Testimony for Congressional Field Hearing: *Scientific Research and the Knowledge-base concerning Forest Management Following Wildfires and Other Major Disturbances*

Chairman Walden, members of the Committee, staff members, thank you for the opportunity to testify.

My name is Dave Perry. I'm a Professor (emeritus) of Ecosystem Studies and Ecosystem Management in the Department of Forest Science, Oregon State University. I currently live in the Illinois River Valley near Selma, Oregon.

I'll begin with a comment on the study by Donato and colleagues. In my opinion, it is a fine piece of work. That it has stirred up such a controversy calls to mind a plaque that forest service scientist, Jim Lotan, had on his office wall. The plaque had a single stirrup on it, and beneath the stirrup the inscription " He who tells the truth better have one foot in the stirrup".

Since the critics of Donato's work chose not to follow accepted scientific procedure and air their objections in the open literature, I can only guess what they are. I imagine a major criticism is that the study focused on short-term responses and did not account for long-term dynamics (something Donato et al acknowledged). This is a valid criticism, and it can be applied to virtually every study we have on forest ecology and forest management. Studies that span as much as two decades are rare, whereas the dynamics of these forests play out over many decades and centuries. The few long term studies we have teach us that what you see today is not necessarily what you get tomorrow, which means that most of what we know must be considered provisional. If I could summarize 35 years of ecological research in a single phrase, it would be that nature loves to throw curveballs.

The Sessions Report stressed the environmental benefits of active post-fire management, particularly with regard to reducing fire risk from standing snags and ameliorating the impact of brush on conifer seedlings. I want to discuss some of the environmental benefits of leaving fire-killed trees and the so-called brush species, both of which represent critically important biological legacies. I will briefly discuss three aspects: habitat, conifer regeneration, and susceptibility to future fires. I will conclude with comments on science's role in helping society find a proper balance between levels of utilization and maintenance of ecosystem health.

Habitat. It's beyond the scope of my testimony (not to mention my expertise) to go into all the habitat implications of post-fire management, suffice it to say that big dead wood and noncommercial plant species are critically important habitat for a number of animal species. For example, a comparison of bird communities in salvaged and unsalvaged areas in Alberta found that "resident species, canopy and cavity nesters, and insectivores were the least likely to be detected in salvaged areas" (Morrisette et al 2002). In their review of the scientific literature, McIver and Starr (2001) found that

"Most cavity-nesters showed consistent patterns of decrease after (post-fire) logging, including the mountain bluebird and the black-backed, hairy, and three-toed woodpeckers; abundance of the Lewis' woodpecker increased after logging… In general, postfire logging enhances habitat for some wildlife species and diminishes it for others".

At least one bird, the black-backed woodpecker (more common in the northern Rockies and the eastern Cascades than in the Klamath region), is critically dependent on fire killed trees. Montana has listed the black-backed as a species of high concern.

Mast produced by oaks and tanoaks is an important food resource for many animals, as are madrone berries.

Prominent hydrologists and fisheries biologists have raised concerns about the impacts of post-fire management on streams (Karr et al. 2004).

Aids to conifer regeneration. In some cases standing trees (living or dead) and early successional hardwood trees and shrubs help rather than hinder conifer regeneration. I'll illustrate that with a story from my own research in SW Oregon. My students and I were trying to understand the factors underlying the inability to reforest high elevation clearcuts, which is a widespread problem in the portions of the west. One of our prime study sites was a degraded clearcut at high elevation not far from Oregon Caves National Monument. Like a number of other clearcuts in similar environments, this one had been cut in the early '60's and despite several planting attempts had virtually no living conifer seedlings. Adjacent to this clearcut was a fully stocked 80 year old conifer stand that was obviously established by fire. The fire would have occurred long before roads were put into that area, so the site presumably received no post-fire management of any kind. Yet it was a thriving forest, in sharp contrast to the neighboring unreforested clearcut. It seems nature knew something we didn't. Perhaps the climate had changed, but I doubt that's the explanation. To make a long story short, we concluded that it was the biological legacies represented by fire-killed snags and early successional sprouting shrubs that enabled trees to successfully reestablish on the burn (Perry et al. 1989). Standing boles, living or dead, provide what is essentially a greenhouse effect that reflects radiant heat loss back to the surface and thereby ameliorates temperature extremes (which is the basis for the old silvicultural technique called shelterwood). At high elevations in the west, where the window of establishment for a tree seedling may be very short, the extension of the growing season that results from a sheltering overstory—living or dead— can be a critical factor enabling seedlings to establish and survive.

A number of studies have demonstrated the beneficial role of sprouting shrubs and hardwood trees. They protect soils and therefore streams, stabilize soil organisms that are important to conifer survival, induce conifer seedlings to form roots faster, and cleanse the soil of organisms harmful to conifers. Research following a recent wildfire on the San Dimas Experimental Forest, funded by the National Commission on the Science of Sustainable Forestry (NCSSF), used modern molecular techniques to study recovery of the soil biota (Egerton-Warburton et al. 2005). Speaking of ectomycorrhizal fungi (EM), which form a critically important symbiosis with trees, the researchers concluded that

The root zone of re-sprouting plants and possibly senescing roots, along with soil spore banks are … important sources of EM inoculum. Halting activities that impede the recovery of the EM, such as salvage logging, stump removal, site clearing or ripping, should be considered because these activities remove sources of inoculum. In addition, any mechanical disruption of the soils will limit plant access to resources transferred by common mycorrhizal networks.

Planting conifers promptly (within one year) also stabilizes soils (if the seedlings survive). However, even if planted at high densities, seedlings will influence less than 10% of a site during their first few years. The more widespread cover provided by the naturally recovering vegetation is necessary for protecting soils and streams (seeded grasses can stabilize soil physical properties, but not the ectomycorrhizal fungi required by conifers). The San Dimas researchers went on to conclude that

"Adequate mycorrhizal inoculum exists within the soils of natural communities for post-fire plant regeneration. Plantation forests, however, contain lower fungal abundance and species diversity, with the result that plant regeneration may be slower due to limited mycorrhizal benefits (e.g., aggregation, resource uptake)".

Fire Susceptibility. It's well known that fine fuels rather than standing dead boles carry fire, however snags can send up flaming brands and contribute to spotting. But the story is turning out to be more complex. Analysis by Thompson and Spies (2006) shows that areas salvaged and planted following the Silver Fire tended to burn with higher severity than comparable areas that burned in Silver but were not salvaged and planted. Initial results indicate a sudden change in weather was not a factor in the difference.

Though not studied, standing dead timber seems likely to disrupt patterns of air movement that influence the behavior of subsequent fires. In later years, unsalvaged timber would become a source of soil organic matter and large down wood, both of which hold large amounts of water that would also influence the flammability of stands. To date, I am not aware of any models that take these factors into account. Our understanding of the full range of effects of unsalvaged timber on subsequent fires is poor.

Studies and observations both show that certain hardwood species retard the spread of fire and protect intermixed conifers (something foresters of 100 years ago knew and used). In one natural experiment, the Longwood fire (part of the Silver complex) burned through a plantation that was the site of a brush control study. All conifers in the area where the brush had been removed were killed. All conifers intermixed with the brush were alive, and appeared to be completely unaffected by the fire. This example calls to mind Aldo Leopold's first rule of intelligent tinkering, to keep all the pieces. It also cautions about premature judgments and the need to incorporate risk into our decisions. Measurements of the effects of brush on conifer growth would have reached quite different conclusions depending on whether they were made before or after the fire.

Finding balance. The weight of scientific knowledge cautions against significant modification of ecosystems recovering from severe disturbance. Vital systems could easily be disrupted and ecosystem health jeopardized. This is not to say, however, that all post-fire management is inappropriate. The "brush", for example, performs important ecological functions but it also competes for resources. There is no reason that competition can't be managed on a spot basis while preserving the overall functioning of the noncommercial plants. Similarly, I believe some economic value can be captured in salvage without compromising the ecological values of fire-killed trees, however that is a hypothesis to be tested. There is precedent. Following the Silver fire, the USFS worked salvaged 50% and left 50%. Salvage was done with helicopters to minimize site impacts.

As recognized in the Walden Bill, science has a crucial role to play in helping policy makers find balance. We cannot maintain healthy and productive ecosystems unless we know how they work, and there is still much to be learned. Other testimony goes into research needs in some detail and I will be brief. Two general types of research will be needed: (a) rapid response to study natural patterns of recovery, and (b) manipulative experiments.

In a recent issue of the Proceedings of the National Academy of Science, Robert Holt wrote,

"Ecologists increasingly recognize that the structure of natural communities reflects the interplay of processes acting over a wide range of temporal and spatial scales that are well beyond the scope of manipulative experiments".

The ability to respond quickly with post-disturbance research aimed at understanding the processes of natural recovery (in other words letting nature teach us) is critically important. The National Fire Program and the NCSSF have funded such research on several recent wildfires (NCSSF is sponsoring a symposium in Denver in April to review some of the findings). It is important that continued funding be made available for such studies.

Manipulative experiments still have an important role to play. Finding balance involves exploring options that can only be achieved by manipulation, such as different levels of salvage or brush control.

Finally, it would be highly desirable for scientists and managers to form rapid-response collaborations, which would develop options for management response to each large disturbance on public lands,. Each group has a critical role to play: managers know their objectives and their ground better than scientists do; scientists bring knowledge of relevant, cutting edge science (e.g. landscape ecology, modern disturbance ecology, ecosystem management, risk analysis). Following the model established by the Northwest Plan, the objective should be to produce a set of options for policy makers to choose from, not a single approach. Unlike the Northwest Plan, these options would have to be developed within a short time-frame. A general strategy will be necessary to guide the tactical approaches to individual situations. Lindenmayer et al (2004) made that point clearly

Large-scale salvage harvesting is often commenced when resource managers are in "crisis" mode following wildfires. Major decisions are made rapidly, often with long-lasting ecological consequences. A better approach would be to formulate salvage harvesting policies before major disturbances occur again. Such policies should make provision for the exemption of large areas from salvaging such as national parks, nature reserves, and watersheds closed to human access to maximize water quality. Furthermore, wherever salvage harvesting continues, carefully formulated prescriptions are needed to guide the timing and intensity of such operations. This is essential to both maintain the regenerative potential of recovering stands (15) and ensure the retention of biological legacies such as dead trees, live trees, logs, and islands of undisturbed or partially disturbed vegetation..

Similarly, Karr et al (2004) offered 10 recommendations for minimizing impacts on streams by post-fire management.

The formation of rapid response collaboration teams is more easily said than done, and the general framework will require planning. I suggest that a first step would be to bring together a blue-ribbon panel of scientists and managers to work out a strategy for forming such teams and to develop general guidelines for protecting the resource base along the lines of those published by Lindenmayer et al (2004) and Karr et al (2004).

In conclusion, I would like to thank the committee members and staffers for the opportunity to testify.

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