June 16, 2022

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RE: Antelope and Tennant Salvage Timber Sale Proposal

"Salvage logging of large snags and down boles does not contribute to recovery of late-successional forest habitat; in fact, the only activity more antithetical to the recovery process would be removal of surviving green trees from burned sites. Large snags and logs of decay resistant species, such as Douglas-fir and cedars, are critical as early and late successional wildlife habitat as well as for sustaining key ecological processes associated with nutrient, hydrologic, and energy cycles."
-Dr. Jerry Franklin, 1/20/04.

"When wildfires do occur on federal lands they create an opportunity for development of high-quality early successional ecosystems. Intensive salvage operations and associated site preparation and tree planting are not appropriate if a management goal is to utilize such events to provide for early successional ecosystems. Salvage and related activities can greatly reduce the potential for full development of early successional ecosystems by removing important legacies, eliminating important constituent species, and abridging the duration of early successional development."
-Dr. Jerry Franklin and Dr. Norm Johnson, 2/15/12.

"While the severity varied throughout the fire area, young timber plantations carried the fire while older stands tended to be more resistant. This is mostly due to young timber plantations having a high density of ground fuels."
-BLM Douglas Complex Fire 9/5/13 Burned Area Emergency Rehabilitation Plan

Dear Forest Service Planners,

Thank you for the opportunity to provide scoping comments regarding the Antelope and Tennant Salvage Logging Project. As the quotations above indicate, and as will be discussed throughout these comments, ***post-fire salvage logging does not contribute to the recovery of forest ecosystems***. Rather, the significant impacts of commercial salvage logging inhibit forest recovery and increase fire hazard. It is incontrovertible that a strong consensus exists among fire ecologists that post-fire salvage logging harms and delays forest recovery.

The Antelope and Tennant Salvage Logging Project scoping letter indicates that the purpose of the project is primarily to aid reforestation and reduce future fuel loading. Please note that salvage logging is antithetical to achievement of these two management objectives. In the body of our scoping comments (below) we will reference accepted peer-reviewed scientific publications establishing that post-fire salvage logging increases fuel loading while decreasing conifer reestablishment of burned sites.

We are extremely concerned that the Forest Service appears committed to conducting post-fire salvage logging within the Late Successional Reserve land use allocation and within Northern spotted owl critical habitat. We sincerely hope the agency will take this opportunity to achieve the project purpose and need by protecting, rather than degrading, this fragile post-fire landscape.

Please note that we generally support the limited and responsible removal of hazard and danger trees adjacent to forest roads that are designated as open in the Motor Vehicle Use Map. However, we oppose the exploitation of roadside logging as a means to re-open and log along level one roads or as a timber grab to clearcut large continuous forest swaths.

UTILIZE THE WKRP POST-FIRE RECOMMENDATIONS

Unfortunately, the Klamath National Forest has often pursued an insular "all or nothing" approach to post-fire management that maximizes logging while largely ignoring concerns regarding the impacts of salvage logging on wildlife, soils and watersheds.

We urge the Forest Service to seriously engage with stakeholders and communities who care about the future of this planning area. Please do not simply pursue a controversial salvage logging agenda that emphasizes timber production. Please consider and implement the recommendations contained in the **attached** Western Klamath Restoration Partnership document.

TWELVE THOUSAND ACRES OF SALVAGE LOGGING NECESSITATES AN EIS

The scope and scale of the proposed post-fire logging is massive and significant by any measure. Just as the Klamath National Forest documented the Westside salvage logging project in an Environmental Impact Statement (EIS) so must it conduct an EIS prior to logging thousands of acres across the Tennant and Antelope fire footprints.

THE SIX SHOOTER AND HARLAN PROJECTS ARE SIGNIFICANT

Our organizations were largely supportive of the proposed Six Shooter and Harlan projects as initialy proposed by the KNF. That support appears to be misplaced. The Forest Service cannot legally rely upon prior analysis of green tree thinning projects to support post-fire clearcutting and plantation establishment that may increase fire hazard and inhibit natural conifer regeneration. The physical circumstances in these two project areas have dramatically changed and the impacts of post-fire logging were not analyzed or contemplated during the Six Shooter and Harlan planning processes. Had Six Shooter and Harlan initially consisted of post-fire salvage logging proposals our comments on those projects would have looked very different and our organizations would have filed objections to the decision documents.

LOGGING WITHOUT A DECISION, A PUBLIC PROCESS, OR ANY ANALYSIS

The Klamath National Forests practice of conducting extensive roadside post-fire logging with taxpayer fire money via the Incident Management Team breaks trust and prevents transparency with the public. The extensive secret roadside logging in this project area was not supported by any environmental analysis or public process and was not even authorized by a Forest Service decision document. Secret logging unsupported by planning, process or a decision is a violation of both NEPA and NFMA. The secret logging also involves significant impacts that necessitate completion of an EIS for this project.

SCIENCE INDICATES THAT SALVAGE LOGGING INVOLVES SIGNIFICANT ENVIRONMENTAL IMPACTS SUCH THAT AN EIS MUST BE PREPARED

The agency should be aware of and incorporate the findings contained in the following documents that address common assumptions often relied upon by Forest Service timber planners in their analysis of fire ecology and post-fire logging.

Attachment 1 is a peer-reviewed study by Donato et al. entitled Post-Wildfire Logging Hinders Regeneration and Increases Fire Risk published in Sciencexpress, January 5, 2006.

The paper concludes:

Our data show that postfire logging, by removing naturally seeded conifers and increasing surface fuel loads, can be counterproductive to goals of forest regeneration and fuel reduction. In addition, forest regeneration is not necessarily in crises across all burned forest landscapes. The results presented here suggest that postfire logging may conflict with ecosystem recovery goals.

Attachment 2 is a peer-reviewed study conducted by Odion et al. entitled Fire Severity in Conifer Forests in the Sierra Nevada, California published in Ecosystems, 2006, 9, 1177-1189.

The abstract states:

Natural disturbances are an important source of environmental heterogeneity that have been linked to species diversity in ecosystems. However, spatial and temporal patterns of disturbances are often evaluated separately. Consequently, rates and scales of existing disturbance processes and their effects on biodiversity are often uncertain. We have studied both spatial and temporal patterns of contemporary fires in the Sierra Nevada Mountains, California, USA. Patterns of fire severity were analyzed for conifer forests in the three largest fires since 1999. These fires account for most cumulative area that has burned in recent years. They burned relatively remote areas where there was little timber management. To better characterize high-severity fire, we analyzed its effect on the survival of pines. We evaluated temporal patterns of fire since 1950 in the larger landscapes in which the three fires occurred. Finally, we evaluated the utility of a metric for the effects of fire suppression. Known as Condition Class it is now being used throughout the United States to predict where fire will be uncharacteristically severe. Contrary to the assumptions of fire management, we found that high-severity fire was uncommon. Moreover, pines were remarkably tolerant of it. The wildfires helped to restore landscape structure and heterogeneity, as well as producing fire effects associated with natural diversity. However, even with large recent fires, rates of burning are relatively low due to modern fire management. Condition Class was not able to predict patterns of high-severity fire. Our findings underscore the need to conduct more comprehensive assessments of existing disturbance regimes and to determine whether natural disturbances are occurring at rates and scales compatible with the maintenance of biodiversity.

Attachment 3 is a peer-reviewed study conducted by Beschta et al. entitled Postfire Management on Forested Public Land of the Western United States published in Conservation Biology, Volume 18, No. 4 August 2004 pages 957-967.

The abstract states:

Forest ecosystems in the western United States evolved over many millennia in response to disturbances such as wildfires. Land use and management practices have altered these ecosystems, however, including fire regimes in some areas. Forest ecosystems are especially vulnerable to postfire management practices because such practices may influence forest dynamics and aquatic systems for decades to centuries. Thus, there is an increasing need to evaluate the effect of postfire treatments from the perspective of ecosystem recovery. We examined, via the published literature and our collective experience, the ecological effects of

> some common postfire treatments. Based on this examination, promising postfire restoration measures include retention of large trees, rehabilitation of firelines and roads, and, in some cases, planting of native species. The following practices are generally inconsistent with efforts to restore ecosystem functions after fire: seeding exotic species, livestock grazing, placement of physical structures in and near stream channels, ground-based postfire logging, removal of large trees, and road construction. Practices that adversely affect soil integrity, persistence or recovery of native species, riparian functions, or water quality generally impede ecological recovery after fire. Although research provides a basis for evaluating the efficacy of postfire treatments, there is a continuing need to increase our understanding of the effects of such treatments within the context of societal and ecological goals for forested public lands of the western United States.

Attachment 4 is a peer-reviewed study by researchers from the Corvallis Forestry Sciences Lab who found that mixed-conifer and mixed evergreen-hardwood forests that were salvage logged (and planted) following the 1987 Silver Fire in the Siskiyou National Forest experienced *higher severity re-burn* in the 2002 Biscuit Fire than did stands in the Silver Fire (subsequently burned in the Biscuit Fire) that were not subject to salvage logging and artificial plantation establishment. **Thompson, JR, TA Spies, LM Ganio, 2007. Reburn Severity in Managed and Unmanged Vegetation in a Large Wildfire. Proceedings of the National Academy of Sciences.** The abstract states:

> Debate over the influence of post wildfire management on future fire severity is occurring in the absence of empirical studies. We used satellite data, government agency records, and aerial photography to examine a forest landscape in southwest Oregon that burned in 1987 and then was subject, in part, to salvage-logging and conifer planting before it reburned during the 2002 Biscuit Fire. Areas that burned severely in 1987 tended to reburn at high severity in 2002, after controlling for the influence of several topographical and biophysical covariates. Areas unaffected by the initial fire tended to burn at the lowest severities in 2002. Areas that were salvage-logged and planted after the initial fire burned more severely than comparable unmanaged areas, suggesting that fuel conditions in conifer plantations can increase fire severity despite removal of large woody fuels.

Attachment 5 is Hutto, R.L. 1995. Composition of bird communities following stand-replacement fires in northern Rocky Mountain (U.S.A.) conifer forests. Conservation Biology 9: 1041-1058.

The abstract states:

> During the two breeding seasons immediately following the numerous and widespread fires of 1988, I estimated bird community composition in each of 34 burned-forest sites in western Montana and northern Wyoming. I detected an average of 45 species per site and a total of 87 species in the sites combined. A compilation of these data with bird-count data from more than 200 additional studies conducted across 15 major vegetation cover types in the northern Rocky Mountain region showed that 15 bird species are generally more abundant in early post-fire communities than in any other major cover type occurring in the northern Rockies. One bird species (Black-backed Woodpecker, *Picoides arcticus*) seems to be nearly restricted in its habitat distribution to standing dead forests created by stand-replacement fires. Bird

communities in recently burned forests are different in composition from those that characterize other Rocky Mountain cover types (including early-successional clearcuts) primarily because members of three feeding guilds are especially abundant therein: woodpeckers, flycatchers, and seedeaters. Standing, fire-killed trees provided nest sites for nearly two-thirds of 31 species that were found nesting in the burned sites. Broken-top snags and standing dead aspens were used as nest sites for cavity-nesting species significantly more often than expected on the basis of their relative abundance. Moreover, because nearly all of the broken-top snags that were used were present before the fire, forest conditions prior to a fire (especially the presence of snags) may be important in determining the suitability of a site to cavity-nesting birds after a fire. For bird species that were relatively abundant in or relatively restricted to burned forests, stand-replacement fires may be necessary for long-term maintenance of their populations. Unfortunately, the current fire policy of public land-management agencies does not encourage maintenance of stand-replacement fire regimes, which may be necessary for the creation of conditions needed by the most fire-dependent bird species. In addition, salvage cutting may reduce the suitability of burned-forest habitat for birds by removing the most important element--standing, fire-killed trees-needed for feeding, nesting, or both by the majority of bird species that used burned forest.

Attachment 6 is Hutto, R.L. 2006. Toward meaningful snag-management guidelines for postfire salvage logging in North American conifer forests. Conservation Biology 20: 984-993.

The abstracts states:

The bird species in western North America that are most restricted to, and therefore most dependent on, severely burned conifer forests during the first years following a fire event depend heavily on the abundant standing snags for perch sites, nest sites, and food resources. Thus, it is critical to develop and apply appropriate snag-management guidelines to implement postfire timber harvest operations in the same locations. Unfortunately, existing guidelines designed for green-tree forests cannot be applied to postfire salvage sales because the snag needs of snag-dependent species in burned forests are not at all similar to the snag needs of snag-dependent species in green-tree forests. Birds in burned forests have very different snag-retention needs from those cavity-nesting bird species that have served as the focus for the development of existing snag-management guidelines. Specifically, many postfire specialists use standing dead trees not only for nesting purposes but for feeding purposes as well. Woodpeckers, in particular, specialize on wood-boring beetle larvae that are superabundant in fire-killed trees for several years following severe fire. Species such as the Black-backed Woodpecker (*Picoides arcticus*) are nearly restricted in their habitat distribution to severely burned forests. Moreover, existing postfire salvage-logging studies reveal that most postfire specialist species are completely absent from burned forests that have been (even partially) salvage logged. I call for the long-overdue development and use of more meaningful snag-retention guidelines for postfire specialists, and I note that the biology of the most fire-dependent bird species suggests that even a cursory attempt to meet their snag needs would preclude postfire salvage logging in those severely burned conifer forests wherein the maintenance of biological diversity is deemed important.

Attachment 7 is Kotliar, N.B., S.J. Hejl, R.L. Hutto, V. Saab, C.P. Melcher, and M.E. McFadzen. 2002. Effects of fire and post-fire salvage logging on avian communities in conifer-dominated forests of the western United States. In: George, T.L. and D.S. Dobkin. Effects of habitat fragmentation on birds in western landscapes: contrasts with paradigms from the eastern United States. Studies in Avian Biology No. 25. Camarillo, CA: Cooper Ornithological Society. p. 49-64.

The abstract states:

> Historically, fire was one of the most widespread natural disturbances in the western United States. More recently, however, significant anthropogenic activities, especially fire suppression and silvicultural practices, have altered fire regimes; as a result, landscapes and associated communities have changed as well. Herein, we review current knowledge of how fire and post-fire salvaging practices affect avian communities in (1) burned vs. unburned forests, and (2) unsalvaged vs. salvage-logged burns. We also examine how variation in burn characteristics (e.g. severity, age, size) and salvage logging can alter avian communities in burns.
>
> Of the 41 avian species observed in three or more studies comparing early post-fire and adjacent unburned forests, 22% are consistently more abundant in burned forests, 34% are usually more abundant in unburned forests, and 44% are equally abundant in burned and unburned forests or have varied responses. In general, woodpeckers and aerial foragers are more abundant in burned forests, whereas most foliage-gleaning species are more abundant in unburned forests. Bird species that are frequently observed in stand-replacement burns are less common in understory burns; similarly, species commonly observed in unburned forests often decrease in abundance with increasing burn severity. Granivores and species common in open canopy forests exhibit less consistency among studies. For all species, responses to fire may be influenced by a number of factors including burn severity, fire size and shape, proximity to unburned forests, pre- and post- fire cover types, and time since fire. In addition, post-fire management can alter species' responses to burns. Most cavity-nesting species do not use severely salvaged burns, whereas some cavity-nesters persist in partially salvaged burns. Early post-fire specialists, in particular, appear to prefer unsalvaged burns. We discuss several alternatives to severe salvage-logging that will help provide habitat for cavity nesters.

Attachment 8 is Kotliar et al. 2002. Fire on the Mountain: Birds and Burns in the Rocky Mountains. USDA Forest Service Gen. Tech. Rep. PSW-GTR-191. 2005. A version of this paper was presented at the Third International Partners in Flight Conference, March 20-24, 2002, Asilomar Conference Grounds, California.

No abstract is available for this paper.

Attachment 9 is an October 6, 2006 letter that appeared in Science volume 314 from a number of scientists concluding that:

> The effects of post-disturbance logging require careful consideration of whether to log at all, and if so, how to conduct such logging to minimize negative consequences. If we must conduct post-disturbance logging for timber production, stringent ecological safeguards must be in place to minimize impacts to terrestrial and aquatic ecosystems. When viewed through an ecological lens, a recently disturbed landscape is not just a collection of dead trees, but a unique and biologically rich environment that also contains many of the building blocks for the rich forest that will follow the disturbance.

Attachment 10 is Smucker et al., 2005. Changes in Bird Abundance After Wildfire: Importance of Fire Severity and Time Since Fire. Ecological Applications, 15(5), 2005, pp. 1535–1549 q 2005 by the Ecological Society of America.

The abstract states:

> Fire can cause profound changes in the composition and abundance of plant and animal species, but logistics, unpredictability of weather, and inherent danger make it nearly impossible to study high-severity fire effects experimentally. We took advantage of a unique opportunity to use a before–after/control–impact (BACI) approach to analyze changes in bird assemblages after the severe fires of 2000 in the Bitterroot Valley, Montana. Observers surveyed birds using 10-minute point counts and collected vegetation data from 13 burned and 13 unburned transects for five years before fire and three years after fire. We compared changes in vegetation variables and relative bird abundance from before to after fire between the set of points that burned and the set of points that did not burn. The magnitude of change in vegetation variables from before to after fire increased with fire severity. The relative abundances of nine bird species showed significantly greater changes from before to after fire at burned points compared with unburned points. Moreover, when burned points were separated by whether they burned at low, moderate, or high severity, an additional 10 species showed significant changes in relative abundance from before to after fire at one or more severities. Overall, almost twice as many bird species increased as decreased significantly in response to fire. We also found changes in abundance between one year after and two years after fire for most species that responded to fire. Thus, species that have been termed ''mixed responders'' in the literature appear to be responding differently to different fire severities or different time periods since fire, rather than responding variably to the same fire conditions. These findings underscore the importance of fire severity and time since fire and imply that both factors must be considered to understand the complexities of fire effects on biological communities. Because different bird species responded positively to different fire severities, our results suggest a need to manage public lands for the maintenance of all kinds of fires, not just the low-severity, understory burns that dominate most discussions revolving around the use of fire in forest restoration.

Attachment 11 is Kotliar et al, 2007. Avifaunal Responses To Fire in Southwestern Montane Forests Along a Burn Severity Gradient. Ecological Applications, 17(2), 2007, pp. 491–507 by the Ecological Society of America

The abstract states:

> The effects of burn severity on avian communities are poorly understood, yet this information is crucial to fire management programs. To quantify avian response patterns along a burn severity gradient, we sampled 49 random plots (2001–2002) at the 17 351-ha Cerro Grande Fire (2000) in New Mexico, USA. Additionally, pre-fire avian surveys (1986– 1988, 1990) created a unique opportunity to quantify avifaunal changes in 13 pre-fire transects (resampled in 2002) and to compare two designs for analyzing the effects of unplanned disturbances: after-only analysis and before–after comparisons. Distance analysis was used to calculate densities. We analyzed after-only densities for 21 species using gradient analysis, which detected a broad range of responses to increasing burn severity: (I) large significant declines, (II) weak, but

significant declines, (III) no significant density changes, (IV) peak densities in low- or moderate-severity patches, (V) weak, but significant increases, and (VI) large significant increases. Overall, 71% of the species included in the after-only gradient analysis exhibited either positive or neutral density responses to fire effects across all or portions of the severity gradient (responses III–VI). We used pre/post pairs analysis to quantify density changes for 15 species using before–after comparisons; spatiotemporal variation in densities was large and confounded fire effects for most species. Only four species demonstrated significant effects of burn severity, and their densities were all higher in burned compared to unburned forests. Pre- and post-fire community similarity was high except in high-severity areas. Species richness was similar pre- and post-fire across all burn severities. Thus, ecosystem restoration programs based on the assumption that recent severe fires in Southwestern ponderosa pine forests have overriding negative ecological effects are not supported by our study of post-fire avian communities. This study illustrates the importance of quantifying burn severity and controlling confounding sources of spatiotemporal variation in studies of fire effects. After-only gradient analysis can be an efficient tool for quantifying fire effects. This analysis can also augment historical data sets that have small samples sizes coupled with high non-process variation, which limits the power of before–after comparisons.

Attachment 12 is a peer-reviewed paper entitled "Salvage Logging, Ecosystem Process, and Biodiversity Conservation" by Lindenmayer and Noss that appeared in Conservation Biology Volume 20, No. 4, 949–958. 2006.

The abstract for this paper states:

We summarize the documented and potential impacts of salvage logging—a form of logging that removes trees and other biological material from sites after natural disturbance. Such operations may reduce or eliminate biological legacies, modify rare postdisturbance habitats, influence populations, alter community composition, impair natural vegetation recovery, facilitate the colonization of invasive species, alter soil properties and nutrient levels, increase erosion, modify hydrological regimes and aquatic ecosystems, and alter patterns of landscape heterogeneity. These impacts can be assigned to three broad and interrelated effects: (1) altered stand structural complexity; (2) altered ecosystem processes and functions; and (3) altered populations of species and community composition. Some impacts may be different from or additional to the effects of traditional logging that is not preceded by a large natural disturbance because the conditions before, during, and after salvage logging may differ from those that characterize traditional timber harvesting. The potential impacts of salvage logging often have been overlooked, partly because the processes of ecosystem recovery after natural disturbance are still poorly understood and partly because potential cumulative effects of natural and human disturbance have not been well documented. Ecologically informed policies regarding salvage logging are needed prior to major natural disturbances so that when they occur ad hoc and crisis-mode decision making can be avoided. These policies should lead to salvage-exemption zones and limits on the amounts of disturbance-derived biological legacies (e.g., burned trees, logs) that are removed where salvage logging takes place. Finally, we believe new terminology is needed. The word salvage implies that something is being saved or recovered, whereas from an ecological perspective this is rarely the case.

Attachment 13 consists of an April 2006 open letter to Congress from an extremely long and impressive list of scientists contending that:

> [N]o substantive evidence supports the idea that fire-adapted forests might be improved by logging after a fire. In fact, many carefully conducted studies have concluded just the opposite. Most plants and animals in these forests are adapted to periodic fires and other natural disturbances. They have a remarkable way of recovering—literally rising from the ashes—because they have evolved with and even depend upon fire.

Attachment 14 is a February 24, 2006 peer-reviewed paper presented to the Society for Conservation Biology by Reed Noss, Jerry Franklin and William Baker entitled "Ecology and Management of Fire-prone Forests of the Western United States."

Key Findings of this paper include the following:

- Research by both ecologists and foresters provides evidence that areas affected by large-scale natural disturbances often recover naturally.

- Post-fire logging does not contribute to ecological recovery; rather it negatively impacts recovery processes, with the intensity of such impacts depending upon the nature of the logging activity.

- Post-fire logging destroys much of whatever natural tree regeneration is occurring on a burned site.

- Evidence from empirical studies is that post-fire logging typically generates significant short- to mid-term increases in fine and medium fuels.

- There is no scientific or operational linkage between reforestation and post-fire logging; potential ecological impacts of reforestation are varied and may be either positive or negative depending upon the specifics of activity, site conditions, and management objectives. On the other hand, ecological impacts of post-fir logging appear to be consistently negative.

Attachment 15 is a peer-reviewed study by that appeared in November 2004 / Vol.54 No.11 issue of BioScience entitled "The Effects of Postfire Salvage Logging on Aquatic Ecosystems in the American West" by Karr et al.

The authors found that:

• Postfire salvage logging generally damages soils by compacting them, by removing vital organic material, and by increasing the amount and duration of topsoil erosion and runoff (Kattleman 1996), which in turn harms aquatic ecosystems.

• Postfire salvage logging has numerous ecological ramifications. The removal of burned trees that provide shade may hamper tree regeneration, especially on high-elevation or dry sites (Perry et al.1989). The loss of future soil organic matter is likely to translate into soils that are less able to hold moisture (Jenny 1980), with implications for soil biota, plant growth (Rose et al. 2001, Brown et al. 2003), and stream flow (Waring and Schlesinger 1985). Logging and associated roads carry a high risk of spreading nonindigenous, weedy species (CWWR 1996, Beschta et al. 2004).

• Increased runoff and erosion alter river hydrology by increasing the frequency and magnitude of erosive high flows and raising sediment loads. These changes alter the character of river channels and harm aquatic species ranging from invertebrates to fishes (Waters 1995).

• Construction and reconstruction of landings (sites to which trees are brought, stacked, and loaded onto trucks) often accompany postfire salvage logging. These activities damage soils, destroy or alter vegetation, and accelerate the runoff and erosion harmful to aquatic systems.

• By altering the character and condition of forest vegetation, salvage logging after a fire changes forest fuels and can increase the severity of subsequent fires (CWWR 1996, Odion et al. 2004).

Attachment 16 consists of a September 2006 post-disturbance literature review by Dr. Dominick A. DellaSala, Ph.D. for the National Center for Conservation Science & Policy.

The executive summary for the review states:

> Post-disturbance recovery, much like fire itself, has been the subject of intense debate and widespread misunderstanding regarding how and whether to treat regenerating landscapes following large disturbance events. As HR4200 – the Forest Emergency Recovery and Research Act – heads to the Senate for debate, it is important that lawmakers and land managers consider the latest science in making informed decisions about the management of public lands following natural disturbances. Numerous scientific studies have demonstrated that natural disturbances, even very large ones such as volcanic eruptions, wildfires, and severe wind storms, are critical to the health of terrestrial and aquatic ecosystems as they are characterized by unique biological communities and generate important structural elements that forests depend on for decades to centuries. The standing dead, dying, and downed trees (especially large ones) and surviving green and scorched ones transfer their critical functions from the predisturbed forest to the regenerating one. When post-disturbance “salvage logging” removes these important forest elements, it sets back recovery triggering ecosystem damages that may exceed the impact of the initial disturbance itself. **Based on a review of approximately 38 scientific studies on post-fire logging and additional government reports published to date, not a single study indicated that logging benefits ecosystems regenerating after natural disturbance**. In fact, post-fire logging impedes regeneration when it compacts soils, removes “biological legacies” (e.g., large dead standing and downed trees), introduces or spreads invasive species, causes soil erosion when logs are dragged across steep slopes, and delivers sediment to streams from logging roads. With post-disturbance logging these impacts occur when forest recovery is most vulnerable to the effects of additional,

especially anthropogenic disturbances, creating cumulative effects that exceed logging of undisturbed forests. Such effects can extend for a century or more, because of the removal of long-persisting and functioning wood legacies. These findings are especially relevant to public lands policy and management as postdisturbance logging currently generates ~40 percent of the timber volume on Forest Service lands nation-wide (USFS Washington Office, timber volume spread sheets - Timber Management Staff, 2005 statistics). Therefore, the following conclusions were provided to assist decision makers regarding post-disturbance management decisions: (1) post-disturbance landscapes should be allowed to regenerate naturally as evidence from several locations (Biscuit fire (sw Oregon), Storrie and Starr fires (California Sierra's), Yellowstone 1988 fires, Mt. St. Helens eruption, New England hurricanes and insect infestations) indicates recovery can be surprisingly swift and many species that colonize disturbed areas are adapted to them, contributing to recovery in unique ways; (2) road building (even temporary roads) damages regenerative processes in terrestrial and aquatic ecosystems and should be avoided; (3) natural disturbances are characterized by unique biological legacies (large dead and dying trees) essential to regenerative processes – recovery is not possible in their absence; and (4) if salvage logging is to take place for economic reasons, large trees should be retained to protect their biological legacy functions and "no harvest zones" established on steep slopes with fragile soils, including areas of conservation and public health concern such as late-successional and old-growth forests, riparian areas, aquatic watersheds essential to drinking water municipalities, and roadless areas.

Attachment 17a consists of Darren Clark's 2007 Master's Thesis in Wildlife Science entitled "Demography and Habitat Selection of Northern Spotted Owls in Post-Fire Landscapes of Southwestern Oregon."

This 2007 study found that:

> Nesting, roosting and foraging habitat with low, moderate, or high severity burn was selected [as habitat] by spotted owls in post-fire landscapes. Furthermore, roosting and foraging habitat with a moderate severity burn was also selected. These habitats were used in a similar manner to early seral forests including: roosting and foraging habitat with low or high severity burn and salvage logged areas. Non-habitat was the only habitat that was avoided.

Attachment 17b is a 2013 published paper in the Journal of Wildlife Management. **Relationship Between Wildfire, Salvage Logging, and Occupancy of Nesting Territories by Northern Spotted Owls Darren A. Clark, Robert G. Anthony and Lawrence S. Andrews.**

> Furthermore, Timbered Rock had a 64% reduction in site occupancy following wildfire (2003–2006) in contrast to a 25% reduction in site occupancy at South Cascades during the same time period. This suggested that the combined effects of habitat disturbances due to wildfire and subsequent salvage logging on private lands negatively affected site occupancy by spotted owls. In our second analysis, we investigated the relationship between wildfire, salvage logging, and occupancy of spotted owl territories at the Biscuit, Quartz, and Timbered Rock burns from 2003 to 2006. Extinction probabilities increased as the combined area of early seral forests, high severity burn, and salvage logging increased within the core nesting areas (^b ¼ 1:88, 95% CI ¼ 0.10–3.66). We were unable to identify any relationships between initial occupancy or colonization probabilities and the habitat covariates that we considered in our analysis where the b coefficient did not overlap zero. We concluded that site occupancy of

> spotted owl nesting territories declined in the short term following wildfire, and habitat modification and loss due to past timber harvest, high severity fire, and salvage logging jointly contributed to declines in site occupancy.

Attachment 18 is a study that was published in the Wildlife Society Bulletin in 2002 entitled "Short-term effects of wildfires on spotted owl survival, site fidelity, mate fidelity, and reproductive success" by Bond et al.

The abstract for this study states:

> The effects of wildfire on wildlife are important considerations for resource managers because of recent interest in the role of fire in shaping forested landscapes in the western United States. This is particularly true of wildfire effects on spotted owls because of the uncertainty of impacts of controlled burning within spotted owl habitat. Therefore, we documented minimum survival, site fidelity, mate fidelity, and reproductive success for 21 spotted owls after large (>540 ha) wildfires occurred within 11 owl territories in California, Arizona, and New Mexico. In each territory, fire burned through the nest and primary roost sites. Eighteen owls (86%) were known to be alive at least 1 year after the fires, which was similar to reported annual adult survival probabilities for the species. Of 7 pairs, of which both members were later resighted, all were located together on the same territories during the breeding season following fires, and 4 pairs produced a total of 7 fledglings. No pair separations were observed after fire. On 8 territories where fire severities were mapped, 50% experienced predominately low- to moderate- severity fires while 50% experienced high-severity fires that burned large (>30%) area of the territories. We hypothesize that wildfires may have little short-term impact on survival, site fidelity, mate fidelity, and reproductive success of spotted owls.

Attachment 19 consists of several news articles about the significant scientific controversy surrounding post-fire management. We incorporate these documents into our comments and into the administrative record for the Antelope and Tennant Fire Salvage Logging Project. The included documents are:

- *In Fire's Wake, Logging Study Inflames Debate; University Study Challenges Cutting of Burnt Timber,* The Washington Post, February 27, 2006, p.A3.
- *In Bed With Big Wood,* Willamette Week, April 19, 2006.
- *Logging and Fire Debate Grows,* Corvallis Gazette-Times, February 25, 2006
- *Wildfire Logging Debate Heats Up,* The Scientist, January 27, 2006.
- *Logging Study Sets Off Own Firestorm,* The Oregonian, January 20, 2006.
- *A Student's Forest Paper Sparks One Hot Debate*, L.A. Times, June 11, 2006.

Attachment 20 is a 2009 peer-reviewed article by Bond et al. that appeared in The Journal of Wildlife Management entitled "Habitat Use and Selection by California Spotted Owls in a Postfire Landscape."

The abstract for this article states:

Forest fire is often considered a primary threat to California spotted owls (Strix occidentalis occidentalis) because fire has the potential to rapidly alter owl habitat. We examined effects of fire on 7 radiomarked California spotted owls from 4 territories by quantifying use of habitat for nesting, roosting, and foraging according to severity of burn in and near a 610-km2 fire in the southern Sierra Nevada, California, USA, 4 years after fire. Three nests were located in mixed-conifer forests, 2 in areas of moderate-severity burn, and one in an area of low- severity burn, and one nest was located in an unburned area of mixed-conifer–hardwood forest. For roosting during the breeding season, spotted owls selected low-severity burned forest and avoided moderate- and high-severity burned areas; unburned forest was used in proportion with availability. Within 1 km of the center of their foraging areas, spotted owls selected all severities of burned forest and avoided unburned forest. Beyond 1.5 km, there were no discernable differences in use patterns among burn severities. Most owls foraged in high-severity burned forest more than in all other burn categories; high-severity burned forests had greater basal area of snags and higher shrub and herbaceous cover, parameters thought to be associated with increased abundance or accessibility of prey. We recommend that burned forests within 1.5 km of nests or roosts of California spotted owls not be salvage-logged until long-term effects of fire on spotted owls and their prey are understood more fully.
-JOURNAL OF WILDLIFE MANAGEMENT 73(7):1116–1124; 2009.

Attachment 21 consists of a peer-reviewed study by Saab et al. that appeared in Forest Ecology and Management (2009) entitled "Nest-site selection by cavity-nesting birds in relation to salvage logging."

The abstract reads as follows:

Large wildfire events in coniferous forests of the western United States are often followed by postfire timber harvest. The long-term impacts of postfire timber harvest on fire-associated cavity-nesting bird species are not well documented. We studied nest-site selection by cavity-nesting birds over a 10-year period (1994–2003), representing 1–11 years after fire, on two burns created by mixed severity wildfires in western Idaho, USA. One burn was partially salvaged logged (the Foothills burn), the other was primarily unlogged (the Star Gulch burn). We monitored 1367 nests of six species (Lewis's Woodpecker Melanerpes lewis, Hairy Woodpecker Picoides villosus, Black-backed Woodpecker P. arcticus, Northern Flicker Colaptes auratus, Western Bluebird Sialia mexicana, and Mountain Bluebird S. currucoides). Habitat data at nest and non-nest random locations were characterized at fine (field collected) and coarse (remotely sensed) spatial scales. Nest-site selection for most species was consistently associated with higher snag densities and larger snag diameters, whereas wildfire location (Foothills versus Star Gulch) was secondarily important. All woodpecker species used nest sites with larger diameter snags that were surrounded by higher densities of snags than at non-nest locations. Nests of Hairy Woodpecker and Mountain Bluebird were primarily associated with the unlogged wildfire, whereas nests of Lewis's Woodpecker and Western Bluebird were associated with the partially logged burn in the early years after fire. Nests of wood-probing species (Hairy and Black-backed Woodpeckers) were also located in larger forest patch areas than patches measured at non-nest locations. Our results confirm previous findings that maintaining clumps of large snags in postfire landscapes is necessary for maintaining breeding habitat of cavity-nesting birds. Additionally, appropriately managed salvage logging can create habitat for some species of cavity-nesting birds that prefer more open environments. Our findings can be used by land managers to develop design criteria for postfire salvage logging that will reserve breeding habitat for cavity-nesting birds.

NEW PLANTATIONS INCREASE FIRE HAZARD

> "Plantations are extremely flammable because of high crown to trunk ratio and because crowns are very close to the ground."
> -Upper South Fork Trinity River Happy Camp Creek Watershed Analysis, Shasta-Trinity National Forest at page 21.

Our organizations are extremely concerned that the proposed establishment of artificial plantations may increase future fire hazard in the planning area. The practice of planting young tree plantations significantly increases fire hazard in the mid- to long-term. Tree plantations are more susceptible to intense fire behavior and severe fire effects than unlogged mature forests, including burned forests (DellaSala et al. 1995, Odion et al. 2004). The increased susceptibility of plantations to severe fire is due to:

- Structural characteristics, such as fine and interlocking branch structures situated low to the ground, which facilitate high heat energy output by fire and rapid fire spread (Sapsis and Brandow 1997).

- Warm, windy and dry microclimates compared to what would exist in an unlogged burned forest that possessed more structural diversity, ground shading and barriers to lateral wind movement (Countryman 1955, van Wagtendonk 1996).

- Accumulations of large volumes of fine logging slash on the ground surface (Weatherspoon and Skinner 1995).

In addition to these direct and indirect effects on the fire environment, the cumulative effects of plantation establishment include the creation of more highly flammable even-aged stands on a landscape already vulnerable to uncharacteristically large and severe fires. The number and distribution of even-age tree plantations resulting from industrial timber management has altered fire behavior and effects at both stand and landscape scales. (Frost and Sweeny 2000, Hann et al. 1997, Huff et al. 1995). Perry (1995) suggests that the existence of sufficient young tree patches on a forest landscape creates the potential for "a self-reinforcing cycle of catastrophic fires." Most plantations occur near roads (DellaSala and Frost 2001), which presents an added risk of human-caused ignitions during hot and dry conditions (USDA 2000).

Please note that the BLM BEAR Report for the Douglas Fire acknowledged that "while the [fire] severity varied throughout the fire area, young timber plantations carried the fire while older stands tended to be more resistant. This is mostly due to young timber plantations having a high density of ground fuels." These findings are directly applicable to the Antelope and Tennant planning area.

In summary, post-fire logging to facilitate plantation establishment will reinforce a growing tendency toward high severity fire at a landscape scale. Please address peer-reviewed findings indicating that post-fire logging and plantation establishment irreversibly hinder the natural low- and mixed-severity fire regime.

FIRE AND FUELS

The Forest Service must use the best available science regarding the effects of fire or the proposed logging on fire and fuels, and document those conclusions in an EIS.

Salvage logging would increase fire hazard

In the project area, where post-fire fuel loading is currently low, logging without timely slash treatment is likely to be the single most important factor that will contribute to an increase in potential wildfire severity (Weatherspoon 1996).

There is no scientific, empirical evidence to prove that the presence of large-diameter standing or downed fuels translates into high fire hazard. Besechta et al. (1995) stated, "We are aware of no evidence supporting the contention that leaving large dead woody material significantly increases the probability of reburn" (p. 11).

The Besechta Report prompted responses by agency scientists. These included Everett (1995): "There is no support in the scientific literature that the probability of reburn is greater in post-fire tree retention areas than in salvage logged sites…The authors are correct that the intense reburn concept is not reported in the literature" (p. 4).

The Forest Service's Pacific Northwest Research Station reviewed the scientific literature and concurred that, "Following Besechta and others (1995) and Everett (1995), we found no studies documenting a reduction in fire intensity in a stand that had previously burned and then been logged" (McIver and Starr 2000).

Small diameter surface fuels are the primary carriers of fire. Current fire spread models such as the BEHAVE program do not consider fuels greater than three inches (3") in diameter because the fine sized surface fuels allow fires to spread. *Commercial* logging operations often remove large diameter fuels, which have higher surface area to volume (S/V) ratios that inhibit combustion. Moreover, logging leaves behind increased fire-prone slash and other small diameter fuels. Indeed, it is highly likely that a significant amount small diameter material will be the outcome of your salvage logging proposal.

Logging would create an immediate source of highly flammable fuel. The forthcoming NEPA document must disclose how many tons of slash would remain per acre and how its presence might influence the multitude of lightning strikes that occur in the watershed regularly.

This issue is highly significant because other federal land agencies have acknowledged in NEPA documents that fine woody material up to three inches in diameter, such as the tops of trees, has the greatest influence on the rate of spread and flame length of a fire, which has direct impacts on fire suppression efforts (e.g., USDI 2002, USDA 1994). Salvage logging could increase fuel loadings by 10 tons to the acre or more. With this immediate change in the project area's fuel model, higher rates of fire spread, and greater flame lengths would occur (Rothermel 1991). Direct attack of a fire would be limited under some weather conditions so indirect measures would become necessary. This, in turn, would increase the size and cost of a wildfire. Slash created by logging operations, if not treated, would also increase the duration and intensity of a ground fire.

SOILS

Total organic matter remaining after the fire and after salvage is the key indicator for the issue of site productivity. Please address soil chemistry, productivity, hydrology, and biological integrity on a site-specific (*i.e.*, unit-by-unit) basis. Please map soil types and composites using field reconnaissance data and include the maps in the NEPA document. Include a qualified, journey-level soil scientist on the ID Team. Design actions and mitigation *after* you have collected field reconnaissance data on soils at every site proposed for action. Please do not lump "moderate" and "severe" fire impacts to soils in your forthcoming analysis.

SLOPE STABILITY, LANDSLIDES AND SEDIMENT

The Forest Service should analyze and disclose the cumulative impacts of the fire, fire suppression activities, and post fire logging on slope stability, landslides and sediment production via an EIS. This is particularly important in a planning area such as this that includes well-traveled public roads and salmon-bearing streams. Please note that uncertainty and scientific controversy are both triggers necessitating completion of an EIS.

TRACTOR YARDING

As established in the peer-reviewed literature submitted with these scoping comments, ground-based yarding on post-fire soils is a particularly destructive and controversial practice that necessitates the completion of an EIS.

Please address the following conclusions from page 44 of the Doubleday Fire Salvage Environmental Assessment. March 2009. BLM-OR-MO50-0015-EA. Butte Falls Resource Area. Medford District BLM:

> Tractor yarding causes soil compaction and displacement. Soil compaction is an increase in bulk density with a corresponding decrease in soil porosity. Compaction reduces soil productivity through a reduction in root growth, tree height, and timber volume (Greacen and Sands 1980[1]; Froehlich and McNabb 1984[2]) and may be produced by a single pass of logging

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[1] Greacen, EL and R Sands. 1980. 1980 Compaction of forest soils. A review. *Australian Journal of Soil Research.* 18(2):163-189.

equipment across a site (Wronski 1984[3]). Productivity losses have been documented for whole sites (West and Thomas 1981[4]) and for individual trees (Froehlich 1979[5], Helms and Hipkin 1986[6]). Decreases in important microbial populations have also been observed in compacted soils (Amaranthus et al. 1996.)[7] Soil compaction may also increase surface runoff because of reducing infiltration (Graecen and Sands 1980).[8]

Soil displacement from tractor yarding occurs when the tracked equipment turns on its skids pushing the soil into small piles, or berms, along the skid trails. This displacement of the topsoil removes the organic litter layer and exposes mineral soil. Removal of the loose, organic surface materials promotes surface sealing and crusting that decreases infiltration capacity and may increase erosion (Child et al. 1989).[9] Soil displacement also results in a loss of important soil biota, such as mycorrhizal fungi, which facilitates nutrient uptake by plants (Amaranthus et al. 1989 and 1996).[10]

ARTIFICIAL REPLANTING DOES NOT RECOVER FORESTS

The Forest Service is proposing activities to facilitate the artificial planting of trees, and associated elimination of shrubs around planted sites, on thousands of acres in the fire area, implying that natural conifer regeneration would not effectively or adequately occur in the absence of such artificial planting.

On August 1, 2006, a letter from nearly 600 American scientists opposed post-fire snag removal and subsequent artificial replanting, share the finding that such activities do not represent the current state of scientific knowledge and "would actually slow the natural recovery of forests and of streams and the creatures within them…" The scientists concluded that "no substantive evidence supports the idea that fire-adapted forests might be improved by logging after a fire."

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[2] Froehlich, HA, and DH McNabb. 1984. Minimizing soil compaction in Pacific Northwest forests. In EL Stone (editor) *Forest Soils and Treatment Impacts*. Proceedings of 6th North American Soils Conference, June 1983, University of Tennessee, Department of Forestry, Wildlife and Fisheries, Knoxville, TN. P 159-192.

[3] Wronski, EB. 1984. Impacts of tractor thinning operations on the soils and tree roots in a Karri forest, Western Australia. *Australian Forestry Research* 14:319-332/

[4] West, S and BR Thomas. 1981. Effects of skid roads on diameter, height, and volume growth in Douglas-fir. *Soil Science Society of America Journal* 45:629-632.

[5] Froehlich, HA. 1979. Soil compaction from logging equipment: effects on growth of young ponderosa pine. *Journal of Soil and Water Conservation* 34:276-278.

[6] Helms, JA, and C Hipkin. 1986. Effects of soil compaction on tree volume in California ponderosa pine plantation. *Western Journal of Applied Forestry.* 1:121-124.

[7] Amaranthus, MP, and DA Perry. 1989. Rapid root tip and mycorrhizal formation and increased survival of Douglas-fir seedlings after soil transfer. *New Forests* 3:77-82.

[8] Greacen, EL and R Sands. 1980. 1980 Compaction of forest soils. A review. *Australian Journal of Soil Research.* 18(2):163-189.

[9] Childs, SW, SP Shade, DW Miles, E Shepard, HA Froehlich. 1989. Management of soil physical properties limiting forest productivity. In: DA Perry et al. (eds.) Maintaining the long-term productivity of Pacific Northwest forest ecosystems. Timber Press, Portland, OR.

[10] Amaranthus, MP, and DA Perry. 1989. Rapid root tip and mycorrhizal formation and increased survival of Douglas-fir seedlings after soil transfer. *New Forests* 3:77-82.

Patches of higher-intensity fire, wherein most or all trees are killed, do not "remove" the stand of trees, and do not put the area to a nonforest use. On the contrary, higher-intensity fire patches create one of the most ecologically important and biodiverse *forest habitat types* in western U.S. conifer forests: "snag forest habitat".

The agency's apparent assumption that higher-intensity fire areas will not naturally regenerate with conifers effectively is not supported by any citation to scientific literature, and is directly contradicted by Forest Service data regarding natural post-fire conifer regeneration in large high-intensity fire patches (Collins et al. 2010). Specifically, the Forest Service found vigorous natural post-fire forest regeneration, dominated mostly by pines and oaks for trees over 1 centimeter in diameter at breast height (Collins et al. 2010, Table 5), and hundreds of trees per acre overall, within several years to about a decade after high-intensity fire, even where native shrub cover was 90-100% (Collins et al. 2010, Tables 5 and 6). This is consistent with findings from other studies (Shatford et al. 2007). And, while a more recent report from Collins et al. (Plumas Lassen Study 2011 Annual Report) claims to find little natural conifer regeneration in many high-severity fire areas this is misleading because nearly half of the area surveyed had been subjected to intensive post-fire logging, which damages soils and removes or destroys natural seed sources—and many of the areas that were not post-fire salvage logged were pre-fire clearcut.

Further, the results of Collins et al. (2010 [Table 5]), who found and reported substantial natural conifer regeneration—especially ponderosa pine and sugar pine—in high-intensity fire patches, excluded salvage logged areas, unlike Collins et al. (2011). Collins et al. (2010) state that "some areas within each of these fires experienced post-fire management, ranging from post fire salvage logging, tree release and weed management. *These areas were removed from analysis*." (emphasis added). Specifically, Collins et al. (2010 [Table 5]) found 158 ponderosa pine and sugar pine conifers per acre regenerating in high-intensity fire patches in the Storrie fire—68% of the total natural conifer regeneration by species. Moreover, the plots in Collins et al. (2011 [see map]) within the Storrie fire area were concentrated at the edge of the fire in the areas subjected to extensive salvage logging and roadside hazard tree logging, which removes conifer (including pine) seed sources and tramples natural conifer regeneration with ground-based machinery (thus, even the plots that technically had not been post-fire logged were often adjacent to logged areas). Extensive natural conifer regeneration surveys deeper into the Storrie fire, at seven years post-fire, revealed abundant natural conifer regeneration, especially pine (Hanson 2007b [Tables 1 through 4, and Appendix A]). In addition, over 95% of the conifer regeneration in Collins et al. (2010, 2011) was under 0.1 cm in diameter at breast height (Collins et al. 2010); the plots used to determine the density of conifers of this size covered only 9 square meters of area per plot, and many high-intensity fire patches in the study only had 3-5 plots for an entire high-intensity fire patch (Collins et al. 2011). This means that, even if 200-300 naturally-regenerating conifers per hectare actually existed in a given high-intensity fire patch, the methods used by Collins et al. would be very unlikely to detect conifers, as a matter of math and probability.

Siegel et al. (2011) concluded that native fire-following shrubs are vitally important to biodiversity in complex early seral forest (CESF) created by high-intensity fire: "Many more species occur at high burn severity sites starting several years post-fire, however, and these include the majority of ground and shrub nesters as well as many cavity nesters. Secondary cavity nesters, such as swallows, bluebirds, and wrens, are particularly associated with severe burns, but only after nest cavities have been created, presumably by the pioneering cavity-excavating species such as the Black-backed Woodpecker. Consequently, fires that create preferred conditions for Black-backed Woodpeckers in the early post-fire years will likely result in increased nesting sites for secondary cavity nesters in successive years."

Similarly, Burnett et al. have found that shrub dominated landscapes are critically important wildlife habitat: "while some snag associated species (e.g., black-backed woodpecker) decline five or six years after a fire [and move on to find more recent fire areas], [species] associated with understory plant communities take [the woodpeckers'] place resulting in similar avian diversity three and eleven years after fire (e.g. Moonlight and Storrie)." (Burnett et al. 2012). Burnett et al. (2012) also noted that "there is a five year lag before dense shrub habitats form that maximize densities of species such as Fox Sparrow, Dusky Flycatcher, and MacGillivray's Warbler. These species have shown substantial increases in abundance in the Moonlight fire each year since 2009 but shrub nesting species are still more abundant in the eleven year post-burn Storrie fire. This suggests early successional shrub habitats in burned areas provide high quality habitat for shrub dependent species well beyond a decade after fire." (Burnett et al. 2012).

CONIFER REGENERATION AND BRUSH FIELDS

Attachment 22 is another peer-reviewed paper regarding post-fire forest succession entitled "Conifer Regeneration After Forest Fire in the Klamath Siskiyous: How Much, How Soon?" by Shatford, J.P.A.; Hibbs, D.E.; Puettmann, K.J. Journal of Forestry. Volume 105, Number 3, April/May 2007, pp. 139-146(8).

The abstract of this paper states:

> The increasing frequency and extent of forest fires in the western United States has raised concerns over postfire management actions on publicly owned forests. Information on ecosystem recovery after disturbance is lacking and has led to heated debate and speculation regarding the return of forest vegetation after disturbance and the need for management actions. One critical question emerges, will these ecosystems recover on their own, and if so, over what time frame. ***We report on one aspect of recovery, the spatial and temporal variation of natural conifer regeneration evident 9-19 years after forest fires in California and Oregon. In contrast to expectations, generally, we found natural conifer regeneration abundant across a variety of settings.*** Management plans can benefit greatly from using natural conifer regeneration but managers must face the challenge of long regeneration periods and be able to accommodate high levels of variation across the landscape of a fire.

Attachment 23 is a paper entitled "Vegetation Response to a Short Interval Between High-Severity Wildfires in a Mixed-Evergreen Forest" by Donato et al. in the Journal of Ecology. 2009, Volume 97. 142-154.

Summary:

1. Variations in disturbance regime strongly influence ecosystem structure and function. A prominent form of such variation is when multiple high-severity wildfires occur in rapid succession (i.e. short-interval (SI) severe fires, or 're-burns'). These events have been proposed as key mechanisms altering successional rates and pathways.

2. We utilized a natural experiment afforded by two overlapping wildfires occurring within a 15- year interval in forests of the Klamath–Siskiyou Mountains, Oregon (USA). We tested for unique effects of a SI fire (15-year interval before 2002 fire) by comparing vegetation communities 2 years post-fire to those following a long-interval (LI) fire (> 100-year interval before 2002 fire) and in mature/old-growth (M/OG) stands (no high-severity fire in > 100-year).

3. Nearly all species found in M/OG stands were present at similar relative abundance in both the LI and SI burns, indicating high community persistence through multiple high-severity fires. However, the SI burn had the highest species richness and total plant cover with additions of disturbance-associated forbs and low shrubs, likely due to a propagule bank of early seral species that developed between fires. Persistence of flora was driven by vegetative sprouting, on-site seed banks, and dispersal from off-site seed sources. Several broadly generalizable plant functional traits (e.g., rapid maturation, long-lived seed banks) were strongly associated with the SI burn.

4. Sprouting capacity of hardwoods and shrubs was unaltered by recurrent fire, but hardwood/ shrub biomass was lower in the SI burn because individuals were smaller before the second fire. Conifer regeneration densities were high in both the SI and LI burns (range = 298–6086 and 406–2349 trees ha., respectively), reflecting similar availability of seed source and germination substrates.

5. Synthesis. SI severe fires are typically expected to be deleterious to forest flora and development; however, these results indicate that in systems characterized by highly variable natural disturbances (e.g., mixed-severity fire regime), native biota possess functional traits lending resilience to recurrent severe fire. Compound disturbance resulted in a distinct early seral assemblage (i.e. interval-dependent fire effects), thus contributing to the landscape heterogeneity inherent to mixed-severity fire regimes. Process-oriented ecosystem management incorporating variable natural disturbances, including 'extreme' events such as SI severe fires, would likely perpetuate a diversity of habitats and successional pathways on the landscape.

The great majority of areas that burn at high severity naturally regenerate conifers vigorously--starting shortly after the fire. See Shatford et al. (2007) in Journal of Forestry for more information.

ACCURATELY DESCRIBE FIRE INTENSITY

Please do not "lump" moderate and severe fire intensity in your analysis. The NEPA documents should clearly describe the differences in salvage logging impacts on forests that have experienced fire of different severity. For instance, soils that are severely burned are likely to respond to ground-based yarding much differently than soils that are moderately burned.

FULLY DISCLOSE CUMULATIVE IMPACTS

Please disclose and *analyze* the cumulative impacts of the proposed fire salvage in conjunction with prior and foreseeable management activities in the watershed. Clearly address the cumulative impacts on future fire behavior, snag retention, soil health, hydrology and wildlife.

We believe that the significant cumulative impacts on these watersheds from past road construction and federal logging, combined with the impacts of fire suppression, private and county logging and proposed post-fire logging along with proposed Forest Service logging necessitate the completion of an EIS for this proposed timber sale.

Please note that a proper consideration of the cumulative impacts of a project requires "some quantified or detailed information;…[g]eneral statements about some possible effects and some risk do not constitute a hard look absent a justification regarding why more definitive information could not be provided." *Ocean Advocates v. United States Army Corps of Eng'rs*, 361 F.3d 1108, 1128 (9th Cir. 2004) (quoting *Neighbors of Cuddy Mountain v. United States Forest Serv.,* 137 F.3d 1372, 1379-80 (9th Cir. 1998)). The analysis "must be more than perfunctory; it must provide a useful analysis of the cumulative impacts of past, present and future projects." *Id*.

The many severe cumulative impacts from timber sale activities, road construction and fire suppression in this planning area must be analyzed in a NEPA document such that:

> A proper consideration of the cumulative impacts of a project requires "some quantified or detailed information;…general statements about possible effects and some risk do not constitute a hard look absent a justifications regarding why more definitive information could not be provided." *Ocean Advocates*, 361 F.3d at 1128 (quoting *Neighbors of Cuddy Mountain v. US Forest Service*, 137 F.3d 1372, 1379-80 (9th Cir. 1998)). The analysis "must be more than perfunctory; it must provide a useful analysis of the cumulative impacts of past, present, and future projects." *Id.*
> -*KS Wild v. BLM* 387 F 3d. 15269 (9th Cir. 2004).

As discussed in the Ninth Circuit's ruling of July 24, 2007, NEPA requires disclosure of the cumulative impacts of multiple actions:

> One of the specific requirements under NEPA is that an agency must consider the effects of the proposed action in the context of all relevant circumstances, such that where "several actions have a cumulative…environmental effect, this consequence must be considered in an EIS." *Neighbors of Cutty Mountain v. US Forest Service*., 137 F.3d 1372, 1378 (9th Cir. 1998) (quoting *City of Tenakee Springs v. Clough*, 915 F.2d 1308, 1312 (9th Cir. 1990)). A cumulative

> effect is "the impact on the environment which results from the incremental impact of the action when added to other **past**, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or persons undertakes such other actions." 40 CFR § 1508.7.
>
> Our cases firmly establish that a cumulative effects analysis "must be more than perfunctory; it must provide a useful analysis of the cumulative impacts of past, present, and future projects." *Klamath Siskiyou Wildlands Center v. BLM*, 387 F.3d 989, 993 (9th Cir. 2004). To this end, we have recently noted two critical features of a cumulative effects analysis. First, it must not only describe related projects but also enumerate the environmental effects of those projects. *See Lands Council v. Powell*, 395 F.3d 1019, 1028 (9th Cir. 2005) (holding a cumulative effects analysis violated NEPA because it failed to provide adequate data of the time, place, and scale" and did not explain in detail "how different project plans and harvest methods affects the environment"). Second, it must consider the interaction of multiple activities and cannot focus exclusively on the environmental impacts of an individual project. See *Klamath Siskiyou Wildlands Center*, 387 F 3d at 996 (finding a cumulative effects analysis inadequate when "it only considers the effects of the very project at issue" and does not "take into account the combined effects that can be expected as a result of undertaking" multiple projects).
>
> -*Oregon Natural Resources Council et al. v. Brong*. 9th Circuit. July 24, 2007.

Given the impacts of past Forest Service, private and county logging and road activities on the hydrological and terrestrial health of the project area, it is vital that the agency analyze and disclose the cumulative impacts of past activities and its future plans.

We contend that for a cumulative effects analysis to properly inform the decision-maker and the public, the agency must analyze spatially explicit logging occurring on private lands now and in the foreseeable future within the project area watersheds. The logging data from ongoing private harvest must be considered "available" to the Forest Service for NEPA purposes. This private salvage logging is certain to occur and will have severe impacts to the landscape since clearcutting and tractor logging is allowed along streams, on steep slopes, and on post-fire soils. Subsequent discretionary decisions by the Forest Service must quantitatively assess the effects of private salvage logging in combination with proposed federal logging.

The Antelope and Tennant fires drew a heavy suppression response that included tree felling, road use, burnout and use of chemical retardants over broad areas. Backer and others (2004) described numerous potentially significant adverse effects on the environment resulting from the suppression of fire including:

- Direct soil damage resulting from emergency road, fire line, and helispot construction.
- Hydrological impacts caused by fire lines, which route overland water flow and disrupt soil infiltration.
- Chemical pollution of water and soil from aerial flame retardant drops.
- Destruction of snags and other ecologically significant large woody debris.

- Spread of highly flammable exotic plants.

The public and the decision maker must be able to discern whether these factors resulted in significant impacts when considered cumulatively with the proposed action. Consideration and disclosure of cumulative impacts should include, but not be limited to, the following issues:

1. All past "shelterwood" cuts and clear-cuts, including their impacts on overall canopy cover, old growth quality and extent, and habitat suitability for canopy dependent species including sensitive and indicator species.

2. All past crown fires, including their impacts on overall canopy cover, old growth quality, quantity and extent, and habitat suitability for canopy dependent species including sensitive and indicator species.

3. Past changes in forest structure, including those resulting from the fire, and their impacts on wildlife habitat and populations.

4. Invasive plant populations occurring in past timber sales, along roads and in past fire perimeters, and the potential for the proposed action and/or spatially or temporally concurrent management to introduce and increase invasive plant populations within the project area. This analysis should also evaluate invasive plant population responses to climate, seasonality, soil, slope, aspect, land uses, management activities, timing and interactions therein.

5. Overall fire management goals for the planning area. The Forest Service should specifically frame the proposed action in terms of fire management goals, and it should demonstrate in the context of cumulative effects analysis—using maps, GIS and a Fire Management Plan—how the proposed restoration activities serve as a corrective step that facilitate managing natural fires both within and beyond the project area in the future.

6. Location of the project area and proposed management activities, including roads and skid trails, in relationship to the location of important wildlife habitat, both formally protected habitats and other important habitat, such as wildlife movement corridors.

NOXIOUS WEEDS

The forthcoming NEPA document must adequately disclose and analyze the potential for proposed Forest Service activities to increase and hasten the spread of noxious weeds in the planning area.

Please note that federal timber planners in the Butte Falls Resource Area of the Medford BLM plainly acknowledged that noxious weeds are a serious issue for post-fire logging when it wrote the Timbered Rock Salvage Logging DEIS (Butte Falls RA). That DEIS recognized that "[P]rojects in these [action] alternatives could spread noxious weeds at a higher rate than the No Action Alternative, due to a higher level of ground-disturbing activities." (DEIS 3-150). The Timbered Rock DEIS further acknowledged that the higher the burn severity the more vulnerable to noxious weed invasion and that subsequent loss of native vegetation "may be irretrievable." (DEIS 3-151). Such analysis must be completed for the Antelope and Tennant salvage logging proposal.

CALCULATING THE NUMBER OF LEAVE SNAGS PER ACRE

The forthcoming NEPA document must fully analyze and disclose the ability of the timber sale units to provide the required habitat for snag-dependent species. This analysis must be conducted on an acre-by-acre basis rather than "masked" by relying on snags outside of harvest units to alter the post-harvest per-acre snag numbers.

BURNED FORESTS PROVIDE IMPORTANT WILDLIFE HABITAT

Scientists have recently recommended that forest managers should ensure the maintenance of moderate and high severity fire patches to maintain populations of numerous native bird species positively associated with fire (Hutto 1995, Hutto 2006, Kotliar et al. 2002, Noss et al. 2006, Smucker et al. 2005). At the landscape level, high severity habitat (unlogged) is among the most underrepresented, and rarest, of forest habitat types (Noss et al. 2006). Indeed, the current annual spatial extent of wildland fire in California's forests is about one tenth of what it was prior to fire suppression (Medler 2006).

Forests experiencing high severity burns, or "snag forests", are often incorrectly assumed by land managers to be "damaged" (USDA 2004). Ecologically, this is strongly contradicted by the scientific evidence. Peak biodiversity levels of higher plants and vertebrates are found in patches of snag forest habitat—areas where most or all of the trees are killed by fire (Noss et al. 2006), consistent with the principle that pyrodiversity enhances biodiversity, where mixed-severity fire effects occur (Chang 1996). Fire-induced heterogeneity, including a mix of low, moderate, and high severity patches, leads to higher post-fire understory plant species richness compared to homogeneous low severity fire effects (Chang 1996, Rocca 2004). Mixed-severity fire, meaning a heterogeneous mix of high, moderate, and low severity effects, facilitates reproduction of numerous native herbaceous and shrub species (Chang 1996, Rocca 2004), the germination of many of which is triggered by fire-induced heat, charate, or smoke (Biswell 1974, Chang 1996). These flowering plants, in turn, increase biodiversity of flying insects, including hymenopterans (bees, wasps, flying ants). And, fire-mediated conifer mortality attracts bark beetles and wood-boring beetles, some species of which have evolved infrared receptors capable of detecting burned forests from over 161 km away (Altman and Sallabanks 2000, Hutto 1995). Other insect species are attracted by the smoke from fires (Smith 2000).

As a result, avian species richness and diversity increases in heavily burned patches occurring within a mix of low and moderate severity effects. Woodpeckers excavate nest cavities in snags and feed upon bark beetle and wood-boring beetle larvae in dead trees; Mountain Bluebirds (*Sialia currucoides*) and other secondary cavity-nesting species use nest holes created the previous year by woodpeckers; granivores such as the Red Crossbill (*Loxia curvirostra*) feed upon seed release from cones following fire; shrub-dwelling species like the Blue Grouse (*Dendragapus obscurus*) nest and forage within shrub growth scattered throughout high severity patches; while aerial insectivores such as the Olive-sided Flycatcher (*Contopus cooperi*) prey upon the bark beetles that are abundant in snag patches (Altman and Sallabanks 2000, Hutto 1995). The Olive-sided Flycatcher is listed by the U.S. Forest Service as a Species at Risk, meaning that there is significant concern about the viability of its populations due to habitat scarcity and loss (USFS 2001). Populations of small mammals experience overall increases shortly after high severity fire, and amphibians are positively associated with the large woody material that gradually accumulates in the decades following such fire effects (Smith 2000). As well, ungulates forage upon post-fire flora, and large predators frequently seek their prey in burned patches (Smith 2000).

Studies have detected higher overall avian species richness in severely burned versus unburned forest in the western United States (Bock and Lynch 1970, Hutto 1995, Raphael and White 1984, Siegel and Wilkerson 2005). In one snag forest area resulting from the Manter Fire of 2000 in the southern Sierra Nevada, a total of 111 bird species were observed (Siegel and Wilkerson 2005). Following the 60,000 ha McNally Fire of 2002 in Sequoia National Forest, Olive-sided Flycatchers were found in the burn area (Siegel and Wilkerson 2005). This species had previously been considered to be extirpated from Sequoia National Forest, possibly since 1930 (Altman and Sallabanks 2000).

Research has also indicated that numerous avian species, including several woodpecker species, exhibit a preference for burned conifer forest habitat (Bock and Lynch 1970, Dixon and Saab 2000, Murphy and Lehnhausen 1998, Granholm 1982, Hutto 1995, Saab et al. 2002, Saab et al. 2004). Fire-killed trees provide nesting and foraging habitat for numerous woodpecker species (Hutto 1995, Dixon and Saab 2000). Post-fire logging has been described as a threat to such species (Dixon and Saab 2000, Kotliar et al. 2002, Lindenmayer et al. 2004, Murphy and Lehnhausen 1998, Saab et al. 2004).

To conserve populations of species which prefer heavily burned forest patches in the eastern Cascades, Altman (2000) recommended that: at least 2% of the forested landscape be maintained in early post-fire habitat; at least 40-50% of such burned stands be retained in an unlogged state; and, where salvage logging does occur, all snags (fire-killed trees) > 51 cm (20 inches) dbh and half of all snags 30-51 cm (12-20 inches) dbh should be retained.

There is perhaps no vertebrate species more strongly representative of the snag forest habitat type than the Black-backed Woodpecker (*Picoides arcticus*) (Hanson 2007, Hutto 1995). This species is a designated Management Indicator Species, acting as a bellwether for the viability of dozens of other species associated with snag forests (USDA 2004). One of only two woodpecker species globally with three toes instead of four, the Black-backed Woodpecker is able to deliver exceptionally hard blows due to added heel mobility resulting from the lack of a fourth toe and, as a consequence, it can reach beetle larvae that other woodpecker species cannot (Dixon and Saab 2000). One bird eats an astounding 13,500 beetle larvae per year (Hutto, unpublished data). From behind, the all-black coloring of this species confers excellent camouflage against the charred bark of a fire-killed tree. Though Black-backed Woodpeckers are occasionally, but rarely, seen outside of stand-replacement burns, forests outside of snag forest habitat are believed to be "sink" habitats which do not support them (Hutto 1995, Dixon and Saab 2000).

In the northern Rocky Mountains, the Black-backed Woodpecker is largely restricted to recently severely burned conifer forest that is unlogged (Hutto 1995). The same is true in forests of the Sierra Nevada and southern Cascades (Hanson 2007).

The Black-backed Woodpecker, which was historically "quite numerous" in Sierra Nevada mixed conifer forests (Cooper 1870), but later became "rare" (Dawson 1923, Grinnell and Storer 1924, Siegel and DeSante 1999), appears to require a minimum high severity patch size of 12-25 ha (Saab et al. 2002). "Strong excavators" such as the Black-backed Woodpecker may effectively use snag forest habitat for only 5-7 years post-fire (Saab et al. 2004), relying upon a constantly replenished supply of this ephemeral habitat as new fires occur. However, large fires allow longer periods of occupancy, since it takes nest predators longer to recolonize the burn area (Saab et al. 2004). Other strong excavators, such as the Hairy Woodpecker (*Picoides villosus*) and the White-headed Woodpecker (*Picoides albolarvatus*) are positively associated with burned forest as well (Saab et al. 2002, Saab et al. 2004).

Heterogeneous fires are very important ecologically, since a number of species depend not only upon burned forest habitat in general, but also specifically upon particular levels of severity, with some requiring low or moderate severity burn patches and some requiring only patches of high severity burned forest (Smucker et al. 2005, Kotliar et al. 2007).

Indeed, a recent scientific study of the northern Sierra Nevada and southern Cascades by the Forest Service scientists concluded that:

> "…it is clear from the scientific data that burned forest, including stand replacing burns [high severity fire patches], provide important bird habitat. The abundance and diversity of woodpecker species generally reaches a peak in recently burned forest. The Black-backed Woodpecker, a rare resident of the northern Sierra forest, predominantly occurs in recently burned forest. Olive-sided Flycatcher, a species declining throughout the Sierra Nevada, has been shown to be strongly associated with burned forest as well. Thus, we promote the view that burned forest is important wildlife habitat." (USFS 2006).

It is the diversity of fire effects that facilitates and maximizes native biodiversity (Connell 1978, Noss et al. 2006). It is, in fact, the unlogged high severity patches that are most in deficit in west coast forests, probably more than any other single forest habitat type. Any post-fire logging would only un-do the benefits of heterogeneous fire effects.

Attachment 24 is a peer-reviewed study conducted by Lee et al. for the Institute for Bird Population published in The Condor 114(4): 792-802, The Cooper Ornithological Society 2012. Its abstract concludes:

> Understanding how habitat disturbances such as forest fire affect local extinction and probability of colonization—the processes that determine site occupancy—is critical for developing forest management appropriate to conserving the California Spotted Owl (Strix occidentalis occidentalis), a subspecies of management concern. We used 11 years of breeding-season survey data from 41 California Spotted Owl sites burned in six forest fires and 145 sites in unburned areas throughout the Sierra Nevada, California, to compare probabilities of local extinction and colonization at burned and unburned sites while accounting for annual and site-specific variation in detectability. We found no significant effects of fire on these probabilities, suggesting that fire, even fire that burns on average 32% of suitable habitat at high severity within a California Spotted Owl site, does not threaten the persistence of the subspecies on the landscape. We used simulations to examine how different allocations of survey effort over 3 years affect estimability and bias of parameters and power to detect differences in colonization and local extinction between groups of sites. Simulations suggest that to determine whether and how habitat disturbance affects California Spotted Owl occupancy within 3 years, managers should strive to annually survey ≥200 affected and ≥200 unaffected historical owl sites throughout the Sierra Nevada 5 times per year. Given the low probability of detection in one year, we recommend more than one year of surveys be used to determine site occupancy before management that could be detrimental to the Spotted Owl is undertaken in potentially occupied habitat.

NORTHER SPOTTED OWLS

The Forest Service must complete an EIS prior to removing elements of spotted owl habitat such as large snags and future sources of down wood. Please note that Bond 2009 (attached to these scoping comments) recommends forgoing salvage logging activities within 1.5 km of NSO nest sites. The impacts of proposed salvage logging activities trigger the duty under the Endangered Species Act to consult with the US Fish and Wildlife Service regarding this project.

How many acres of designated critical habitat is the agency proposing to salvage log? How many acres of designated critical habitat is the agency proposing to convert into fiber plantations? Does the agency contend that the removal of constituent elements of NSO critical habitat (such as large snags and future down wood) is not a significant action impacting the critical habitat of a threatened species? How does the Forest Service intend to implement Recovery Actions 10 and 12 of the Northern Spotted Owl Recovery Plan?

NATURAL DISTURBANCE CREATES HABITAT AND BIODIVERSITY WHILE LOGGING HARMS FOREST HEALTH

The ecological differences between biologically rich stands that result from natural disturbance and stands that are subject to logging and yarding are well-known and established:

> Early-successional forest ecosystems that develop after stand-replacing or partial disturbances are diverse in species, processes, and structure. Post-disturbance ecosystems are also often rich in biological legacies, including surviving organisms and organically derived structures such as woody debris. These legacies and post-disturbance plant communities provide resources that attract and sustain high species diversity, including numerous early-successional obligates, such as certain woodpeckers and anthropods. Early succession is the only period when tree canopies do not dominate the forest site, and so this stage can be characterized by high productivity of plant species (including herbs and shrubs), complex food webs, large nutrient fluxes, and high structural and spatial complexity. Different disturbances contrast markedly in terms of biological legacies, and this will influence the resultant physical and biological conditions, thus affecting successional pathways. Management activities, such as post-disturbance logging and dense tree planting, can reduce the richness within and the duration of early-successional ecosystems. Where maintenance of biodiversity is an objective, the importance and value of these natural early-successional ecosystems are underappreciated.
>
> -Swanson et al, The Forgotten Stage of Forest Succession: Early-Successional Ecosystems on Forest Sites. 2010. Frontiers in Ecology and the Environment.

Attachment 25a consists of the Swanson et al paper quoted above.

Attachment 25b is "Restoration Framework for Federal Forests in the Pacific Northwest" by Jerry F. Franklin and K. Norman Johnson which supports Swanson et al. 2011 need for unmanaged early succession forests.

> Franklin and Johnson (2012) state on p. 431: "Theoretically, disturbances of either natural (e.g., wildfire) or human (e.g., timber harvest) origin are capable of generating this stage. Large natural disturbances often produce high-quality early seral ecosystems provided they are not intensively salvaged and replanted (Swanson et al. 2011), but such disturbances are poorly distributed in time and space. For example, less than 1% of suitable NSO habitat (complex forest) was transformed by wildfire into early successional habitat between 1996 and 2006 in MF-dominated provinces of the Northwest Forest Plan (NWFP; USDI Fish and Wildlife Service 2011). Areas devoted to intensive timber production generally provide little high-quality early seral habitat for several reasons. First, few or no structures from the preharvest stand (e.g., live trees, snags, and logs) are retained on intensively managed sites but are abundant after severe natural disturbances (Swanson et al. 2011). Additionally, intensive site preparation and reforestation efforts limit both the diversity and the duration of early seral organisms, which may also be actively eliminated by use of herbicides or other treatments (Swanson et al. 2011). Consequently, many MF landscapes currently lack sufficient representation of high-quality early seral ecosystems because of harvest, reforestation, and fire suppression policies on both private and public lands (Spies et al. 2007, Swanson et al. 2011)

Attachment 26 is a 2013 letter to congress signed by 250 scientists asking that decision makers "consider what the science is telling us: that post-fire habitats created by fire, including patches of severe fire, are ecological treasures rather than ecological catastrophes, and that post-fire logging does far more harm than good to the nations public lands."

PROPOSED ACTION ALTERNATIVE

Our organizations hereby propose that the Forest Service include analysis of an alternative based upon *all* of the post-fire management recommendations contained in the peer-reviewed 1995 Bestcha paper provided as an attachment to these scoping comments.

HOW MANY GREEN TREES WILL BE LOGGED?

How many green (living) trees will be logged to facilitate yarding activities? How many green (living) trees will be logged under the assumption that they will die in the future?

Please account for the following findings in your NEPA analysis:

> "Our key findings on post-fire management are as follows. First, post-burn landscapes have substantial capacity for natural recovery. Re-establishment of forest following stand-replacement fire occurs at widely varying rates; this allows ecologically critical, early-successional habitat to persist for various periods of time. Second, post-fire (salvage) logging does not contribute to ecological recovery; rather, it negatively affects recovery processes, with the intensity of impacts depending upon the nature of the logging activity (Lindenmayer et al. 2004). Post-fire logging in naturally disturbed forest landscapes generally has no direct ecological benefits and many potential negative impacts (Beschta et al. 2004; Donato et al. 2006; Lindenmayer and Noss 2006). ***Trees that survive fire for even a short time are critical as seed sources and as habitat that sustains biodiversity both above- and belowground.*** Dead wood, including large snags and logs, rivals live trees in ecological importance. Removal of structural legacies, both living and dead, is inconsistent with scientific understanding of natural disturbance regimes and short- and long-term regeneration processes. Third, in forests subjected to severe fire and post-fire logging, streams and other aquatic ecosystems will take longer to return to historical conditions or may switch to a different (and often less desirable) state altogether (Karr et al. 2004). Following a severe fire, the biggest impacts on aquatic ecosystems are often excessive sedimentation, caused by runoff from roads, which may continue for years. Fourth, post-fire seeding of non-native plants is often ineffective at reducing soil erosion and generally damages natural ecological values, for example by reducing tree regeneration and the recovery of native plant cover and biodiversity (Beyers 2004). Non-native plants typically compete with native species, reducing both native plant diversity and cover (Keeley et al. 2006). Fifth, the ecological importance of biological legacies and of uncommon, structurally complex early-successional stands argues against actions to achieve rapid and complete reforestation. Re-establishing fully stocked stands on sites characterized by low severity fire may actually increase the severity of fire because of fuel loadings outside the historical range of variability. Finally, species dependent on habitat

conditions created by high severity fire, with abundant standing dead trees, require substantial areas to be protected from post-fire logging (Hutto 1995)."

- Noss and others, *Frontiers in Ecology & Environment* (2006:485-86)

Attachment 27 is a 2013 publication entitled Effects of Riparian Thinning on Wood Recruitment: A Scientific Synthesis Science Review Team Wood Recruitment Subgroup Thomas Spies, Michael Pollock, Gordon Reeves and Tim Beechie. This most recent report from government scientist found that thinning caused significant reductions in future dead wood recruitment to streams. Removing commercial sized dead trees from Riparian Reserves would harm streams in the long-term by reducing future wood recruitment.

Attachment 28 is a 2020 publication entitled Estimating Retention Benchmarks for Salvage Logging to Protect Biodiversity by Simon Thorn et al. The abstract for this study indicates that:

> Forests are increasingly affected by natural disturbances. Subsequent salvage logging, a widespread management practice conducted primarily to recover economic capital, produces further disturbance and impacts biodiversity worldwide. Hence, naturally disturbed forests are among the most threatened habitats in the world, with consequences for their associated biodiversity. However, there are no evidence-based benchmarks for the proportion of area of naturally disturbed forests to be excluded from salvage logging to conserve biodiversity. We apply a mixed rarefaction/extrapolation approach to a global multi-taxa dataset from disturbed forests, including birds, plants, insects and fungi, to close this gap. We find that 75% of a naturally disturbed area of forest needs to be left unlogged to maintain 90% richness of its unique species, whereas retaining 50% of a naturally disturbed forest unlogged maintains 73% of its unique species richness. These values do not change with the time elapsed since disturbance but vary considerably among taxonomic groups.

Attachment 29 consists of a paper entitled Spotted Owls and Forest Fire: Reply, by Derek Lee in which he "found significant positive effects on foraging habitat selection and recruitment from mixed-severity forest fires, and significant positive effects on reproduction from high-severity fire."

Attachment 30 is a 2020 peer reviewed study entitled Patterns of Bird Species Occurrence in Relation to Anthropogenic and Wildfire Disturbance: Management Implications that was published in Forest Ecology and Management. The study found that:

> Twelve of 68 bird species occurred significantly more frequently in burned mixed-conifer forest than in any of the 13 unburned vegetation types, and most of them reached their greatest abundance in the severely burned portions of those forests…33 of 68 species (49%) were significantly more abundant in burned forests at some combination of times-sine fire and fire

> severity than in unburned conifer forest… [Hence] [t]he presence of many species (especially those most specialized to use burned forest conditions) is incompatible with both pre-fire and post-fire timber harvesting.

ROADS

Besechta et al. (1995) warned that even temporary road construction should be prohibited on burned landscapes. Existing roads in the watershed are experiencing significant slumping and failure that contributes directly to sediment loading. Commercial landings, log decks, and hauling have similar direct impacts on soil and hydrological values.

The construction of landings also causes erosion at elevated levels and contributes sediment over considerable distances. (Detcheson and Megehan 1996). The increased sedimentation should be considered in light of all past, present and foreseeable future activities in the watershed.

The Flounce Around EA (a 500 acres matrix salvage timber sale in the Medford District Butte Falls Resource Area) acknowledges that:

> "Many of these roads were previously closed or had little traffic but were opened up during the suppression effort of the Timbered Rock wildfire in the adjacent Elk Creek watershed in the summer of 2002. As a result, many of these high gradient access roads have not been re-blocked and winter traffic has destroyed many of the designated road drainage (i.e. water bars, water dips and culverts). This has caused damage to the road surfaces creating road related erosion (rill, gullies) and subsequent sedimentation of the nearby stream channel."
> -Flounce Around EA

Please disclose if similar impacts occurred during fire suppression activities at the Antelope and Tennant fires. Please also disclose the cumulative and synergistic impact of tractor fire line construction.

Roads can be expected to be the principal conduit for accelerated sediment delivery to streams. Watershed and stream recovery can be best accomplished by hydrologically obliterating roads in close proximity to fish bearing streams and reducing the percent of remaining road miles that are connected to the stream system.

CONCLUSION

Please note that there is almost universal agreement that salvage logging does not leave watersheds and forests in a healthier, more resilient state, and that the timber volume gained via salvage is neither predictable nor sustainable.

We urge the Forest Service to familiarize itself with the growing body of literature indicating that the post-fire ecosystems have more to offer than simply an opportunity for salvage logging and plantation forestry.

Thank you for considering our concerns and input in this planning process.

Regards,

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