CASCADIA WILDLANDS PROJECT
EDUCATING, ORGANIZING, AND AGITATING FOR THE ECOSYSTEMS OF CASCADIA

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Jerry Hensley, Project Manager
Thorn Fire Salvage Recovery Project
Malheur National Forest
431 Patterson Bridge Road, P.O. Box 909
John Day, OR 97845

Electronic copy submitted to: comments-pacificnorthwest-malheur@fs.fed.us

RE: THORN FIRE SALVAGE RECOVERY PROJECT DRAFT E.I.S.

This letter offers comment from the Cascadia Wildlands Project (CWP) and the Oregon Chapter of the Sierra Club on the draft environmental impact statement for the Thorn Fire Salvage Recovery Project. Thank you for soliciting public input.

The CWP is a 501(c)(3) non-profit public interest conservation organization based in Eugene, Oregon. It works to restore degraded forest landscapes and ensure protection for ecologically healthy wildlands and native species. CWP members use and enjoy the Blue Mountain Ranger District of the Malheur National Forest for recreation including fishing, hunting, hiking and boating. CWP members also value the semi-primitive and unmotorized character of the recreation experience available to the public in the upper Dry Creek, Todd Creek, Fields Creek and Duncan Creek watersheds. Moreover, we value the occurrence of natural post-fire recovery on burned forest landscapes. We enjoy seeing blackened snags and the wildlife that uniquely associates with severely burned habitats. We are personally familiar with the Shaketable Complex fire area, and the Thorn planning area in particular, having hiked substantial portions of it in the spring and summer of 2007 to observe post-fire plant community succession and natural recovery processes, as well as to evaluate burned area emergency rehabilitation and other management practices.

In our observation, forests that burned in the Shaketable Complex fire do not require further management intervention to promote ecosystem health except to limit competitive success of exotic plants such as *Bromus spp.* and *Chenopodium spp.*, which can displace native flora and negatively impact the landscape fire regime. Some BAER work, such as mulching, already may have introduced exotic plants and created a short-term increased fire hazard. Proposed logging of burned forest stands for economic recovery could adversely affect sensitive soil resources, which in turn could harm forest and aquatic ecosystem health as well as spread exotic plants and increase the likelihood of a harmful and expensive reburn.

We encourage you to develop an action alternative in the final EIS that would forego ground-based logging systems and limit tree extraction to existing road corridors where the underlying Forest Plan land allocations support such activity without any need for amendment. Such an alternative would respond to the purpose and need for action as well as to significant scientific controversy and uncertainty regarding environmental effects of post-fire logging, as described below.

ECONOMIC RECOVERY

According to the draft EIS, the "primary" purpose and need for the proposed action is to salvage economic value from fire-killed trees (page 43). Post-fire logging in the Thorn project will not economically benefit the Forest Service. The present net value associated with both action alternatives is a loss of nearly $2.4 million, whereas the no-action alternative would maintain the status quo (draft EIS pages (44, 46). We further note that no volume loss will occur in dead trees larger than 13" diameter from fall 2007 to summer 2008 (table 135, page 291). These facts undercut the rationale for an Emergency Situation Determination, which the draft EIS indicates will be sought from the Forest Service Chief to expedite the project.

RANGE OF ALTERNATIVES

The scale and scientific controversy of the proposed action warrants consideration of an action alternative that limits economically driven post-fire logging to the General Forest (MA-1) land allocation, where the Malheur National Forest Land and Resource Management Plan (LRMP) anticipates and authorizes that style of forest resource use (see LRMP pages IV-50 to IV-52). Other salvage cutting and wood fiber harvest along road corridors also could be justified on safety grounds. In the General Forest, no plan amendments would be required to accomplish post-fire logging. The Forest Service did not consider this obvious alternative during project planning even though it clearly meets the purpose and need for action (see pages 40-43).

The difference between the two action alternatives, as presented in the draft EIS, is minor because only a proposal to conduct economically driven post-fire logging in <u>one</u> land allocation (MA-10) on <u>642 acres</u> distinguishes them. That difference represents only approximately 20 percent of the proposed action area. The draft EIS discloses that many resource impacts of both alternatives would be exactly the same. Moreover, both alternatives require amendments to the LRMP to allow economically driven post-fire logging where it is now precluded by law (see draft EIS pages 24-27 and 49-51).

TEMPORARY FOREST PLAN AMENDMENTS

The proposal to amend several provisions of the Malheur LRMP for the limited purpose of implementing the Thorn project, and then to restore pre-existing standards and guidelines after the project is completed, inherently suggests that the proposed action and its alternative are both illegal. We are particularly concerned about proposed amendments to standards that now govern management of the Big Game Winter Range (MA-4a), Semiprimitive Nonmotorized Recreation Area (MA-10 – *Alternative 2 only*), Dedicated Old Growth (MA-13), Dry Cabin Wildlife Emphasis Area (MA-20a) and Wildlife Emphasis Area (MA-21) land allocations. We are also concerned about proposed amendments to Forest Plan Standard #5 affecting wildlife conservation plans, Eastside Screen Wildlife Standard 6d(2)(a) affecting removal of live trees, and Regional Forester's Forest Plan Amendment #2 affecting northern goshawk (see draft EIS pages 24-27). We support the designation of a new "replacement old growth" area, as described on page 132 of the draft EIS, but not for the purpose of permitting post-fire logging in the existing ROG.

All of the above identified forest plan amendments proposed in the draft EIS would effectively moot the forest planning process and establish precedent whereby the Forest Service may conveniently override the LRMP at its pleasure. That is not the purpose or intent of the National Forest Management Act (NFMA). The plan amendment proposal is not legitimate because the Forest Service also proposes to change the rules back to what they are now once the proposed logging is finished. This style of "temporary exemption" to the LRMP amounts to a series of deliberate LRMP violations.

The draft EIS lacks rationale why the proposed LRMP amendments are non-significant, per the requirement of Forest-Wide Standard #3 (LRMP page IV-25). Non-significant amendments may include "course corrections" that result in "slight changes" in management emphasis or direction" (see 36 C.F.R. § 219.10, FSM 1922 and FSH 1909.12). But if proposed LRMP amendments would tilt the balance of resource outputs from affected areas or otherwise frustrate the intent for which lands were specifically designated in the forest planning process, then those amendments are "significant" under NFMA and not allowed in project documentation.

PRE-DECISIONAL BIAS

The Forest Service already has decided to implement the Thorn project even before it has completed the NEPA process. A May 4, 2007 press release distributed by the Malheur National Forest and posted on its website (attached) declares,

> Salvage logging on the Malheur National Forest will close Aldrich Lookout Road (Forest Service Road 2150) and surrounding areas beginning this fall, limiting hunter access to Aldrich Mountain on the northwest side of the popular Murderers Creek Wildlife Management Unit.
>
> The closure is due to the Thorn Salvage Fire Recovery Project and runs from Oct. 1, 2007 to June 30, 2008. It directly affects 7,800 acres of the 735,762-acre Murderers Creek unit and includes portions of the Murderers Creek-Flagtail Travel Management Area.

The press release uses affirmative, not conditional, language. It identifies specific locations where post-fire logging "will" occur. A map accompanying the press release also is attached to this comment. Those documents clearly evidence that the Forest Service is using the NEPA process to achieve a pre-determined result. Bias in an EIS renders impossible the fair and careful evaluation of a project's environmental impacts demanded by statute and regulation, and it pre-disposes the decision maker to proceed without due consideration to relevant factors.

FIRE AND FUELS

Post-fire logging creates residual fuel profiles that enhance future fire severity.

The proposed action would substantially increase available fuel loads by relocating to the soil surface tree crown material (tops, limbs, needles) that is not currently available to burn. Relocating flammable biomass from the canopy to the ground would significantly change the fuel complex in the project area and increase the short-term hazard of a severe reburn that could endanger public safety and ecosystem resilience (for empirical analysis of the relation between post-fire logging and increased fire hazard see Donato et al. 2006).

The National Fire Danger Rating System assesses fuel properties relative to potential fire behavior and helps to determine the likely effectiveness of control efforts. It considers logging slash to generate the highest fireline intensity of any wildland fuel type when it is dry (Andrews and Rothermel 1982, Rothermel 1991). The change in surface fuel model that directly results from post-fire logging causes higher rates of fire spread and greater flame lengths when an ignition occurs. Logging without timely treatment of slash is the single most important factor contributing to observed increases in the severity and duration of wildfires (Stephens 1998, van Wagtendonk 1996, Weatherspoon 1996).

One controlled experiment compares no logging with "partial salvage" and "full salvage" logging after the 1996 Summit fire on the Malheur NF and reveals that post-fire logging increased loading of fine woody slash fuel by 10 to 13 tons per hectare (Duncan 2002 – attached). That level of fine fuel loading is more than an order of magnitude greater than the reported post-fire condition in the Shaketable Complex (table 61, page 93). The draft EIS lacks any attention to this widely available analysis of residual fuel loading after similar actions on a nearby landscape, even though the EIS draws heavily from other field observations of the Summit fire. Furthermore, it fails to explain the reason behind its modeling assumption that post-fire logging will produce less fine woody fuel loading than might accumulate over 30 years without logging (tables 64, 67, pages 95, 97). Similar management on the Malheur NF reported by Duncan (2002) produced substantially greater slash loads on a per-hectare scale than the EIS estimates would occur on a per-acre basis with the proposed action (one hectare = 2.471 acres). We find the current fuel modeling assumptions and fire hazard statement to be unreasonable.

Peer-reviewed research that controls for other management effects as well as weather and topographical influences, and that replicates similar post-fire logging treatments across many test plots that burned in both the 1987 Silver fire and the 2002 Biscuit fire on the Siskiyou National Forest in southwest Oregon, finds more severe 2002 reburn effects in areas that were logged after the 1987 fire than in areas where snags were left to fall for 15 years (Thompson et al. 2007). Other research on the Klamath National Forest in northwest California finds greater proportions of high severity fire on lands where post-fire logging occurred after the 1977 Hog fire compared to similarly positioned and burned sites that were not logged (Weatherspoon and Skinner 1995). An additional refereed study points to an increased occurrence of highly severe reburn effects at very short time intervals where burned forests were logged compared to similar forests that remain uncut (Odion et al. 2004). In all of the studies cited above that compare fire severity in forests that experienced post-fire logging with similar forests that lack any such management legacy, the recorded fire severities closely correlated with residual accumulations of fine slash left on the ground after logging operations. The draft EIS makes clear that both action alternatives would duplicate precisely this management action (pages 20, 23, 91).

Furthermore, all three of the above referenced studies on post-fire logging effects to subsequent fire regimes offer robust analytic designs with better explanatory power than the Thorn draft EIS and its cursory and uninformative data table that generally compares past logging acreage with burn severity percentages by watershed (table 72, page 110). That table appears designed to suggest that no correlation exists between past management and spatial distributions of subsequent burn severity without showing their actual spatial distributions on a map. As a result, the reviewing public can attain no sense from the draft EIS of whether or to what degree past timber management and severe fire effects may overlap. Empirical peer-reviewed research with well-designed experimental methods undercuts this retrospective approach of dismissing past logging effects on fire regimes of the present (see Raymond and Peterson 2005). Moreover, the Forest Service's method appears to overlook and obfuscate the observed and tested relationships between post-fire logging and subsequent fire severity discussed above.

NEPA requires federal agencies to assess the direct, indirect and cumulative effects of proposed actions in addition to past, present and reasonably foreseeable future actions (40 C.F.R. 1502.16, 1508.7). The EIS must disclose at a unit scale how much slash would remain on the ground after logging is completed, and what actual fire hazard would result on the landscape. The Thorn draft EIS only offers an estimate of residual slash loading at a project scale and suggests that fine woody fuel loads would exceed "optimal" levels under any alternative (pages 92-97). The "optimum" level is based solely on unreviewed grey literature attributed to J.K. Brown and colleagues (2003) that appears to draw substantially from modeling of the Bitterroot and Lolo National Forests in western Montana. The Thorn draft EIS offers no reason why those modeling assumptions should apply to the project area.

Accurate spatial description of wildland fuels is fundamental to assessing fire hazard and risk on a landscape (Chuvieco and Congalton 1989). Therefore, field sampling data should support any characterization of fuel loading and associated fire hazard in the project area. Planar intercept transects developed by Brown (1971 and 1974) quantify surface wood fuel, litter and duff, and other methods enable description of sub-canopy fuel loading (see Miller et al. 2003). The fuel model description tools created by Anderson (1982) and Scott and Burgan (2005) both cite planar intercept as a defensible verification method. Indeed, Weatherspoon and Skinner (1996, p. 1488) make clear that field data collection is a fundamental professional standard for project-scale fuels management planning:

> Mapping should utilize the best sampling strategies combining remote sensing imagery (perhaps at several scales) and ground truthing. The reliability of existing vegetation maps should be verified before they are incorporated into the database. Fire-relevant attributes of vegetation (including understory composition and structure, and vertical and horizontal continuity) need to be characterized adequately. Similarly, surface fuels should be described, utilizing field-verified vegetation/fuels correlations to the extent feasible.

The Thorn draft EIS does not demonstrate that hazardous fuel load prediction accuracy can be improved through combining gradient modeling (e.g., plant association groups) with maps derived from remotely sensed data, as appears to be presented in Appendix B. Keane et al. (2000) report accuracies between 30 and 40 percent for such an effort in the Gila National Forest, which is low even for generic vegetation mapping projects. Most fuel mapping projects do not report any error analysis, or the reported error analyses are deficient due to a lack of field verification (Keane et al. 2001). The present EIS duplicates this failure to disclose scientific uncertainty. Finer-scale modeling combined with repeatable measurements of sub-canopy forest structure and composition is required, and this information must be included in the EIS.

The residual fuel conditions likely to prevail after logging is completed in the Thorn project would render direct attack of any wildfire impossible under common summer afternoon weather conditions, and indirect suppression measures would become necessary. This, in turn, would increase the size and cost of the next wildfire. Moreover, the project itself would require the Forest Service to pursue total suppression of all ignitions to minimize the area burned and protect its investment in new tree plantations (see analysis below).

Establishment of even-aged tree plantations compounds hazardous fuel conditions and endangers firefighter safety.

Even-aged young tree plantations that will be created after logging in the Thorn project contain unnaturally combustible fuel complexes, which compound the potential severity and difficulty of control of the next wildfire beyond what slash loading alone would produce. Plantations are far more susceptible to severe fire behavior and effects than unmanaged burned forests (Thompson et al. 2007, DellaSala et al. 1995), especially where logging slash remains untreated. The elevated susceptibility of plantations to severe fire is due to:

- Structural characteristics that promote high heat energy output by fire (Sapsis and Brandow 1997).
- Warm, windy and dry microclimates compared to what would exist in an unlogged forest that possessed more structural diversity and ground shading (van Wagtendonk 1996).
- Accumulations of fine logging debris on the ground surface (Weatherspoon and Skinner 1995).

Furthermore, most plantations occur near roads, which spread invasive and exotic plants with poor resistance to fire (DellaSala and Frost 2001) and which elevate risks of human-caused ignitions (USDA 2000).

Research in forest science and landscape ecology notes that the number and distribution of even-aged plantations established after logging has altered fire behavior and effects at both stand and landscape scales (Countryman 1955, Hann et al. 1997, Huff et al. 1995, Lindenmeyer and Franklin 2002). The existence of highly combustible plantations on a forest landscape creates the potential for “a self-reinforcing cycle of catastrophic fire” that post-fire logging and tree planting in the Shaketable fire area would perpetuate (Perry 1995).

Two key considerations with regard to fire suppression are the fuel bed depth and the size and moisture of dead woody fuels. Those factors primarily influence flame length, rate of fire spread and resistance to control (Albini 1977, Andrews 1986, Burgen and Rothermel 1984, Rothermel 1991). Thus, vertical fuel loading is more important to the resistance to control of a wildfire than is horizontal fuel loading. Deeper beds of uncompressed, fine and dry fuels support significantly longer flame lengths and more erratic fire behavior than shallower beds of relatively large and moist fuels, as the Forest Service concedes would exist in a no-action coarse wood deadfall scenario (page 111). In other words, logged plantations with accumulated slash would be far more resistant to control than an unlogged burned forest occupied by live brush, forbs and grass, even with large downed logs on the ground.

In addition, creating new tree plantations after logging will force the agency to suppress wildland ignitions to minimize acres burned and protect its capital investment in plantation establishment. A full suppression response guarantees that firefighters will be sent to defend those plantations, even though post-fire logging and plantation establishment would significantly increase the likelihood of dangerous and unmanageable wildfires.

Large tree removal will increase fire hazard in the project area.

The objective of post-fire salvage logging is to remove large-diameter, commercially valuable trees that were killed but not consumed by fire. Large-diameter snags and downed logs possess several features that mitigate their potential contributions to fire hazard, and depending on weather conditions and time of year, their presence on the landscape can reduce the danger of intense, rapidly spreading fires. In general, fires burning through large-diameter downed logs tend to burn slowly, and depending on their spatial arrangement and moisture levels, large downed logs can dampen a fire's intensity and rate of spread (Rothermel 1991). This is so because large-diameter fuels have low surface area-to-volume ratios, which inhibit the amount of oxygen feeding combustion. Moreover, large-diameter fuels retain moisture later into the dry season than do smaller fuels, further reducing their flammability precisely when wildfire potential is greatest (Amaranthus et al. 1989). Extremely dry snags and logs that combust into flames can emit burning embers that, if lofted by wind, may cause spot fires, but these embers can only ignite fine fuels and not other large snags or logs.

Fuel moisture levels, which vary according to season and prevailing weather, can further diminish flammability of large-diameter snags and logs. Large-diameter downed logs are capable of storing large amounts of water, especially if the logs lay directly on the ground surface. Indeed, the centers of large logs can actually be cool and moist even when the outer shell of a log is on fire (Amaranthus et al. 1989). Consequently, large logs can provide “fire shelters” that enable a number of wildlife species, as well as fungi and other flora and fauna essential to post-fire natural recovery, to survive fires (Bull et al. 1997, Harrod et al. 1998).

Large standing trees and downed logs also obstruct solar radiation and lateral wind movement. These microclimate influences moderate ground temperatures and surface wind speeds, which translate into greater live and dead fuel moisture levels compared to areas cleared of standing or downed trees (Sexton 1994). Large downed logs also reduce the speed and variability of surface winds, which inhibits extreme or erratic fire behavior (McIver and Starr 2000).

Live vegetation has greater moisture content and is thus less prone to ignite and carry fire than dead woody fuel (Reinhardt and Ryan 1998). The relative moisture in a fire-regenerated, early-successional brush field shaded by standing snags and buffered by downed logs would present a far less extreme fire environment than the slash-loaded, even-age plantations which the Forest Service seeks to create in the instant proposal (Countryman 1955, Odion et al. 2004, Weatherspoon and Skinner 1995).

It is true that when snags fall to the ground their relative flammability increases, but the time required for snags to fall is directly proportional to their size. It may take as long as 20 years for burned ponderosa pine trees between six and nine inches in diameter to fall, and Forest Service research suggests that larger ponderosa pines can remain standing up to 80 years after burning (Harrod et al. 1998). The Thorn draft EIS fails to state the reason behind its modeling assumption that snag fall will peak within 30 years (pages 95-98). Nor does it quantify actual snag fall, which, as described above, is a crucial step in a defensible fire hazard assessment.

Even when dead logs fall to the ground, they logs do not burn well, unless they are very dry and placed in close proximity to each other (*i.e.*, one log diameter apart). Decayed logs with low moisture content can smolder for long periods, but this does not cause intense fire behavior such as large flame lengths, as the Thorn draft EIS suggests (page 89). Instead, log smolder may cause high severity burn effects in the soil, but such effects are spatially localized to the soil underlying and adjacent to the burning log (Sackett and Haase 1996).

PLANT SUCCESSION AND SOIL PRODUCTIVITY

Post-fire logging may inhibit regeneration of early-successional species that promote ecosystem recovery after fire, and cause long-term harm to soil productivity.

The EIS should employ the best available science to describe possible trajectories of plant community succession under each alternative. Untreated logging slash may inhibit plant growth, and logging operations may virtually eliminate nitrogen-fixing shrub and forb species (Reinhardt and Ryan 1998). Inadequate regeneration of early-successional pioneer species could lead to localized extinctions of other species that restore site productivity after fire. Furthermore, inhibited plant regeneration would preclude burned slope stabilization and result in greater loss of topsoil and increased sedimentation in aquatic network than would occur in the absence of post-fire logging (Beschta et al. 2004). Loss of site productivity is a costly impact of post-fire logging because of its deleterious effect on nitrogen and carbon cycling and on future forest growth (DellaSala et al. 1995).

Loss of soil productivity caused by inhibited shrub regeneration and loss of topsoil is a <u>long-term</u> adverse impact (Beschta et al. 2004). Recovery would not occur for decades because it would take that long for the ecosystem to replenish organic matter removed by salvage logging that otherwise would decompose *in situ*. The effect of organic matter loss on long-term site productivity is not well understood for lack of research (McIver and Starr 2000). The EIS should discuss this matter of scientific uncertainty.

SNAG DEPENDENT WILDLIFE

Existing fire-killed tree stands are highly valuable habitat for rare wildlife.

On a landscape sale, wildfires create patches of highly attractive habitat for a distinct array of rare avian wildlife species (Hutto 2006). Increased abundance of certain insects in burned stands attracts insectivorous birds. One consequence of changes in food composition and breeding habitat is that burned forests support different bird communities, with many species dependent on stand-replacement fires (McIver and Starr 2000). Indeed, the Shaketable fire created optimal habitat for black-backed woodpecker and other insectivorous birds.

Smucker (2005) finds a complex relationship between avian species diversity, fire severity and the amount of time since the last fire. Diverse fire effects are beneficial and land managers should accommodate “catastrophic” fire effects (Smucker 2005). This management recommendation remains shocking to some but presents a very important lesson to absorb. Those concerned with biological diversity actually find the forest in need of high severity fire as a missing ecological component on the landscape.

Post-fire logging eliminates high quality habitat for rare fire-dependent wildlife.

Post-fire logging changes bird species composition in burned forests, reflecting effects of large woody debris removal on foraging and nesting habitat of cavity-nesting species (Smucker et al. 2005). For example, black-backed woodpecker (*Picoides arcticus*) and three-toed woodpecker (*P. tridactylus*) consistently show negative responses to post-fire logging, with significantly more nests found in unlogged sites (Caton 1996, Hitchcox 1996, Hutto 1995, Saab and Dudley 1998). Indeed, post-fire logging can negatively impact biological diversity in a number of ways (Lindenmeyer and Noss 2006).

Scientific controversy exists regarding the adequacy of forest plan wildlife population conservation standards.

Hutto (2006) demonstrates that wildlife population conservation standards mandated by forest plans such as the Malheur LRMP likely are not adequate to maintain viable populations of vertebrate species of concern that occur in the Shaketable fire. Specifically, Forest-Wide Standard #38 and #39, even if met by the proposed action, are predicated on faulty assumptions about population ecology of cavity excavating birds. The EIS must disclose scientific controversy on this point.

LOGGING IMPACTS ON FOREST ECOLOGY

There is a large and growing body of evidence that forests recover naturally from high mortality fire and that post-fire logging and planting harms forest restoration. Noss (2006) says, “Salvage logging can undermine the ecological benefits of fire and reduce prospects for ecosystem recovery.” Specifically referring to “Southwestern Ponderosa Pine” ecosystems, he flatly states, “Salvage logging is not restoration.” Managers need to broaden perspectives on the lands they manage to understand fire as a natural and beneficial ecological process, not a catastrophic event to be “fixed.”

On the issue of post-fire logging impacts to plants and wildlife, Beschta (2004) has spoken clearly. “Forest ecosystems are especially vulnerable to postfire management practices because such practices may influence forest dynamics and aquatic systems for decades to centuries. . . 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.”

On behalf of the Forest Service Pacific Northwest Research Station Graham (1999) notes on a related issue: “Salvage cuttings usually address financial rather than ecological needs (Nyland 1996) even though they are often promoted for restoring drought- and disease-prone forests to more typical mixes of fire-tolerant species (McCool and others 1997).” The same has often been true of post-fire sales.

Karr (2004) is even more direct. “Although often done in the name of post-fire restoration, salvage logging typically delays or prevents natural recovery in several important ways.” His recommendations to avoid damage from salvage logging include, “allow natural recovery to occur on its own . . . retain old or large trees . . . protect soils . . . avoid creating new roads . . . limit reseeding and replanting . . .” He believes that natural recovery is typically more cost-effective and often results in more rapid recovery than salvage logging and replanting. Putting ecological needs forward as a justification for economically driven post-fire logging no longer passes academic muster.

Lindenmeyer (2006) adds his measured voice to the chorus. He recommends against salvage in riparian areas, old growth, roadless areas, reserves, on steep slopes or on fragile soils. He recommends that large trees be retained and ground-based logging should be limited. Finally, he recommends that the timing of logging be scheduled to minimize inevitable damage.

McIver (2000) has also said that salvage logging must avoid steep and sensitive soils and ground-based systems should be avoided. He believes the greatest post-fire treatment impacts result from road building.

Soil loss with respect to method of harvest is directly related to the amount of soil disturbed and bared by harvest activity, especially the density of skid trails and roads required to access the timber. Megahan (1981) found tractor logging on granitic soils to result in 28 percent of the soil disturbed, ground cables with 23 percent, suspended cables with five percent and helicopter logging with two percent. Similarly, Swanston and Dyrness (1973) found tractor yarding in granitic soils to result in 35.1 percent bare soil, hi-lead in 14.8 percent and skyline in 12.8 percent.

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.

Savage (2005) looked at Ponderosa pine forests after fire and worried that full recovery was not guaranteed. He counsels against actions on post-fire landscapes that could compound recovery problem and sees post-fire resource extraction as the problem. “Mitigation of the effects of intense fires may begin by avoiding actions that increase stress on these ecosystems, such as salvage logging or grazing. . .” Franklin (2003) is clearly against removing large trees from post-fire landscapes. He further advises against establishing dense plantations where they did not exist previous to fire.

Radeloff (2000) notes that areas with poor soils might be most susceptible to fire-driven tree mortality and warns against salvage on these poorer soils. To clarify, consider a forest with many soil types. The author’s work suggests that the poorest soil types might be most susceptible to fire-based conifer mortality. If fire-driven mortality is followed by salvage logging, the extraction of timber volume is being directed to those very areas where it is least able to handle it – poor soils. Brais (2000) found several soil nutrients depleted by post-fire salvage logging that were not depleted by severe fire alone.

One author representing the Forest Service (Reeves 2006) recently noted that there are no studies that claim salvage logging is beneficial to streams. They call, therefore, for all pre-fire stream protections to be maintained on post-fire landscapes. “The effectiveness of using post-fire logging to restore desired riparian structure and function is therefore unproven . . . providing post-fire riparian zones with the same environmental protections they received before they burned is justified ecologically.” This statement is in the context of riparian management areas defined as site *potential* tree height. They note, “important riparian functions extend to intermittent streams and streams that do not contain fish.” And “salvaging trees that have accumulated in headwater depressions and small ephemeral channels thus removes an important source of wood for larger streams and reduces the sediment storage capacity of small catchments. This may result in chronic routing of sediment out of headwater streams, leading to downstream channels that are sediment rich and have lost habitat complexity.”

Donato (2006) points to another specific mechanism for salvage logging impacts to ecological health. He found that modern logging practices have severe impacts on natural restocking levels, reducing natural regeneration levels by 71%. While he looked at conifers, it can be assumed that many other species were similarly impacted. Further, salvage logging is a cumulative impact to pre-fire impacts, the fire itself, and firefighting, all of which could harm natural regeneration potential.

A new study by Shatford (2007) deserves the highest level of agency attention. The study, funded by the Joint Fire Science Program found that mixed conifer forests at a variety of elevations and exposures naturally recovered from fire if left unlogged, even in areas with tree mortality greater than 90%. This occurred when seed sources were generally a few hundred yards, up to a quarter of a mile from the plots in question. The successful natural restocking densities were generally higher than the number of trees to be planted under typical Forest Service projects. The naturally regenerating conifers were able to successfully out-compete shrubs and other vegetation without human intervention. That study has direct implications for the third goad identified in the purpose and need statement of the Thorn draft EIS regarding reforestation.

Several authors look at post-fire landscapes and see an especially important role for snags. Hutto (2006) calls for a sharply revised policy on snag retention on post-fire landscapes. “Existing guidelines designed for green-tree forests cannot be applied to post-fire 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. . . . Existing postfire salvage-logging studies reveal that most postfire specialist species are completely absent from burned forests that have been (even partially) salvaged logged.”

Hutto (2006) finds evidence that as many as 45% of native American bird populations are snag-dependent. “An astounding two-thirds of all wildlife species use deadwood structures or woody debris for some portion of their life cycles (Brown 2002).” Hutto cites the work of several authors to make a ground-breaking recommendation: “newer guidelines . . . suggest that 200-300 snags/ha may better address the needs of wildlife in burned forests.”

Hutto (2006) further argues against equating logging with natural forest succesional stages and instead sees forests in the first five years after fire as having special importance. “Because there is less of that forest age than what was historically available due to successful fire suppression during the past half century (Gruell 1983; Hessburg et al. 2000) these forests should be valued at least as much as the small amounts of old-growth that are left." This author believes that even partial salvage can due lasting harm. "A partial salvage harvest that produces little or no ecological damage will be difficult to achieve because of the sensitivity of early postfire specialists to any disturbance. . . . I am hard pressed to find any other example in wildlife biology where the effect of a particular land-use activity is as close to 100% negative as the typical salvage-logging operation tends to be. . . . Nowhere are soils, special plants, or wildlife more sensitive to the proposition of tree harvesting than in a burned forest."

Agency scientists (Harrod, 1998) found Ponderosa pine forests traditionally had snag stocking levels around $100ft^2$/ac or less. But this number is an average across landscapes with a variety of fire histories and successional stages. Morrsion (1993) however, points out that snags differ in longevity based primarily on method of creation and size, more so than on species. Fire-killed trees decay and fall faster than trees on unburned plots. Older trees last longer. Pines fall faster than firs. Where mortality is at or near 100% there is no opportunity for snag recruitment for many decades. Setting a salvage target near Harrods historical snag values guarantees that in a few decades snag stocking levels will be far under historical values and well under the values needed by wildlife.

Brown (2003) at the Rocky Mountain Research Station finds salvage logging conflicting with needs for coarse woody debris (CWD). The authors note that estimates for CWD loadings on mature forests underestimate needs on post-fire landscapes and recommend employing "the upper limit of recommended ranges or higher . . ." The authors find no upper limit to the amount of CWD beneficial to wildlife but find values of 40 tons/ac or higher may lead to excessive soil heating in the event of a reburn. They conclude, "Salvage may be undesirable where large diameter snags needed by wildlife are in short supply in adjoining areas."

In the last decade the ecological science of post-fire logging has clearly resolved several important issues. Logging is not restoration, far from it. Many post-fire management practices employed in the past have been studied and found to be destructive of the need for restoration in the sensitive conditions that pertain after fire. Adaptations of management practices to this newer peer-reviewed science are unavoidable. Successful restoration of a burned forest necessitates that logging must be avoided.

The authors above further point out that naturally recovering post-fire landscapes are significantly under-represented throughout the West. Post-fire areas represent important, unique habitat. NEPA analysis should clearly explore the extent to which unlogged habitat in the project area at this early post-fire successional stage is present in sufficient quantities elsewhere in the region.

CUMULATIVE EFFECTS

Fire suppression operations caused significant direct and indirect effects to the fire environment, and the EIS should account for cumulative effects with this proposal.

Fire fighting has numerous significant adverse effects on the environment 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.

NEPA demands full disclosure of cumulative effects of fire suppression operations in addition to proposed post-fire logging in the project area. The public and the decision maker must be able to discern from this EIS whether these factors combined might result in significant cumulative adverse effects.

Thanks again for the opportunity to comment. Please consider us interested parties to the proposed action and keep us updated on new developments in the planning process as it unfolds. Specifically, please notify us at the addresses below of the availability of a final EIS and decision document so that we may review them and file timely appeals.

Sincerely,

/s/ Jay Lininger, Executive Director
Cascadia Wildlands Project
P.O. Box 10455, Eugene, OR 97440
541.434.1463 (ph)
541.434.6494 (fx)
jlininger@cascwild.org

for

Asante Riverwind, Eastern Oregon Forest Organizer
Oregon Chapter Sierra Club
P.O. Box 5534, Bend, OR 97708
(541) 322-4065
asante.riverwind@sierraclub.org

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