Testimony before Subcommittee on Forests and Forest Health
Scientific Research and the Knowledge-Base Concerning Forest Management Following Wildfires and Other Major Disturbances

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I thank the Subcommittee for this opportunity to testify regarding scientific knowledge relevant to appropriate management activities following a major forest disturbance. This testimony supplements a general statement that Drs. Hal Salwasser and K. Norman Johnson of Oregon State University and I prepared on the importance of increasing long-term research and monitoring programs focused post-disturbance management activities. I do reiterate from that statement the critical need for credible data management (e.g., documentation, archiving, and public access) as part of these activities.

At the outset I view it as fundamental that the management objectives for a disturbed area under consideration are an essential consideration in identifying and applying science relevant to post-disturbance activities. Management objectives are probably the most important factor in determining appropriate post-disturbance activities, assuming that we do not want disturbances to automatically result in *de facto* changes in management objectives. If management objectives for the area are focused on timber production, than one knowledge set based on experience and scientific study will be relevant. On the other hand, if management objectives for the area are directed primarily to sustaining biological diversity and important ecological processes, such as watershed protection, than a different knowledge set will be relevant. Of course, there will be overlap in these knowledge sets but the emphasis is certainly going to be very different.

I personally believe that much of the controversy that has arisen over post-fire logging and other activities relates to stakeholders viewing the appropriateness of an activity through the prism of their own experience and values without adequately considering the defined management objectives for the area under consideration.

There is a very large body of ecological science relevant to management of areas following large disturbances, much of which has not yet been fully assimilated by resource management agencies, policy makers, and the public. The sources include recent studies of such diverse major disturbances as the Mount St. Helens eruptions (Dale et al. 2005), the 1988 Yellowstone Fires (Christensen et al. 1989), and Hurricanes Hugo and Andrew (Walker et al. 1991; Pimm et al. 1994) as well as designed disturbances, such as the artificial hurricane experiments created at Harvard Forest in Massachusetts (Foster et al. 1997).

Rapid natural recovery is commonly observed in these studies, particularly in terms of ecological functions. Such recovery does not always equate with rapid re-establishment of a dense forest of commercially important tree species, however! Results of current studies also reiterate findings from much earlier research on the many ways in which human activities--many of them well intended—can interfere with natural recovery processes. The results provided by Donato et al. (2006), for example, should not have surprised anyone. The negative impacts of post-fire logging on natural regeneration have been reported in many past studies, including one conducted on the Tillamook Burn by the guru of Douglas-fir management, Leo A. Isaac (Isaac and Meagher 1938).

Biological legacies are a key factor contributing to rapid ecological recovery (Franklin et al. 2000). The concept of biological legacies emerged from research at Mount St. Helens but it is applicable to essentially all disturbance types. Biological legacies consist of living organisms, organic matter, and organically-created patterns that persist from the pre-disturbance ecosystem and strongly influence the development of the post-disturbance ecosystem. Living legacies are extremely diverse in form and often abundant, typically ranging from spores and seeds to large trees and sexually mature animals. Legacies of organic matter are also abundant since trees and other plants are killed but very little organic matter is actually consumed or removed in natural disturbances, including intense wildfires. Legacies of organic matter are most apparent in the concentrated forms of standing dead trees (snags) and downed boles (logs), material often referred to as coarse wood.

Snags, logs, and other coarse wood are biological legacies of extraordinary significance to ecological recovery, second only to surviving trees. The literature on the ecological role of coarse wood is immense; Harmon et al. (2004) and Maser et al. (1988) provide excellent entry points into this literature. The functions of such material are many. Logs and snags provide critical habitat for probably ½ to 2/3 of forest animal life (mammals, birds, amphibians, reptiles and invertebrates). Coarse wood is a long-term source of energy and nutrients but, unlike other organic matter, coarse wood is also a site for nitrogen fixation. Coarse wood has significant direct physical influences on geomorphic and hydrologic processes, such as erosion, sediment deposition, and the physical structure of stream and river ecosystems. Residual wood structures significantly modify the microclimatic regime of the disturbed site, which is important in lifeboating diversity and in facilitating the establishment of natural tree reproduction.

Logs, snags and other wood persist and progressively play these and other roles for many decades and even centuries, particularly in the case of larger and more decay-resistant wood and in the case of aquatic ecosystems. *Furthermore,* where a stand-replacement disturbance has occurred, *the resulting pulse of large wood in the form of snags and logs is all of the coarse wood that the recovering ecosystem is going to get for the next 60 to 80 years or more*—i.e., until the new forest is large enough to begin generating large snags and logs on its own (Spies 1988). In part, this is the basis for my comment in earlier testimony that, from an ecological perspective, it is better to harvest living trees from an intact forest than to remove dead trees from an intensely burned site.

Ecological science also provides substantial insight into landscape-level issues that need to be considered in any type of post-disturbance management activity, such as ecological impacts of logging (e.g., Lindenmayer and Franklin 2002). All parts of a landscape are not created equal. The special importance of riparian habitats in a forest landscape exemplifies this principle. As another example, post-fire logging programs that are selectively focused on portions of the landscape with high residual wood volumes can have a disproportionately high impact on overall ecological conditions within the disturbed landscape, even though the activity directly impacts only a small percentage of the total area. The potential is there to effectively “high grade” a large disturbed landscape by logging the majority of the areas with abundant large legacies.

Research on natural forest disturbances has also shown that post-disturbance landscapes are important sites for many biota and important ecological processes, such as nitrogen fixation. Because such areas have a rich array of structural legacies and are free of dominance by tree canopies, very high levels of biological diversity are often present in the form of animal, plant and fungal species as well as diverse plant life forms. Forest guru Leo A. Isaac noted such qualities based on his observations in the Tillamook Burn (Isaac 1963). Such naturally-disturbed early-successional habitats are very different from clearcuts in structure, composition, and duration.

The naturally recovering portions of the Mount St. Helens blast zone provide graphic evidence that such areas can be regional hotspots of biological diversity, as exemplified by the extraordinary species diversity and population levels of amphibians, birds, small mammals, and meso-predators found in this landscape (Dale et al. 2005). Such richness of organisms and processes is not to be found within the reforested portions of the Mount St. Helens region although these dense young forests are producing a lot of wood. This contrast makes explicit the importance of management objectives for a disturbed area.

Resource managers do have much knowledge and experience with post-disturbance landscapes but there has been relatively little systematic research on impacts of post-fire logging. Moreover, some of the science described as relevant has limitations. We cannot assume that research focused on solving regeneration problems following timber harvesting in southwestern Oregon are directly applicable to conditions or to management objectives on naturally disturbed areas in the Biscuit Burn. As I hope we have all learned--clearcuts are not just like wildfires! To which I would add, what is good for timber production may not be good for many other forest values. Hence, the importance of management goals for affected properties.

In conclusion, we certainly do need more credible scientific research as well as systematic monitoring to increase the breadth and depth of the knowledge available to guide management. I would emphasize that the research and monitoring need to be sustained – long term – efforts and, further, that these efforts will be largely wasted without appropriate investments in data management.

Finally, I want to express a concern that all of this attention on salvage and reforestation has diverted us from what I view as a more important task, which is to get on with treatment of green forests at risk of uncharacteristic stand-replacement fires. In eastern Oregon there are hundreds of thousands of acres of forest and millions of irreplaceable old-growth trees at risk of loss. We need to focus on these green forests so that they don't end up as part of policy debate over salvage!

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