID.

McIver, J.D. 2003. A national study on the ecological consequences of alternative fuel reduction treatments. Pages 335-347 in Hydrological Science and Technology, 2002 AIH Annual Meeting, Volume 19, No. 1-4, 2003. American Institute of Hydrology.

Oregon SAF. 2002. Commercial timber harvest on public lands in Oregon. Position statement of the Oregon Society of American Foresters. Available at: www.forestry.org

Oregon SAF. 2003a. Salvage harvesting. Position statement of the Oregon Society of American Foresters. Available at: www.forestry.org

Oregon SAF. 2003b. Active management to achieve and maintain healthy forests. Position statement of the Oregon Society of American Foresters. Available at: www.forestry.org

Poff, R.J. 1989. Compatibility of timber salvage operations with watershed values. Pages 137-140 in N.H. Berg, technical coordinator, Proceedings of the symposium on fire and watershed management. General Technical Report PSW-109. USDA Forest Service, Berkeley, CA.

Robichaud, P.R., J.L. Beyers and D.G. Neary. 2000. Evaluating the effectiveness of postfire rehabilitation treatments. RMRS-GTR-63. USDA Forest Service Rocky Mountain Research Station, Fort Collins, CO.

Sessions, J., R. Buckman, M. Newton and J. Hamann. 2003. The Biscuit Fire: Management Options for Forest Regeneration, Fire and Insect Risk Reduction and Timber Salvage. College of Forestry, Oregon State University, Corvallis.

Table 1. Primary research or monitoring reports with specific findings concerning soil and water effects of post-fire salvage harvest operations in the western U.S.A.

Reference	Location	Key Findings
Chou & others 1994	Stanislaus National Forest, CA	Although soil disturbance was often high in salvage logged watersheds, there were no significant differences in stream sedimentation among tractor logged, cable logged, & unlogged watersheds. Large areas of bare ground in unlogged watersheds were obvious sources of sediment.
Helvey 1980; Klock 1975	Wenatchee National Forest, WA	Soil disturbance from postfire salvage varied widely with logging system, although tractor logging over snow was similar to skyline cable logging. Watersheds that were seeded, fertilized and salvage logged did not yield more stream sediment than the unlogged control watershed.
Maloney & Thornton 1995	Boise National Forest, ID	"Over a 3 year period no accelerated soil erosion & sediment delivery to stream channels was identified as a result of the Foothills Fire Salvage when BMPs [best management practices] & soil & water protection measures were correctly implemented. This was documented by hydrologists' extensive field observations & measurements… Watershed condition was improved where BMPs & soil & water protection measures were implemented in conjunction with salvage logging activities."
McIver 2003	Malheur National Forest, OR	"despite high wildfire, …several factors probably contributed to relatively low levels of soil disturbance & sediment transport…" These included: a) low slopes & low to moderate risk soils, b) hand felling, logging over snow, no new roads, c) no severe weather 2 years after logging. Although relatively low for all salvage treatments, soil disturbance & sediment transport were greater with higher vs. lower salvage removals.
Poff 1989	Tahoe National Forest, CA	"Timber salvage on the Indian Burn was carried out without compromising watershed values. In some cases watershed condition was improved by providing ground cover, by removing trees that were a source of erosive water droplets, & by breaking up hydrophobic soil layers. Negative impacts …were minimized …using an interdisciplinary team that identified issues, …defined specific objectives, had… accurate site information, & developed… prescriptions in the context of whole watersheds & fire…areas."