Everett, Richard 1995   27 153

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Subject: Review of Recommendations for Post-Fire Management

To: Regional Forester, R-6

As requested in your June 30 letter, I have reviewed the Beschta et al. document and most of my comments are addressed to your specific questions. However, I did not wish to be bound solely by the ideas present in the document and brought in other references as well. As stated in my first review of this document, these scientists are to be commended for identifying potential problems associated with salvage logging following the recent burns. They are justified in asking land managers to consider an array of hazards, both natural and man-induced, to the conservation of natural resources following fire. They counsel for minimal post-fire management, a specific point of view that should be considered along with views of other resource scientists that may argue for a more active management approach. The Beschta document and the reviews you requested should assist you and your staff in the development of a balanced approach to post-fire vegetation management that conserves resources, captures economic values and meets a majority of public expectations (Response to your Question 3).

Preface

As stated in the documents preface, past management has caused environmental stress, but it is time to recognize that land management agencies have made significant progress toward a holistic ecosystem approach in recent years. Watershed analysis, the analysis of current and historical landscape conditions and environmental hazards, is a major recommendation of the Beschta document and has been a focus of land management agencies for over four years (Blue Mountains Report-Caraher et al. 1992, Eastside Forest Ecosystem Health Assessment-Everett et al. 1994, and the ongoing Columbia River Basin Project). National Forests in the Pacific Northwest region are in their second year of watershed analysis for critical watersheds that they administer. BLM in eastern Washington has been examining effects of adjacent lands on riparian and aquatic systems (Salmon Summit Team) for the last 2 years. The gathering of extensive historical and current baseline data on terrestrial, aquatic and socioeconomic conditions is building a science based approach to land management. Post-fire management is a subset of this larger ecosystem management approach and management agencies are gathering information on historical landscape patterns and disturbance processes on the large 1994 burns potential (USDA 1995-Boise NF, Wenatchee Fire Science Team (in progress)). Derived information will serve as the scientific basis for developing future forests with reduced catastrophic hazards from insect, disease and fire while conserving terrestrial and aquatic biodiversity and site productivity.

There is no simple, clear answer in post-fire management, only one of weighing the multiple hazards present and the biological and economic costs associated with alternative post-fire management actions, including no action. A major concern with the Beschta document is that the authors ask land managers to consider all post-fire hazards and management alternatives, but their recommendation are often biased toward custodial management (hands off). Limiting post-fire management action to only intensive management or only to custodial management is inappropriate; every situation is different and should be handled on a case-by-case basis. The recommendations of the Beschta report, preceding reports and this and other reviews should be applied with caution as no one approach is correct in every situation (Responds to your Question 2).

Resource scientists provide scientific information, but this information can be conflicting because resource conditions and process differ from site to site, and scientists focus on different aspects of the same problem. The land manager, not the scientist, because of an unbiased position is better able to integrate several scientific positions and apply them to on site conditions. I encourage land managers not to abdicate this responsibility, and your request for reviews of the Beschta document indicates you are well into this process.

Contrary to the custodial management theme of the Beschta et al. approach there are other scientists that believe intensive science-based management can be used in concert with natural processes to restore sustainability of post-fire eastside forests and is in fact required if ecosystems are to be conserved under an ever increasing human population and rising resource demands. The inefficiencies of natural disturbance and recovery processes may preclude meeting future public expectations and place property and resource values at risk.

Although minimalist and intensive management groups may disagree on approaches, they share many common goals for the conservation of diversity and site productivity following fire. The former believe the optimum outcome will be derived by allowing natural disturbance processes to restore ecosystem integrity; the latter believe that natural disturbance is inefficient, currently out of historical ranges of variability, and now has the potential to cause environmental stress in excess of what has occurred in the past. Rather than accept the roll of the dice on ecosystem outcome, the intensive management group would advocate management to achieve a desired restoration state. That state, where ecosystems are in balance with inherent disturbance regimes, is the same as described in the Beschta document, just a different pathway is recommended.

Intensive management would allow the safeguarding of higher priority goals, where custodial management is passive and may not. By emphasizing the protection of species and resources that require long-term recovery over those with relatively short-term recovery time frames and emphasizing prevention over recovery, the intensive management approach may have a better chance at maintaining long-term site productivity and biodiversity following fire than through custodial management. The protection of short and long-term recovery elements may be in conflict, but protecting the resource with the longest recovery period should be given added emphasis. As an example, to conserve surface soils that took thousands of years to create we may need to seed introduced species on steep slopes following fire; protecting the soil mantle takes precedence over the protection of the current plant community.

The prevention of erosion is much easier that the recovery of soil moved off site and active management is appropriate.

Specific responses to Question 1 are as follows:
Question 1. Are the findings and recommendations (in the Beschta et al. 1995 document) consistent with the existing literature regarding fire recovery, effects of post-fire activities and the role of fire in the ecosystem?

The Beschta et al. 1994 document is a post-fire management position paper written in response to concerns about salvage logging and other management practices to be implemented following the extensive 1994 fires, with recommendations and supporting literature citations. Although literature citations used in the document are minimal, other non-cited work by the authors and others can be found in the literature to support many of their views. Conflicting reports can also be found in the literature, as previously discussed, requiring land managers to integrate different points of view and conflicting findings for action on specific post-fire landscapes.

ROLE OF FIRE IN THE ECOSYSTEM
Past management has caused significant alterations of forests and forest disturbance and recovery processes. The Eastside Forest Ecosystem Health Assessment findings support this statement. This assessment by the US. Forest Service found many eastside forest ecosystems (including aquatic and riparian components) were outside their historical range of variability in composition, structure and function. Also, fire, insect and pathogen disturbance regimes had been significantly altered on some forest types because of past management.

Fires are an inherent part of the disturbance and recovery patterns to which native species have adapted. Native species are adapted to natural patterns and processes of disturbance and recovery : preventing additional human disturbance and reducing effects of past disturbance is the best pathway to regional ecological recovery. In significantly altered ecosystems, natural disturbance processes may no longer be operating within historical ranges of variability (Agee 1994b, Hessburg et al. 1994), and their effects may be as foreign to the functioning of the ecosystem as are human activities. The emphasis should be on the restoration of ecosystems and choosing the pathway that best accomplishes this goal and not the decision of whether human intervention is desirable or not.

Fire is a natural process and should be allowed to perform its natural function. Although wildland fire, the combustion of organic material, is a natural process fire effects are now operating outside of the natural range of variability in the dry forest types of eastern Washington and Oregon (Mutch et al. 1993). As stated in the Beschta document the degree of alteration of fire regimes varies across the landscape. Through fire suppression activities we have altered the fire regime of dry pine forests (high frequency-low severity fire regime) to a greater degree than more moist forest types (low frequency-high intensity fire regime) (Agee 1994a). However, forest types are interconnected and altering disturbance regimes in one eventually impacts the other. Riparian or other fire refugia sites that historically avoided disturbance are now in greater jeopardy from increased fire hazard of adjacent stands (Agee 1994b).

Fire suppression has impacted the fire regime of all forest types regardless if their fire return interval was 7, 70 or 150 years. At the time fire suppression started a portion of each forest type was at the end of the normal fire-free interval and we have interrupted fire occurrence for the last 50 years.

Fires were more frequent and less severe in historical pine-dominated landscapes prior to fire suppression and the alteration of fire regimes. Today landscapes of historical open pine sites can have dense fir or pine understories that are outside the historical ranges of variability in tree density and fuel loadings. Following fire these same sites are outside the historical ranges of variability in amounts of snags and logs (Fire Science Team Report, in progress). Unless dead material is removed and stands are subsequently managed for historical tree densities, future fuel loadings will be outside the historical range of variability for both live trees and dead and down, creating the potential for intense reburn situations. The intense reburn assumption is based on the physics of fire behavior; the greater the amount of available fuel the greater the fireline intensity in BTU s and the difficulty of fire suppression (Rothermal 1983). Everyone who has sat by a campfire knows when you add wood you may have to move away from the heat.

There is no support in the scientific literature that the probability for reburn is greater in post-fire tree retention areas than in salvage logged sites. The real question is not whether there is a greater probability for reburn, but if reburns occur will they be of greater intensity and more destructive to resources. The authors are correct that the intense reburn concept is not reported in the literature. It took time since fire suppressio started (early 1900 s) for forest tree density and cover to increase, and it took time for random ignitions to burn these altered sites (Entiat fire 1970, 107,000 acres, Dinkleman fire 1989, 52,000 acres, Tyee fire 1994, 140,000 acres). It is taking more time for burned snags to fall and burned forests to again increase in tree cover and fuels continuity (Martin et al. 1976). Because of the time tables involved the field testing of the intense reburn concept started in the recent past and will continue into the future.

A precise evaluation of the effects of salvage logging and total tree retention on reburn fire intensity has not been accomplished. What is in the literature is that when dead and live tree biomass increase so does flame length, and fireline intensity (Rothermal 1983). Temperatures and duration of heat increase with added forest fuels (Ottmar and Vihnanek, 1990). Mass fires with extremely violent behavior occur when excessive fuels are ignited (Project Flambeau, Countryman 1969)

The problem is we have tried to control all disturbances rather than letting them play out-forests depend upon disturbance to maintain their integrity. This concept was the cornerstone of the Eastside Forest Ecosystem Health Assessment and follow-up work (Everett et al. 1995). The creation of forests that are in synchrony with inherent disturbance regimes would be working with nature and not against it. Such a forest would be desirable for long-term sustainability and reduced management energy to maintain the system.

Salvage operations that increase downed woody material would create an immediate addition to fuel loading and increase fire hazard, but should result in a long-term reduction in potential fuel loadings. The land manger should evaluate the immediate and long-term hazards. For dry forest types that historically had fire every 7 to 20 years the adverse impacts of immediate reburns may be less than reburn effects at a later date in dead tree retention sites when excessive amounts of dead and down materials accumulate. Land mangers must be concerned with the potential erosion hazards associated with removal of excess fuels and with the potential erosion hazards caused by the next fire event. Forest management practices can increase erosion rates, but wildfires have the greatest potential to accelerate erosion. Erosion increases following fire are directly proportional to fire intensity (Megahan 1991).

The urgency to remove woody biomass is not based on reducing short-term fire hazard, but on the capture of economic values and reduction of long-term fire hazard. The urgency comes from removing wood before it decays, becomes less economically feasible to extract, and makes further reductions in fuel loading more expensive to the American taxpayer.

EFFECTS OF POST-FIRE MANAGEMENT

There are a number of threats to the integrity of ecosystems, - it is inappropriate to focus on fire to the exclusion of other significant threats to aquatic and terrestrial ecosystems. Simply managing (post-fire) fire risk without controlling the adverse effects of logging, grazing, road building and mining is unsound resource management- and could lead to further damage. There are multiple hazards (natural and man-induced) to resources following large fires and these are addressed in Environmental Assessments or Environmental Impact Statements prepared by the land management agencies following large burns. Scientific literature provides examples of increased soil disturbance and erosion following salvage logging and associated road construction on burned areas (Klock 1975, Megahan 1991). Recommendations for road obliteration on burn sites should be viewed with some skepticism if these roads are currently stable and obliteration would cause a sediment pulse (Personal communication William Elliott, USDA, Forest Service, Moscow, Idaho) at a time when elevated sediment loads from the burn could be anticipated. Livestock grazing can reduce initial plant recovery following fire causing increased erosion, thus federal land management agencies generally defer grazing until plants have had an opportunity to become reestablished. Out of concerns for aquatic systems, riparian corridors can be established on large burns where intense post-fire management is restricted (Fire Science Team, in progress).

Land mangers need to evaluate the economic and biological costs to salvaged timber against the potential costs associated with loss in site productivity (soil erosion- Klock 1976), cost of increased sediment transport to streams, and the cost of a loss of fisheries and endangered fish stocks (Everett et al. 1995). Land managers face an extremely difficult job of defining where they can capture the short and long-term benefits of salvage logging (revenue and reduced fire hazard), and where salvage logging gains are secondary to protection of site potential and the conservation of aquatic habitats. The Beschta document focuses on the exclusion of salvage logging from sensitive areas as a preliminary guide.

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Salvage logging by any method must be prohibited on sensitive sites: severely burned areas, erosive sites, fragile soils, roadless areas, riparian areas, steep slopes. This broad brush approach appears in conflict with the Beschta document's stated goals of reestablishing inherent disturbance regimes and historical connectivity across the landscape. Blanket restrictions on management actions amounts to administrative fragmentation of the landscape for post-fire management activities. Salvage logging is a management tool to achieve biological goals. Its use in reestablishment of stable systems on sensitive sites must be viewed with some skepticism, but its should not be excluded out of hand. Again, salvage logging should be evaluated on a case-by-case basis for achieving desired ecosystem values and denied where it is contrary to those goals.

In view of the biological and physical processes associated with standing and dead and down trees, salvage logging must: leave at least 50% of standing dead trees in each diameter class and leave all trees greater than 20 inches dbh or older than 150 years. Numerical limits on salvage logging are not applicable. Historical and pre-fire tree densities varied greatly in stands across the landscape. More appropriate direction is to leave historical amounts of snags and logs as future forest legacies for wildlife and soil organic matter with the option to remove the remainder to capture economic values and reduce fuel loadings (Fire Science Team, in progress). Additional amounts can be left to facilitate other management objectives, but amounts should be balanced against increased fuel loading and amounts supportable under the inherent disturbance regimes.

Fire suppression should not be the highest priority management goal. This is not the case. Fire suppression is not a goal but an action to protect life, property and resources values. Management goals are reflected in both land use designations and in broad ecosystem management principles to restore ecosystem sustainability, that includes the reestablishment of inherent disturbance regimes (Fire Science Team, in progress). The public, through legislation and the NEPA process has defined that on certain portions of public land the emphasis and management goal will be for specific resources: the maintenance of wildlife, scenic viewsheds, late successional reserves, botanical reserves, riparian corridors or timber management for wood fiber production. Fire suppression if used properly promotes stability of the land use; used unwisely places that land use at increased hazard to future fire events.

The overall management goal must be to preserve fire and other disturbance regimes that maintain ecological systems and processes. Again, this is in agreement with Eastside Forest Ecosystem Health Assessment. The Beschta document recommends considering the whole landscape, not just the forest in post-fire management. The burned forest does not exist in a vacuum; it is part of larger landscapes and associated aquatic systems. Removal of excessive fuel loading to reduce the future fire hazard to the burned forest needs to be weighed against increasing post-fire erosion hazard to associated riparian and aquatic systems. This speaks to the need to recognize disturbance process linkages among all forest components, upslope and riparian forests and associated aquatic systems. Philosophies and practices that fragment forests into areas that prohibit connectivity of disturbance regimes may eventually be united by larger, more severe events.

REFERENCE POINTS FOR POST-FIRE MANAGEMENT
Existing conditions should not be used as baseline or desired conditions. Given the significant amount of evidence that current forest ecosystems composition, structure and function have been altered significantly, the use of current conditions as a biological reference base is not warranted. Baseline data should be derived from conditions that are in synchrony with inherent disturbance regimes. In addition because disturbance is required for the integrity of the ecosystem standards and guides should not be absolutes, but ranges that cover periods of disturbance, recovery and maintenance.

The use of current conditions, as a desired condition, although unwise and not sustainable in some instances, is the prerogative of the U.S. public, including American Indians, who have a vested interest in their trust lands. Many of our past resource problems have occurred because desired conditions were not sustainable under inherent disturbance regimes; hence the catastrophic fires of 1994.

SUMMARY:
The Beschta et al. document suggests a return to more stable forest conditions that are sustainable under inherent disturbance regimes. The document requests that land managers consider multiple hazards to post-fire systems not just future fire hazard. Although not stated directly they request salvage logging be used as a tool where appropriate to restore ecosystem values, but not as a goal in itself. There is strong support for these concepts within the scientific community and many have previously been expressed in the Eastside Forest Ecosystem Health Assessment.

The custodial approach recommended by the Beschta document appears less desirable than active management on at least two points: soil protection and fuels reduction. By their own admission current systems are altered in structure and process, and fire effects are increasingly beyond those experienced historically. As a result fire effects in dry forest types are no longer an historically-similar phenomena in which species previously existed. Extended fire-free intervals have increased tree density while at the same time reducing remnant shrubby and herbaceous plants and their seed reserves. Combined loss of the forest floor from increased burn intensity and reduced post-fire plant response increases hazard of erosion and loss of surface soils. There is a need for active management to conserve post-fire soil resources that takes precedence over the protection of the current native plant community.

In 1994 we experienced catastrophic fire events in the dry pine-fir forest types of eastern Washington that were well outside the historical range of variability for fire disturbance. This was the result of increased live tree densities, subsequent increased fuel loading, and increased fuel continuity across the landscape. Because current pre-fire forests had elevated tree densities over that of historical forests, they now have elevated post-fire snag and log densities. If we carry the excessive snag and log densities forward to the next forest and we once again have increased tree densities there is the probability for fire events more severe than the catastrophe we just witnessed. Natural processes of decay are unlikely to remove the current dead tree material before the next fire event, thus managed reduction in fuel loading is recommended.

As stated in the review the immediate reduction of fire hazard is not the issue, it is the long-term fire hazard which is of concern. The extended time-frame until fire hazard increases (20 + years) provides opportunities to reduce fuels with minimal adverse impacts to resources. The decline in economic benefits from salvage logging over time because of wood decay should be considered and weighed against potential economic costs associated with loss of soils, water and fish resources. You have a difficult assignment to use salvage logging as a tool in creating sustainable forests for future generation, and as a socioeconomic goal in the capture of economic values for the current public good. Again, the land manager is the best individual to integrate opposing scientific views and apply them to on site conditions. I salute those who don t abdicate this responsibility to others, but assume their proper role.

/s/Richard Everett
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Enclosures

cc:
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Disease severity increased as temperatures and inoculum concentrations increased. Significant increases in severity ratings occurred among all three inoculum concentrations at 16-22°C and 28-34°C on the fifth day after inoculation. Thus, severity ratings should be made 5 days after inoculation at the above temperatures to study variations in inoculum concentration.

Inoculum concentrations of 5 x 10^7 and 2 x 10^8 CFU/ml at 22-28°C would probably provide the best results for experiments designed to evaluate disease development because significant differences in severity ratings were observed every other day through the fifth day using these treatments.

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ROOT DISEASE IN DOUGLAS-FIR PLANTATIONS IS ASSOCIATED WITH INFECTED STUMPS

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ABSTRACT

Thirty-nine of forty-three 10- to 27-year-old Douglas-fir plantations examined near Quilcene, Washington had mortality caused by either Armillaria mellea or Phellinus weirii. Mortality averaged only 0.5 trees/ha but was clustered within plantations, resulting in understocked openings of 0.04 to 0.1 ha. Mortality due to root diseases was significantly correlated with number of infected stumps.

Plant Dis. Reptr. 63: 580-583.

Additional key words: Fomes annosus, western hemlock, Pseudotsuga menziesii, aerial survey.

Mortality caused by root disease is prevalent in young Douglas-fir (Pseudotsuga menziesii) plantations in Oregon and Washington (3). Large infected stumps of the previous forest stand serve as inoculum for root diseases caused by Armillaria mellea (Vahl ex Fr.) Quél., Phellinus weirii (Murr.) Gilb., and Fomes annosus (Fr.) Cke. (7, 8, 9). Objectives of this investigation