School Fire Salvage Recovery Project

Draft Supplemental Environmental Impact Statement

Pomeroy Ranger District, Umatilla National Forest
Columbia and Garfield Counties, Washington

United States Department of Agriculture

Forest Service

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School Fire Salvage Recovery Project
Draft Supplemental Environmental Impact Statement
Columbia and Garfield Counties, Washington

Lead Agency:	**USDA Forest Service**
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Abstract: The USDA Forest Service is proposing to amend the Umatilla National Forest Land and Resource Management Plan (Forest Plan) to address a recent opinion of the 9th Circuit Court of Appeals (the Court) concerning the School Fire Salvage Recovery Project (the Project).

On February 12, 2007 the Court issued an opinion that the Project was inconsistent with the Forest Plan (Eastside Screens) by inappropriately implementing the "prohibition on logging of any “live tree" ≥ 21 inches diameter at breast height that currently exists in the sales areas – i.e., any tree of the requisite size that is not yet dead." The Court went on to conclude that the agency could not harvest “dying” trees because they were not dead. The Court recognized that we could correct this situation by amending the Forest Plan to include a definition of the term “live tree.” On February 15, 2007 the Eastern District Court of Washington issued an injunction requiring that “the Forest Service shall not harvest from the three timber sales areas any “live tree" ≥ 21 inches diameter at breast height. This includes any tree of requisite size with green needles or that is not yet dead." The proposed action addressed in this DSEIS clarifies the agency's definitions of live and dead trees.

Two alternatives, including the No Action alternative, are analyzed in the DSEIS. Alternative A is the No Action alternative. Alternative B, the proposed action and preferred alternative, would amend the Forest Plan to include definitions of live and dead trees for the project area for the duration of the School Fire Salvage Recovery Project.

The Responsible Official must receive comments on this DSEIS by April 23, 2007.

Emergency Situation Determination:
The Forest Supervisor will seek a determination from the Chief of the Forest Service that an emergency situation exists in the School Fire Salvage Recovery Project area pursuant to 36 CFR 215.10 (b). This emergency situation exists because substantial loss of economic value to the Federal Government would occur if implementation of the decision were delayed. The final determination by the Chief will be published in the legal notice of the decision, 36 CFR 215.10 (d), that the Forest Service made a determination that all or part of a project decision is an emergency situation.

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SUMMARY

INTRODUCTION

The Forest Service has prepared this Draft Supplemental Environmental Impact Statement (DSEIS) in response to a recent opinion of the 9th Circuit Court of Appeals (Appeals Court) concerning the School Fire Salvage Recovery Project. The Final EIS for the School Fire Salvage Recovery Project was issued July 2006 and a Record of Decision signed August 14, 2006, which authorized about 9,430 acres of salvage harvest. Also in August three timber sales (Milly, Oli, and Sun) were awarded covering about 4,200 acres with an estimated volume of 28 million board feet (MMBF).

On February 12, 2007 the Court issued an opinion that the Project was inconsistent with the Forest Plan (Eastside Screens) by inappropriately implementing the prohibition on logging of any “live tree" ≥ 21 inches diameter at breast height that currently exists in the sales areas – i.e., any tree of requisite size that is not yet dead. The Court reasoned that in the absence of an adopted technical definition of “live trees,” the common understanding of the word “live” from the Merriam Webster’s Collegiate Dictionary (10th ed. 1993) meant “to be alive” which meant “not dead.” The Court went on to conclude that the agency could not harvest “dying” trees because they were not dead. The Court recognized that we could correct this situation by amending the Forest Plan to include a definition of the term “live trees.”

On February 15, 2007 the Eastern District Court of Washington (District Court) issued an injunction requiring that “the Forest Service shall not harvest from the three timber sales any “live tree" ≥ 21 inches diameter at breast height. This includes any tree of requisite size with green needles or that is not yet dead." The proposed action addressed in this DSEIS clarifies the agency definitions of live and dead trees.

PURPOSE AND NEED FOR ACTION

As stated in the School Fire Salvage Recovery Project (School) Final EIS on page 1-4 of the Purpose and Need, “there is a need to salvage harvest [burned timber] as rapidly as practicable before decay and other wood deterioration occurs to maximize potential economic benefits.” The Appeals Court opinion and District Court injunction described in the Introduction above prohibits salvage harvest of any “live tree" greater than or equal to 21 inches dbh for the School Project. The Appeals Court definition of a “live tree,” which does not reflect Forest Service silvicultural practice and interpretation, prevents the ability of the Forest Service to achieve the purpose and need of the School Project stated above.

PROPOSED ACTION

The Forest Service proposes to amend the Umatilla National Forest Land and Resource Management Plan to modify Eastside Screens wildlife standard at 6d. (2) (a) to define both live and dead trees. The amendment narrative is based on information disclosed in the FEIS, Appendix B[1], (Implementation and Marking Guides) and Appendix K (Response to Beschta and Others). Appendix B and K are appended to this DSEIS. This amendment applies to, and only for the duration of, the School Fire Salvage Recovery Project.

[1] Appendix B, predicting tree survival scoring guide was modified to be consistent with the August 30, 2006 amendment to the Scott Guidelines.

Existing Eastside Screen wildlife standard at 6d. (2) (a) reads: *Maintain all remnant late and old seral and/or structural live trees ≥21″dbh that currently exist within stands proposed for harvest activities.*

Amended Eastside Screen wildlife standard at 6d. (2) (a) would read: *Maintain all remnant late and old seral and/or structural live trees ≥21″dbh that currently exist within stands proposed for harvest activities. Live trees are defined as trees rated to have a high probability of surviving the effects of fire, and trees rated to have a moderate probability of survival where sampling indicates that at least 50 percent of their basal cambium is alive. Dead trees are defined as trees rated to have a low probability of surviving the effects of fire, and trees rated to have a moderate probability of survival where sampling indicates that more than 50 percent of their basal cambium is dead. Survival probability is determined using "Factors Affecting Survival of Fire Injured Trees: A Rating System for Determining Relative Probability of Survival of Conifers in the Blue and Wallowa Mountains" (Scott et al. 2002, as amended) (commonly referred to as the Scott Guidelines).*

ALTERNATIVES

The DSEIS considered eight alternatives, two were analyzed in detail (the no action and proposed action), and six were considered but eliminated from detailed study for reasons stated in Chapter 2 of this document.

Alternative A – No Action

In this document the no action alternative means the August 14, 2006 decision (Alternative B as described in the FEIS) would be implemented with actual harvest limited to those trees not enjoined by the District Court of the Eastern District of Washington. Specifically "no harvest of "live trees " ≥ 21" dbh including any tree of requisite size with green needles or that is not yet dead." All other activities could proceed as disclosed previously.

Alternative B – Proposed Action (Preferred Alternative)

The Forest Service proposes to amend the Umatilla National Forest Land and Resource Management Plan to modify the Eastside Screens wildlife standard at 6d. (2) (a) as stated above in the Proposed Action.

The following table is a comparison of alternatives.

Table 1 - Summary Comparison of Alternatives

Activity	Unit of Measure	Alternative A (No Action)	Alternative B (Proposed Action)
Amendment to Forest Plan to modify Eastside Screens Wildlife Standard 6d. (2) (a) to include definition of "live" and "dead" trees	Yes/No	No	Yes
Milly Oli and Sun sales (Round-One) Remaining to be Harvested	MMBF	11*	13*
	Acres	1,800	1,800
Round-Two Remaining to be harvested	MMBF	12*	15*
	Acres	5,200	5,200
*Volume figures express actual volumes realized and experienced deterioration, and therefore, differ from the FEIS			

Chapter 1

Purpose and Need

This Draft SEIS only contains discussion or information that is new or different. Other sections of the July 2006 FEIS are unchanged.

INTRODUCTION

The Forest Service has prepared this Draft Supplemental Environmental Impact Statement (DSEIS) in response to a recent opinion of the 9th Circuit Court of Appeals (Appeals Court) concerning the School Fire Salvage Recovery Project. The Final EIS for the School Project was issued July 2006 and a Record of Decision signed August 14, 2006, which authorized about 9,430 acres of salvage harvest. Also in August, three timber sales (Millly, Oli and Sun) were awarded covering about 3,670 acres with an estimated volume of 28 million board feet (MMBF).

On August 15, 2006, the Lands Council, Oregon Natural Resources Council, Hells Canyon Preservation Council, and Sierra Club (plaintiffs) filed suit against Forest Supervisor Kevin Martin and the Forest Service in The Lands Council et al. v. Martin et al., Civ. No. 06-229, District Court of the Eastern District of Washington, challenging the School Fire Salvage Recovery Project. Plaintiffs alleged the Forest Service failed to adequately analyze impacts to certain unroaded areas, failed to consider a reasonable range of alternatives, failed to comply with the Eastside Screens to protect old-growth trees, failed to adequately consider the scientific controversy regarding the "Factors Affecting Survival of Fire-Injured Trees" (Scott et al. 2002, 2006), and failed to adequately analyze cumulative environmental impacts. Timber sale purchasers, Boise Building Solutions Manufacturing, LLC and Dodge Logging, Inc., along with American Forest Resource Council joined the lawsuit as Defendant-Interveners.

On September 11, 2006, the District Court denied plaintiffs' request for a temporary restraining order and preliminary injunction, finding that the Forest Service had not failed in its duty to take the requisite "hard look" at the environmental consequences. Thereafter, the three awarded salvage timber sales began operations. On September 15, the District Court denied plaintiffs' request for stay and on September 18, the Appeals Court denied plaintiffs' request for an injunction pending appeal.

On February 5, 2007, the Appeals Court heard oral argument on the District Court's denial of the preliminary injunction. The Appeals Court issued an opinion on February 12, 2007, that the Forest Service had adequately disclosed the impacts to the unroaded areas, but that the Forest Service was violating the Umatilla Land and Resource Management Plan (LRMP) [Eastside Screens] prohibition of cutting "live trees" $\geq$ 21 inches in diameter at breast height when it designated dying trees for harvest. The intent of the Eastside Screens interim management direction was to restrict timber harvest in those areas that scientific analysis indicated were important to certain fish, wildlife, and ecosystem structure.

The Appeals Court reasoned that in the absence of an adopted technical definition of "live trees," the common understanding of the word "live" from the Merriam Webster's Collegiate Dictionary (10th ed.

1993) meant “to be alive,” which meant “not dead,” and concluded “the common meaning of the term ‘all . . . live trees’ is all trees that have not yet died.” Opinion at 12 Thus, according to the Appeals Court, dying trees designated for harvest were not yet dead, and remained “live” for the purposes of the Eastside Screens. The Appeals Court further opined that “[t]he Forest Service is free, of course, to amend the Eastside Screens to allow logging of old-growth dying trees, either by adding a definition of the term “live trees” or by changing the requirement to maintain all live tress of a certain size. Opinion at 14

The Appeals Court remanded the case to the District Court to issue an injunction consistent with its findings. The District Court issued an injunction on February 15, 2007, requiring that “the Forest Service shall not harvest from the three timber sales areas any “live tree" $\geq$ 21 inches diameter at breast height. This includes any tree of requisite size with green needles or that is not yet dead.” District Court Order at 2 The Appeals Court definition of a “live tree” does not reflect Forest Service silvicultural practice and interpretation, and it prevents the Forest Service from achieving the purpose and need of the School Fire Salvage Recovery Project.

This plan amendment is being proposed under the National Forest Management Act (NFMA) implementing regulations in effect prior to November 9, 2000. The 2005 NFMA implementing regulations allow use of these procedures (36 CFR 219.14 (d) (2)). Specific procedures for amending plans under the regulations in effect prior to November 9, 2000 are found in Forest Service Manual (FSM) 1926.5. Non-significant plan amendments may be made as a part of a project proposal, as is the case here. A plan amendment can be found to be non-significant if the amendment involves:

1. Actions that do not significantly alter the multiple-use goals and objectives for long-term land and resource management.
2. Adjustments of management area boundaries or management prescriptions resulting from further on-site analysis when the adjustments do not cause significant changes in the multiple-use goals and objectives for long-term land and resource management.
3. Minor changes in standards and guidelines.

BACKGROUND

Tree mortality is a complex biological process. Common measures of animal mortality are not useful for trees; tree death is not signified by cessation of a heartbeat, for example. In fact, a tree’s “heart” can rot and yet the tree might remain alive for decades or even centuries (Schmitt and Filip 2005).

Trees die when they cannot acquire or transport sufficient resources (water, mineral nutrients, etc.) to recover from attack by insects and pathogens, or from injuries caused by environmental stress, wildfire, and other disturbance agents (Waring 1987).

A wildfire typically creates a relatively broad spectrum of tree injuries. When fire injuries are acute, trees die almost immediately; when injuries are moderate, delayed mortality may occur over a period of several years; and when injuries are minor, trees may appear to be unaffected or uninjured by the fire.

Acute fire injuries cause obviously dead trees with blackened stems and a complete absence of needles, or trees with crowns having all brown needles, or trees with crowns having “fading” or “dry-appearing” (off-color) needles throughout the crown.

Moderate fire injuries result in a relatively broad array of tree response. Experience indicates that about half of the trees with moderate injuries will survive, and about half of them will die (Scott et al. 2002). Unlike monitoring human physiology with measures such as pulse rate and blood pressure, there is no definitive measure for determining near-term mortality (up to five years) for moderately injured trees.

Because a definitive measure of delayed tree mortality does not exist, the traditional approach to post-fire assessment is to evaluate direct (first-order) fire effects to predict a tree's survival probability. This traditional approach has a long historical precedence in the western United States dating back to the 1920s and 1930s (Connaughton 1936, Dieterich 1979, Flint 1925, Herman 1954, Lynch 1959, Mann and Gunter 1960, Martin 1963, Miller and Patterson 1927, Salman 1934, Starker 1934, Wagener 1961).

PURPOSE AND NEED FOR ACTION

As stated in the School Fire Salvage Recovery Project Final EIS on page 1-4 of the Purpose and Need, "there is a need to salvage harvest [burned timber] as rapidly as practicable before decay and other wood deterioration occurs to maximize potential economic benefits." The Appeals Court opinion and District Court injunction described in the Introduction above "prohibits salvage harvest from the three timber sales areas of any "live tree" greater than or equal to 21 inches diameter at breast height. This includes any tree of requisite size with green needles or that is not yet dead." The Appeals Court definition of a "live tree," which does not reflect Forest Service silvicultural practice and interpretation, frustrates the ability of the Forest Service to achieve the purpose and need of the School Fire Salvage Recovery Project stated above.

PROPOSED ACTION

The Forest Service proposes to amend the Umatilla National Forest Land and Resource Management Plan (Forest Plan) to modify Eastside Screens wildlife standard at 6d. (2) (a) to define both live and dead trees. The amendment narrative is based on information disclosed in the FEIS, Appendix B[2] (Implementation and Marking Guides), and Appendix K (Response to Beschta and Others). Appendix N (Appendix B, revised, of the environmental assessment for Interim Management Direction Establishing Riparian, Ecosystem, and Wildlife Standards for Timber Sales, commonly referred to as the Eastside Screens), and Appendix B and K of School Fire Salvage Recovery Project FEIS are appended to this DSEIS. This amendment applies to, and only for the duration of, the School Fire Salvage Recovery Project.

Existing Eastside Screen wildlife standard at 6d. (2) (a) reads: *Maintain all remnant late and old seral and/or structural live trees ≥ 21″ dbh that currently exist within stands proposed for harvest activities.*

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[2] Appendix B, predicting tree survival scoring guide was modified to be consistent with the August 30, 2006 amendment to the Scott Guidelines.

using "Factors Affecting Survival of Fire Injured Trees: A Rating System for Determining Relative Probability of Survival of Conifers in the Blue and Wallowa Mountains" (Scott et al. 2002, as amended) (commonly referred to as the Scott Guidelines).

DECISION FRAMEWORK

The scope of the decision to be made is limited to the Forest Plan amendment to the Eastside Screens wildlife standard 6d. (2) (a) within the School Fire Salvage Recovery Project area. The Responsible Official for this proposal is the Forest Supervisor of Umatilla National Forest. The decision will be based on a consideration of public comments, responsiveness to the purpose and need, and a comparison of impacts disclosed by alternative.

Chapter 2

Alternatives

This Draft SEIS only contains discussion or information that is new or different. Other sections of the July 2006 FEIS are unchanged.

ALTERNATIVES CONSIDERED IN DETAIL

Alternative A – No Action

In this document the no action alternative means the August 14, 2006 record of decision (Alternative B selected as described in the FEIS) would be implemented as enjoined by the District Court of the Eastern District of Washington. Specifically, the no action alternative excludes further harvest of any "live trees" ≥ 21 inches diameter at breast height, including any tree of requisite size with green needles or that is not yet dead. All other activities would proceed as disclosed previously.

Alternative B – Proposed Action (Preferred Alternative)

The Forest Service proposes to amend the Umatilla National Forest Land and Resource Management Plan (Forest Plan) to modify Eastside Screens wildlife standard at 6d. (2) (a) to define both live and dead trees. The amendment narrative is based on information disclosed in the FEIS, Appendix B[3] (Implementation and Marking Guides) and Appendix K (Response to Beschta and Others). Appendix N (Appendix B, revised, of the environmental assessment for Interim Management Direction Establishing Riparian, Ecosystem, and Wildlife Standards for Timber Sales, commonly referred to as the Eastside Screens), and Appendix B and K of School Fire Salvage Recovery Project FEIS are appended to this DSEIS. This amendment applies to, and only for the duration of, the School Fire Salvage Recovery Project.

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[3] Appendix B, predicting tree survival scoring guide was modified to be consistent with the August 30, 2006 amendment to the Scott Guidelines.

using "Factors Affecting Survival of Fire Injured Trees: A Rating System for Determining Relative Probability of Survival of Conifers in the Blue and Wallowa Mountains" (Scott et al. 2002, as amended) (commonly referred to as the Scott Guidelines).

ALTERNATIVES CONSIDERED, BUT ELIMINATED FROM DETAILED STUDY

Assess Probability of Tree Mortality Using Methods Other Than Scott Guidelines

Several respondents to the School Fire Salvage Recovery Project commented that the project's basis for differentiating between dying and living trees is either questionable or untenable for scientific and other reasons. Often, these comments specifically addressed use of the Scott Guidelines (Scott et al. 2002, 2003) and assert there are other and more appropriate methods that would better predict tree mortality for the School Fire Salvage Recovery Project.

The Scott Guidelines provide a methodology for predicting the relative probability of survival for fire-injured trees growing on a wide variety of site conditions, exposed to varying levels of pre-fire factors that can predispose a tree to fire-induced mortality depending upon their severity or magnitude (occurrence of dwarf mistletoe, root disease, and bark beetles), and experiencing widely varying levels of first-order fire effects to their crowns, stems and roots. The possible combinations of these factors are almost limitless, leading inevitably to a decision to develop a prediction system relating site and tree factors (explanatory variables) to a probabilistic estimate of tree mortality.

The Forest Service agrees there are other methods available to predict tree mortality and differentiate between dying and living trees. The School Fire Salvage Recovery Project Final EIS, Appendix K, compared and evaluated alternative methods to the Scott Guidelines that were suggested during public involvement. Additional information on these alternative methodologies can be found in Appendix K, which is appended to this Draft SEIS. The Forest Service recognizes there will always be uncertainty associated with any probabilistic rating system, because accounting for every combination of variables that could potentially result in tree death is not currently possible.

In order for a methodology to be appropriate for this project, it must:

- Address all of the principal commercial species within the project area (ponderosa pine, Douglas-fir, grand fir/white fir, lodgepole pine, Engelmann spruce, and western larch);
- Be valid for the geographic area of the School Fire Salvage Recovery Project; and
- Be operationally practical to potentially evaluate hundreds of trees per acre, over thousands of acres.

The following alternatives (alternative methodologies) were considered but were not analyzed in detail for the reasons stated below.

Waring Report One respondent provided a report (prepared by Richard Waring) describing an evaluation of the Scott Guidelines for the Easy and High Roberts salvage sales on the Malheur National Forest. In this report, Waring concluded that using indirect indicators (such as the "crown and bole scorch" factors from the Scott Guidelines) to assess a tree's predisposition to fire-caused mortality is inappropriate, and that direct measurement of a tree's physiological processes (photosynthesis or transpiration) provides a better estimate of survival potential.

Waring's report contends that measurements of water stress, using either a pressure chamber (Waring and Cleary 1967) or by collecting increment cores and then analyzing the sapwood's relative water content (Waring and Running 1978), provides definitive estimates of tree health and survival potential.

A plant moisture stress measurement can be obtained by using a portable pressurized chamber, as described by Waring and Cleary (1967), but this procedure is feasible primarily in a laboratory setting and not during the designation (marking) phase of a timber sale. The sapwood water storage article (Waring and Running 1978) describes how transpiration and photosynthesis relationships were examined over a multi-year period in the laboratory, but it does not provide a procedure or methodology for determining tree survivability.

The Waring Report was not evaluated using the six evaluation criteria (FEIS, Appendix K) because Waring's Report is not a tree mortality prediction system, and the criteria were selected for their relevance to mortality prediction systems.

Ryan (2000) studied the effect of varying levels of fire-caused cambium injury on the water relations of ponderosa pine. He found that trees in the 100 percent basal-heating class, which experienced cambium kill over an average of 95 percent of the circumference at their base, had higher midday xylem pressure potentials (i.e., less water stress) than non-girdled trees (Ryan 2000). This result was apparently due to phloem unloading that created a net water flow to the xylem tissue (Kozlowski 1992).

It is our judgment that the Waring Report (Waring, No Date) is inappropriate for use with the School Fire Salvage Recovery Project for two reasons:

- Since the Ryan (2000) study shows that mortality of basal-girdled trees can be delayed for more than two growing seasons after a fire, and because it shows that fire-girdled trees can have a positive ("healthy") water status soon after a fire, it refutes Waring's contention that a one-point-in-time measurement of water stress provides a suitable methodology for differentiating between living and dying trees: and
- As described above, evaluating trees based on water stress or sapwood water content is not a practical approach, because of operational considerations and feasibility, for large burned areas such as School Fire area.

The **McHugh and Kolb (2003) model** was developed using data from three wildfires in northern Arizona. It includes one conifer species (ponderosa pine) and it relates predicted tree mortality to two fire effects: total crown damage (scorch plus consumption), and bole char severity. It is our judgment that the McHugh and Kolb (2003) model is inappropriate for use with the School Fire Salvage Recovery Project for the following reasons:

- Its geographical scope is limited (northern Arizona), and it pertains to an area far removed from the School Fire analysis area;
- It assesses the crown and stem systems only; no direct consideration of fine-root damage or basal stem girdling at the root crown (Ryan and Frandsen 1991) is included;
- Its tree species coverage is limited (ponderosa pine only).

The **Peterson and Arbaugh (1986) model** was based on tree survival patterns after late-summer wildfires in the northern Rocky Mountains. It includes two conifer species (Douglas-fir and lodgepole pine) and it relates predicted tree mortality to a wide variety of tree characteristics and fire effects: tree diameter, tree height, crown diameter and ratio, bark thickness, scorch height, crown scorch volume, basal scorch, bark char, and insect damage. Although the variety of predictive factors included with this model is impressive, it is our judgment that the Peterson and Arbaugh (1986) model is inappropriate for use with the School Fire Salvage Recovery Project for the following reasons:

- Its geographical scope is limited (northern Rocky Mountains of Montana, northwestern Wyoming, and Idaho);
- It assesses the crown and stem systems only (no direct consideration of the root system); and
- Its tree species coverage is limited (Douglas-fir and lodgepole pine only).

The **Ryan and Reinhardt (1988) model** was developed to predict tree mortality following prescribed fires in Idaho, Montana, Oregon, and Washington. It includes seven conifer species and it relates predicted tree mortality to two factors: bark thickness, and crown volume killed by fire. The authors of the Scott Guidelines used the Ryan and Reinhardt (1988) model when developing their rating procedure, in addition to other models and criteria that better account for the totality of fire effects (including root damage). It is our judgment that the Ryan and Reinhardt (1988) model is inappropriate for use with the School Fire Salvage Recovery Project for the following reasons:

- Its geographical scope is limited because the Oregon data came from the western or northern Cascade Mountains, or from the southwestern portion of the state near Medford;
- It assesses the crown and stem systems only, with no factors relating to root damage;
- Its tree species coverage is somewhat limited because it does not include grand fir or ponderosa pine, two abundant tree species in the School Fire area; and
- It was developed using prescribed fire data only, and this is believed to limit its potential applicability for wildfire situations such as the School Fire.

The **Stephens and Finney (2002) model** was developed to predict tree mortality following prescribed fire in the southern Sierra Nevada Mountains of California. It includes five conifer species and it relates predicted tree mortality to four factors: tree diameter, percent crown volume scorched, forest floor (duff) consumption, and crown scorch height. It is our judgment that the Stephens and Finney (2002) model is inappropriate for use with the School Fire Salvage Recovery Project for the following reasons:

- Its geographical scope is limited (southern Sierra Nevada Mountains);
- Its tree species coverage is limited (of the five conifers included in this model, only ponderosa pine occurs in the School Fire area); and
- It was developed using prescribed fire data only, and this is believed to limits its potential applicability for wildfire situations such as the School Fire.

The **Thies et al. (2006) model** was developed to predict tree mortality following prescribed fire in the southern Blue Mountains of northeastern Oregon. It includes one tree species (ponderosa pine) and it relates predicted tree mortality to five factors: live crown proportion, needle scorch proportion, bud kill proportion, basal char severe, and bole scorch proportion. The size class variation for trees included in this study is quite limited due to similar stand replicates. Pre-treatment tree diameter at breast-height (dbh) for control units averaged 28.4 cm (11.2 inches), and the diameters for trees in the fall and spring burning treatments averaged 26.6 cm (10.5 inches) and 27.4 cm (10.8 inches), respectively. This is a very different range of tree diameters from that found in the School Fire Salvage Recovery Project. The authors of this study also caution about extrapolating its results, and using its mathematical models, beyond the geographical area of the sampled stands or with tree species other than ponderosa pine, until datasets are produced to validate the models for other geographical areas or tree species. It is our judgment that the Thies et al. (2006) model is inappropriate for use with the School Fire Salvage Recovery Project for the following reasons:

- Its geographical scope is limited (a specific set of sampled stands in the southern Blue Mountains);
- Its ecological scope is limited (sampled stands are in the ponderosa pine potential vegetation series, and only 1.6 percent of the School Fire area is included in this series; see table E-3 in the School Fire FEIS);
- Its tree species coverage is limited (ponderosa pine only);
- The tree-size variation included in the model-development dataset (a range of 10.5 to 11.2 inches average stand diameter across all replicates) is limited when compared with tree-size variation encountered in the School Fire area;
- It assesses the crown and stem systems only (no direct consideration of the root system); and
- It was developed using prescribed fire data only, and this is believed to limits its potential applicability for wildfire situations such as the School Fire.

COMPARISON OF ALTERNATIVES

The following table shows a comparison of alternatives.

Table 1 - Summary Comparison of Alternatives

Activity	Unit of Measure	Alternative A (No Action)	Alternative B (Proposed Action)
Amendment to Forest Plan to modify Eastside Screens Wildlife Standard 6d. (2) (a) to include definition of "live" and "dead" trees	Yes/No	No	Yes
Milly Oli and Sun sales (Round-One) Remaining to be Harvested	MMBF	11*	13*
	Acres	1,800	1,800
Round-Two Remaining to be harvested	MMBF	12*	15*
	Acres	5,200	5,200
*Volume figures express actual volumes realized and experienced deterioration, and therefore, differ from the FEIS			

Chapter 3
Affected Environment
and
Environmental Consequences

This Draft SEIS only contains discussion or information that is new or different. Other sections of the July 2006 FEIS are unchanged.

INTRODUCTION

The Forest Service has prepared this Draft Supplemental Environmental Impact Statement (DSEIS) in response to a recent opinion of the 9th Circuit Court of Appeals (Appeals Court) concerning the School Fire Salvage Recovery Project. The physical, biological, social, and economic effects of the School Fire Salvage Recovery Project were fully disclosed in the July 2006 FEIS and are not repeated here except as they are affected by the Appeals Court opinion.

AFFECTED ENVIRONMENT

School Fire burned approximately 51,000 acres in August 2005, about 28,000 acres of which were on National Forest System land administered by the Umatilla National Forest. Tree mortality varied from completely black (total needle consumption) to underburned areas where delayed individual tree mortality is expected. The Final EIS for School Fire Salvage Recovery Project was issued July 2006 and a record of decision (ROD) signed August 14, 2006, which authorized about 9,400 acres of salvage harvest. Based on initial field reconnaissance, timber industry capability, and expected deterioration rates, the Umatilla National Forest decided to implement salvage operations in two steps.

Shortly after the August 14, 2006 decision, three timber sales were awarded covering about 4,200 acres with an estimated volume of 29 million board feet (MMBF). This first round of salvage harvest consisted of three sales (Milly, Oli, and Sun) of the most severely burned areas (the majority of trees were dead or expected to die). When the three sales were enjoined on February 15, 2007 approximately 16 MMBF from 2,400 acres had been salvage harvested. There is an estimated 13 MMBF of volume within the remaining 1,800 acres left to be harvested. Of that volume, approximately 2 MMBF consists of trees that meet the definition of "live" as defined in the opinion of the Appeals Court.

The second round of salvage harvest under the August 14, 2006 decision has not been sold, however, salvage harvest was intended to occur on these remaining 5,200 acres for an estimated 15 MMBF beginning in the 2007 field season. As of February 15, 2007, an estimated 3 MMBF of volume across round-two acres would be potentially affected by the Appeals Court ruling. The second round of sales consists of areas with mixed and/or delayed mortality, and may include areas of high mortality. Given these conditions, the Forest Service anticipated extensive use of the Scott Guidelines to predict the relative probability of tree survival for the round-two salvage timber sales.

ENVIRONMENTAL CONSEQUENCES

No Action Alternative

Direct, indirect, and cumulative effects were disclosed for Alternative B in the July 2006 School Fire Salvage Recovery Project FEIS. Timber harvest would still occur in the same areas and along the same roads as originally described for Alternative B in the School Fire Salvage Recovery Project Final EIS. Logging systems would remain the same and no new trees would be designated for harvest. The size and location of Riparian Habitat Conservations Areas would remain the same as would the measures to protect those areas. Seasonal restrictions on operations to minimize impacts on big game winter range, soils, and snowmobile uses would remain the same. The only change would be the retention of scattered "live" trees ≥ 21 inches diameter at breast height (dbh) including any tree of requisite size with green needles or that is not yet dead.

The addition of ≥ 21 inch fire injured trees retained in these units could have a beneficial effect to wildlife. The majority of these ≥ 21 inch dbh fire injured trees are expected to be dead within the next five years, contributing additional snags. Although unlikely, some trees may survive and could provide green component habitat in the burned forest ecosystem. Snags ≥ 21 inches dbh remain standing longer than smaller dbh snags and therefore provide habitat for a variety of species for a longer period of time. Where retention of scattered trees ≥ 21 inches dbh occurs, additional dead wood (snag) habitat would be created. Effects to woodpeckers from scattered increases in greater than 21 inch dead wood habitat may change slightly compared to effects disclosed in the School Fire FEIS. However, these changes are not expected to be measurable across the project area because we do not know the number and location of "live" trees >21 inch diameter at breast height (dbh) including any tree of requisite size with green needles or that is not yet dead. Therefore, effects disclosures in the School Final EIS would remain essentially unchanged. Leaving additional scattered large diameter trees would not contribute significantly to the fire hazard. In fact, leaving them would result in the generation of slightly less timber harvest activity fuels that would have to be treated to reduce post-harvest fire hazard. There would be no new measurable environmental effects for other resources beyond those already identified for Alternative B in the School Fire Salvage Recovery Project Final EIS.

The net effect of not being able to remove the enjoined trees ≥ 21 inches dbh would vary among the three sales. Milly sale is 90 percent complete and relies extensively on helicopter yarding. The economic effect would be an undetermined reduction in volume and value across the remaining acres within the Milly sale area. The Oli and Sun timber sales would be affected by the Court's opinion to a greater extent than the Milly timber sale. They are 35 percent and 60 percent completed, respectively. Both have a significant portion of unlogged units that were designed to utilize skyline and helicopter yarding systems. Skyline yarding falls in the mid-range of yarding cost, while helicopter yarding is the most expensive system. Since a larger portion of the volume of these two sales remains unharvested, the inability to harvest enjoined trees from these sales would have a greater economic effect. The inclusion of larger diameter trees offsets the costs of yarding smaller less valuable trees. This is most apparent when higher cost yarding systems like helicopter and skyline are used. Inability to harvest enjoined trees could render the majority of the unlogged portions of the Oli and Sun sales economically unviable.

Within the second round of sales about 5,200 acres of trees ≥21 inches dbh that meet the Court's definition of live, are expected to result in an estimated 3 MMBF. While they only denote 20 percent of the anticipated volume, they represent the predominance of the remaining value. Wood deterioration has progressed at a faster rate than was initially anticipated in the FEIS due to weather conditions, higher than predicted activity of bark beetles, and other factors. This has rendered much of the small diameter volume unmerchantable for traditional lumber products. Larger diameter trees deteriorate at a slower rate and have a higher initial value. Inclusion of these trees is an essential component of the economic viability of these sales. Loss of volume and value associated primarily with the larger diameter trees and coupled with fluctuating lumber markets, could render the majority of helicopter and skyline portions of round-two sales as economically unviable.

There would be no effect on multiple-use goals and objectives for long-term land and resource management from the no action alternative because there is no plan amendment proposed under this alternative. No adjustments to management area boundaries are proposed, therefore, there would be no change in land allocation. There would be no effect on standards and guidelines from the no action alternative because there is no plan amendment proposed under this alternative.

Proposed Action Alternative

Direct, Indirect, and Cumulative Effects

Effects to resources would be as described for all resources under Alternative B in the School Fire Salvage Recovery Project Final EIS. Timber harvest would still occur in the same areas and along the same roads as originally described in the School Fire Salvage Recovery Project Final EIS. Logging systems would remain the same and no new trees would be designated for harvest. The size and location of Riparian Habitat Conservation Areas would remain the same as would the measures to protect those areas. Seasonal restrictions on operations to minimize effects on big game winter range, soils, and snowmobile uses would remain the same. Therefore, as a result of this amendment, there would be no changes on the ground, or to environmental effects beyond those already described in School Fire Salvage Recovery Project Final EIS.

The Umatilla Forest Plan allows for salvage from all of the lands included in the School Fire Salvage Recovery Project. A summary of the related Forest Plan management direction is found in School FEIS, pp. 1-10 through 1-14. The Forest Plan (p. 4-67) includes the following goal: "Provide for production of wood fiber consistent with various resource objectives, environmental constraints, and considering cost efficiency." Management direction for the various land allocations in the Forest Plan recognizes the need or desire to salvage wood fiber following natural disturbance (Forest Plan pp. 4-94 through 4-105). The proposed action helps meet the goal of wood fiber production by allowing salvage of dead and dying timber that would not otherwise be salvaged. The School FEIS (Chapter 3) addresses the environmental effects of the project in light of the full suite of Forest Plan management direction. In the School Fire Salvage Recovery Project's record of decision (ROD) these effects are evaluated and a finding is made that the selected alternative from that EIS is consistent with the Forest Plan, as amended (ROD p. 12).

The amendment proposed in this DSEIS is short-term (the life of this project) and of limited scope (28,000 acres of the 1.5 million acre Umatilla National Forest) and it amends the Forest Plan in a way that contributes to achieving plan goals. The proposed action includes modification of one Forest Plan standard, limited to the duration and geographic scope of the School Fire Salvage Recovery Project. The amendment would not change management intent of the Eastside Screens wildlife standard nor would there be changes in how the standard would be applied to the School Fire Salvage Recovery Project compared to the effects disclosed in the July 2006 School Fire FEIS. Appendix B, Implementation and Marking Guides, of the FEIS would not change. This amendment clarifies the definitions of live and dead trees to be consistent with normal agency practice and current science. This amendment would not preclude or require other amendments specific to this wildlife standard nor would this amendment preclude or require other actions across the forest.

LITERATURE CITATIONS

This Draft SEIS only contains discussion or information that is new or different. Other sections of the July 2006 FEIS are unchanged.

Waring, R. [N.D.] Evaluation of Don Scott's marking of "dying ponderosa pine above 21"" on fire salvage sales: USFS Prairie City Ranger District. Unpublished Report. [Corvallis, OR]: Oregon State University, College of Forestry, Department of Forest Science. 5 p.

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Index

This list of terms is intended to assist the reader in locating a broad scope of subject areas discussed in the Draft SEIS documentation. The reference to specific page numbers is not intended to be complete.

APPENDIX B

School Fire Salvage Recovery Project
Implementation/Marking Guides

CHANGES AFTER FINAL EIS

After distribution of the Final EIS in July 2006 and after its Record of Decision was signed on August 14, 2006, minor changes were made to Appendix B of the Final EIS. The changes involved score values for one category of trees (Mature and Overmature Ponderosa Pine) in the "Scoring Guide for Rating Tree Survival for the School Fire" section of Appendix B (page B-3).

The score value changes incorporate revisions to a tree survival prediction system commonly referred to as the Scott Guidelines (*Factors Affecting Survival of Fire Injured Trees: A Rating System for Determining Relative Probability of Survival of Conifers in the Blue and Wallowa Mountains* by Scott et al. 2002, as amended). A second amendment to the Scott Guidelines was issued on August 30, 2006 and distributed to the Umatilla National Forest via memorandum on September 18, 2006.

The only Appendix B change that occurred after the Final EIS and ROD was to revise the score values for mature and overmature ponderosa pine, as necessitated by amendment 2 of the Scott Guidelines.

SNAG RETENTION

The purpose of these marking guides is to implement the salvage harvest prescriptions for the School Fire Salvage Recovery Project.

The objectives of the salvage harvest prescription are to remove merchantable fire-killed trees; to remove trees that are expected to die within 1 year (beyond 1 year for mature or overmature ponderosa pine and grand fir or white fir) as a result of fire injuries sustained during the School Fire; to retain fire-injured trees that are predicted to survive for more than 1 year (and longer for mature or overmature ponderosa pine and grand fir or white fir); and to retain dead or dying trees needed as wildlife snags or for future coarse woody debris recruitment.

Most of the time it will not be difficult to determine if an individual tree in the School Fire Recovery Project area would be considered dead or dying. Dead trees can be identified by blackened boles and the complete absence of needles, or with crowns having all brown needles, or with crowns having "fading" or "dry-appearing" (off-color) green needles throughout the crown.

At other times, it will be more difficult to determine the survivability of fire-injured trees with partially or completely green crowns. To determine a survival prediction for fire-injured trees, the "Rating Guide for Tree Survival" section is included below.

Landscape Snag Strategy

General Theme: Retain three snags per acre greater than 21 inches at diameter breast height (DBH) across the landscape for areas where salvage harvest is prescribed. All units would also retain snag clumps on 15 acre grids that will be no smaller than one acre and no larger than three acres.

Criteria Common to All Salvage Harvest Areas:

- The minimum design criterion for snag retention is three snags per acre.
- Snags would be selected from trees that could potentially be designated as "removal or harvest trees" and meet the "expected to die" criteria from the Marking Procedure section below (Scott 2002, 2003).
- If a snag and/or clump identified for retention is required to be felled for operational reasons (i.e., danger trees), and its loss moves snag density below minimum design criteria levels, a snag and/or clump of equal or larger size planned for harvest would be left as replacement.
- Retain all existing down (green or black) material greater than 10 inches in diameter at the large end unless designated amounts are identified for removal by a group consisting of a wildlife biologist, silviculturist, forester, fuels planner and District Ranger.

Three Snags per Acre Guideline:

- ♦ **Species preference –** Select trees that are desirable for cavity nesters and/or likely to persist for the longest period on the landscape. Order of species preference is ponderosa pine, Douglas-fir, western larch, Engelmann spruce, lodgepole pine and grand fir.
- ♦ **Size –** Retain snags greater than 21 inch DBH. Substitute the next largest size available if none are available in the greater than 21 inch DBH class. Existing snags with high wildlife value, but with low commercial value, are preferred for retention, providing they do not create OSHA safety concerns.
- ♦ **Shape and Form –** Select snags with the largest limbs or broken tops and minimal lean (so they don't topple over prematurely) first. Do not select snags where fire damage to the bole (i.e., fire consumed boles, especially in the first 30 feet) or to the root system is severe.
- ♦ **Arrangement –** Spacing of multiple-diameter snags would be preferable to just retaining large-diameter snags in a limited area. Scatter snags throughout the unit and away from roads and landings. Some can be grouped in 15 acre grids if doing so would still maintain a good snag distribution across the unit.

Clumped Snag Guideline:

- ♦ **Objective –** Maintain snag habitat within clumps distributed across salvage harvest units. Clumps can incorporate a few of the larger trees (greater than 21 inches DBH).
- ♦ **Arrangement –** Consider logging systems when selecting clumps, especially helicopter and skyline, while striving to meet the desired clump configuration, which is more oblong or circular and less linear. Locate clumps on mid and upper slopes and away from unit edges and adjacent untreated areas. Clumps may be located on unit edges if few or no snags exist outside the boundary (i.e., old clearcuts, meadows, etc.).
- ♦ **Clump Size –** Will vary by unit. For each 15-acre grid, retain one clump that is no smaller than one acre and no larger than three acres. Units smaller than 15 acres should have adequate clumped habitat adjacent to them and will not require designated clumps.

PREDICTING TREE SURVIVAL

The tree survival scoring guide described below is adapted from a report entitled "**Factors Affecting Survival of Fire Injured Trees: A Rating System for Determining Relative Probability of Survival of Conifers in the Blue and Wallowa Mountains**" (Scott et al. 2002, as amended). This report is commonly referred to as the "Scott Guidelines."

Adaptations of the Scott Guidelines for the School Fire Salvage Recovery Project includes incorporating changes suggested by the Scott Guidelines authors following additional field work in 2003 (Scott et al. 2003), and additional cambium sampling requirements (basal tree chopping near the root crown) for trees falling in the moderate scoring range.

Use the "Scoring Guide for Rating Tree Survival for the School Fire" to determine a probability for tree survival.

SCORING GUIDE FOR RATING TREE SURVIVAL FOR THE SCHOOL FIRE.

Young and Immature Ponderosa Pine (Small Trees < 16 in. dbh)

High Probability of Tree Surviving = Composite Rating Score	3-8
Moderate Probability of Tree Surviving = Composite Rating Score	10-15
Low Probability of Tree Surviving = Composite Rating Score	17-21

Young and Immature Ponderosa Pine (Large Trees > 16 in. dbh)

High Probability of Tree Surviving = Composite Rating Score	3-9
Moderate Probability of Tree Surviving = Composite Rating Score	13-18
Low Probability of Tree Surviving = Composite Rating Score	21-25

Mature and Overmature Ponderosa Pine (orange bark, ≥ 21 in. dbh)

High Probability of Tree Surviving = Composite Rating Score	1-7
Moderate Probability of Tree Surviving = Composite Rating Score	8-15
Low Probability of Tree Surviving = Composite Rating Score	16-24

Young and Immature Douglas-fir

High Probability of Tree Surviving = Composite Rating Score	3-6
Moderate Probability of Tree Surviving = Composite Rating Score	8-16
Low Probability of Tree Surviving = Composite Rating Score	17-25

Mature and Overmature Douglas-fir

High Probability of Tree Surviving = Composite Rating Score	3-10
Moderate Probability of Tree Surviving = Composite Rating Score	11-17
Low Probability of Tree Surviving = Composite Rating Score	19-31

All Size Classes of Lodgepole Pine

High Probability of Tree Surviving = Composite Rating Score	2-5
Moderate Probability of Tree Surviving = Composite Rating Score	6-10
Low Probability of Tree Surviving = Composite Rating Score	14-30

All Size Classes of Western Larch

High Probability of Tree Surviving = Composite Rating Score	3-6
Moderate Probability of Tree Surviving = Composite Rating Score	7-13
Low Probability of Tree Surviving = Composite Rating Score	14-17

Grand Fir and White Fir (Young and Immature Trees <30 in. DBH)

High Probability of Tree Surviving = Composite Rating Score	3-4
Moderate Probability of Tree Surviving = Composite Rating Score	5-10
Low Probability of Tree Surviving = Composite Rating Score	11-30

Grand Fir and White Fir (Mature and Overmature Trees >30 in. DBH)

High Probability of Tree Surviving = Composite Rating Score	2-12
Moderate Probability of Tree Surviving = Composite Rating Score	13-16
Low Probability of Tree Surviving = Composite Rating Score	17-21

Trees that are uncertain to survive, regardless of whether they die in the near future or live for many more years, would be a source of future snag recruitment. This situation would prolong the time period that snags are available for wildlife habitat. Additional tree mortality might occur after marking, but prior to the salvage timber harvest. If the additional mortality is in excess of snag requirements, it is acceptable to remove it.

MARKING PROCEDURE

1. Determine the number of snags and wildlife clumps needed for the unit being marked. Consult the proposed harvest unit data table to determine acres, number of snags >21 inch DBH, and number of clumps to be left. Also, determine the score from part A of the survival guidelines that would apply to all trees being considered in the unit.

2. Direction will be provided on using orange (leave tree) or blue (cut tree) marking paint to designate trees for retention or removal in each unit. For units with leave-tree marking, all merchantable trees that are not marked with orange paint are designated for removal. For units with cut-tree marking, all merchantable trees that are marked with blue paint are designated for removal. Merchantability standards are ≥9 inches DBH for all species on forwarder and skyline units. Merchantability standards for helicopter units are ≥11 inches DBH for pine, and ≥9 inches DBH for all other species.

3. In general, salvage units with greater than 50 percent mortality of merchantable size trees would be marked for leave trees (orange paint); units with less than 50 percent mortality of merchantable size trees would be marked for cut trees (blue paint). For either situation, mark a band at DBH encircling the entire tree for visibility from any angle. Put a butt mark on the uphill and downhill side of the tree, ensuring that some paint gets into bark crevices for implementation monitoring by sale administrators.

4. Use the laminated copies of the survival guidelines (from Scott et al. 2002, as amended), which were issued to each marking crew member prior to any marking activities, when evaluating any of the tree species included in the guidelines. Work through the two parts of the survival guidelines consecutively (first part A, and then part B), choosing the appropriate numerical rating value given in parentheses next to each factor.

5. Use grease pencils to rate individual trees until the guidelines become familiar. When marking, carry the laminated copy of the survival guidelines at all times to ensure their consistent application.

6. The “Scoring Guide for Rating Tree Survival for the School Fire” in the Predicting Tree Survival section shows how the composite rating score will be interpreted as a survival probability rating (low, moderate or high). Then use the following criteria to make a final determination about whether the tree is expected to survive over the next few years.
   a. If the rating score falls within the **High Probability to Survive** range, the tree should be marked for retention.

b. If the rating score falls within the **Low Probability to Survive** range, the tree should be marked for removal if it is not needed for wildlife habitat or for protecting ephemeral draws.

c. If the rating score falls within the **Moderate Probability to Survive** range, chop into the tree bark to check for dead cambium. The chopping should be done on four sides (faces) of the tree and in the interstices between major lateral roots at the root crown or root-collar region, where basal cambium is afforded greater protection from heat generated by smoldering duff.

   d. If dead cambium equals or exceeds 75% (either 3 or 4 of the 4 faces), it is very likely to die and should be marked for removal if it is not needed for wildlife habitat or for protecting ephemeral draws.

   e. If dead cambium is 50% (2 of the 4 faces), the tree should be marked for retention.

   f. If dead cambium is less than 50% (either 0 or 1 of the 4 faces), it is likely to live and should be marked for retention.

   Note: *If the numerical rating score falls in the gaps between the above categories, then assume the following:*

   - *If it is between the low and moderate probability to survive categories, use the low category,*
   - *If it is between the high and moderate probability to survive categories, use the high category.*

The marking procedure was demonstrated by the senior author of the Scott Guidelines (Don Scott) during marking crew training sessions conducted on November 2, 2005 and January 26, 2006 at the Pomeroy Ranger District (see Scott 2005, 2006 for memoranda describing these trainings).

7. Riparian Habitat Conservation Area (RHCA) delineations for the project area are based on stream-class and fish-occupancy records for the Umatilla National Forest. When located adjacent to proposed harvest units, the RHCAs have been excluded from the units by using boundary flagging, tags, and marking paint. RHCA design features are found in table 2-3 on page 2-10 of the School Fire Salvage Recovery Project DEIS. No tree marking will occur in the RHCAs.

8. Determine if the unit is likely to have an ephemeral riparian draw to be buffered, and its probable location, by using topographical maps. If an ephemeral buffer is needed, designate all merchantable sized trees (black and green) for retention, 25 feet slope distance on either side of the defining draw conditions as described by the project hydrologist.

9. Tally the number of trees larger than 9 inches DBH by live and dead categories (including trees predicted to die using the survival guidelines) and by size classes: 9-21 inches DBH, and greater than 21 inches DBH. Snags greater than 21 inches DBH, in excess of 3 per acre in the ephemeral-draw buffer zones, may substitute for other non-buffer-zone acres within the unit. Ephemeral buffers may count toward the number of wildlife snag clumps requirement, providing they are between 1 and 3 acres in size.

10. Locate the necessary number of wildlife snag clumps needed within each unit, leaving a total of 1 to 3 acres for each 15 acres in the unit, and designate all trees within each clump for retention. Tally the number of trees by live and dead categories (including trees predicted to die using the survival guidelines) and by size classes: 9-21 inches DBH, and greater than 21 inches DBH. Snags greater than 21 inches DBH, in excess of 3 per acre in the clumps, may substitute for other non-clump acres within the unit.

11. Cover the remainder of the unit, designating all trees predicted to survive and additional snags greater than 21 inches DBH as required. Distribute the snags across the unit, leaving no areas larger than approximately three acres devoid of snags. If no snags greater than 21 inches DBH are present, then leave the next largest size class.

12. Spacing of multiple diameter snags would be preferable to just retaining large-diameter snags in one limited area. Tally the number of trees by live and dead categories (including trees predicted to die using the survival guidelines) and by size classes: 9-21 inches DBH, and greater than 21 inches DBH.

School Fire Salvage Recovery
Implementation/Marking Guides
Danger Trees

The purpose of these marking guides is to implement danger tree prescriptions for the School Fire Salvage Recovery project. One of the underlying needs of the project is to improve public safety for visitors within the project area by reducing hazards associated with danger trees in areas where they travel and recreate. The objective of these prescriptions is to identify and remove trees in those areas which pose a potential hazard. The majority of these trees have been damaged or killed by the School Fire.

A DANGER TREE...
...is any tree that is hazardous to people or facilities because of:
- ***location***
- ***lean***
- ***physical damage***
- ***overhead hazards***
- ***deterioration of limbs, stem or root system***
- ***a combination of the above.***

Chapter 2 of the Final Environmental Impact Statement

Danger Tree Removal – Danger trees would be felled along all haul routes used for timber sale activity (regardless of Class) other designated Class 3, 4, and 5 Forest roads, in developed recreation sites (Boundary, Alder Thicket, Pataha, and Tucannon campgrounds; Rose Spring Sno Park; and Rose Spring and Stentz recreational residence areas), and in administrative sites (Tucannon Guard Station). Danger trees would be felled along an estimated 71 miles of road. Danger trees located within defined RHCAs would be cut and left to provide additional coarse woody debris. All other danger trees would be removed and sold as part of a salvage sale, if economically feasible.

A danger tree is defined as any standing tree that presents hazard to people due to conditions such as, but not limited to, deterioration or physical damage to the root system, trunk, stem, or limbs and the direction or lean of the tree. Along roadways, danger trees would be evaluated in accordance with the Field Guide for Danger Tree Identification and Response, Pacific Northwest Region, 2005. Danger trees in recreation sites and administrative sites would be evaluated in the context of Long Range Planning for Developed Sites in the Pacific Northwest: The Context of Hazard Tree Management, Pacific Northwest Region, 1992.

Along roadways trees that have an imminent or likely potential to fail and the trees potential failure zone includes an open Class 3 or higher system road, any road designated for hauling, would be felled. Trees that have an imminent potential to fail are so defective or rotten that it would take little effort to make them fail. Trees considered likely to fail include all dead trees and some live trees with specific diseases and/or damage. A tree's potential failure zone is the area that could be reached by any part of a failed tree. This is generally one and one-half tree lengths, but can vary depending on slope, tree height, lean, individual tree characteristics, and other factors (see Appendix B – Implementation/Marking Guides).

School Fire Salvage Recovery
Danger Tree Implementation
Marking Procedure
Roadside Salvage Units

1. Use blue paint (cut tree) to designate merchantable danger trees for removal which are 9 inch DBH and larger. Paint a band at DBH encircling the entire tree for visibility from any angle. Put a butt mark on the downhill side of the tree, ensuring that some paint gets into the crevices for tracking by sale administration. Only designate for harvest those trees that have some certainty of being feasible to yard to the roadside or appropriate landing.

2. Danger trees smaller than 9 inches DBH, those that cannot be yarded reasonably, those within Riparian Conservation Areas (RHCAs), and danger trees within the Willow Springs Inventoried Roadless area should be marked only with a blue spot at DBH facing the road. This method will designate danger trees which are to be cut and left on site.

3. Marking crews are to tally danger trees marked, which road segment they are located in and whether or not they are within an existing fire salvage Unit (specify Unit # in notes), RHCA or roadless area.

4. For roadside danger units consult the *Field Guide for Danger Tree Identification and Response*, Pacific Northwest Region, 2005. This guide was distributed during the training given by Rick Toupin, Diane Hildebrandt and Craig Schmidt held on 01/24-25/2006. Danger trees are to be marked for removal if they fall into the imminent or likely potential to fail categories and based on their potential failure zones they could reach a designated haul route, open system road (class 3 or higher), or other designated area. See the descriptions below.

Potential Failure Zone

The **potential failure zone** is the area that could be reached by any part of a failed tree. When a tree fails, the tree or its parts may strike other trees and cause them to fail as well. The parts may slide or roll. This is especially true in dead timber.

When determining the failure zone, the following conditions must be evaluated:

- Portion of tree that has a potential to fail.
- Ground slope.
- Amount and direction of lean.
- Height of tree.

Imminent
Identify tree defects and determine the tree's potential to fail.

A tree may have an **imminent potential to fail,** if it is so defective or rotten, that it would take little effort to make it fail during project implementation. It is much more apt to fail than those trees rated as likely to fail.
Trees with an imminent potential to fail include those that have the following conditions (1, Pgs. 35-65).
• Root sprung.
• Recent lean.
• Missing bole wood due to fire or damage.
• Significant heart or sap rot.
• Loose bark.
• Dwarf mistletoe bole swellings if they have decay that extends to an area **more than half** the bole diameter.
• Fungus cankers on the bole when the canker width is **more than half** the bole diameter.
• Dead tops with significant sap rot.

Likely
Identify tree defects and determine the tree's potential to fail.

A tree may have a **likely potential to fail** if any of the following conditions exist. (1, Pgs. 35-65). Appendix A contains a detailed listing of symptoms and indicators.
• Root diseased but still alive.
• Old lean.
• Undermined or severed roots but not severely.
• Some heart, butt, or sap rot.
• Cracks or structural defect associated with some decay.
• Dead tops with some heart or sap rot.
• Dwarf mistletoe bole swellings if they have decay that extends to an area less than **half** the bole diameter.
• Fungus cankers on the bole when the canker width is less than **half** the bole diameter.
• Forked tops and crotches associated with decay, cracks, splits, or callus ridges. Pitch or resin is not always associated with likely failure potential. Pitch is often a sign in a healthy tree when it is defending itself against pathogen or insect attack.
• Dead trees that are still sound.
• Fire damaged or killed trees that are still sound.
• Hardwoods with sap rot approaching half their diameter.

5. For this project danger trees that are fire damaged or killed will be those trees that have been damaged structurally (cat faces, burned roots, etc.), are dead, or are not likely to survive as defined below.

6. Most of the time it will not be difficult to determine if an individual tree in the School Fire Recovery Project area will be considered dead or dying. Dead trees can be identified by blackened boles and the absence of needles, crowns with all brown needles, or crowns with "fading" or "dry-appearing" off-color green needles throughout the crown. However, at times it will be more difficult to

determine the survivability of fire-injured trees with partially or completely green crowns. To determine which of these trees will survive use the "Rating Guide for Tree Survival for the School Fire Recovery Project" included below.

13. To identify trees within danger tree units that have a low or moderate probability to survive damage from the School Fire, use the laminated copies of the survival guidelines (Scott et al. 2002) issued to each marker for all species and for parts A and B. Determine the score from part A of the survival guidelines that will be common to all trees in the unit. Work through the two parts consecutively (A and B) choosing the appropriate rating value given in parentheses adjacent to each factor (as described by Don Scott during training on 11/02/2005). Use grease pencils to rate out individual trees until the guides become familiar. Carry the laminated guide sheets at all times when marking for consistency of application.

    a. If the rating score falls within the **High Probability to Survive** range, the tree should be retained.
    b. If the rating score falls within the **Low Probability to Survive** range, the tree should be designated for removal.
    c. If the rating score falls within the **Moderate Probability to Survive** range, chop into the tree bark to check for dead cambium. The chopping should be done on four sides (faces) of the tree and in the interstices between major lateral roots at the root crown or root-collar region, where basal cambium is afforded greater protection from heat generated by smoldering duff.
        d. If dead cambium equals or exceeds 75% (3 or 4 out of 4 faces) it is very likely to die and should be designated for removal.
        e. If dead cambium is 50% (2 out of 4 faces) the tree should be retained.
        f. If dead cambium is less than 50% (0 or 1 out of 4 faces) it is likely to live and should be retained.

        Note: *If the numerical rating score falls in the gaps between the above categories assume the following:*

        - *If it is between the low and moderate probability to survive use the low category,*
        - *If it is between the high and moderate probability to survive use the high category.*

APPENDIX K

Responses To Beschta And Others

VEGETATION

Many of the reports and articles mentioned by respondents apply to a wide variety of resources, topics or issues (aquatic ecosystems, terrestrial wildlife habitat, etc.); **any response provided below to these reports or articles is from the perspective of forest vegetation only**.

Science Criteria. The Eastside Screens are interim direction used to amend the Land and Resource Management Plans for every national forest located east of the Cascade Mountains in Oregon and Washington. The current version of the Eastside Screens is Regional Forester's Forest Plan Amendment #2 (USDA Forest Service 1995).

After the Eastside Screens were issued, the Pacific Northwest Regional Forester appointed an Eastside Screens Oversight Team (Norris 2005) and charged them with reviewing and monitoring Screens implementation. The team's objective was to ensure that the Eastside Screens were being applied consistently across all of the Eastside national forests.

The Oversight Team provided clarification and interpretation of the Eastside Screens by periodically reviewing sample projects on each national forest, producing a letter describing their findings, and then circulating the letter to other Eastside national forests as a "lessons learned" communication tool. These letters, which are signed by the Regional Forester or the Director of Natural Resources, are not considered advisory because they are used as administrative direction for Eastside Screens implementation.

The Eastside Screens has a requirement to consider "best available science" (item 4 in scenario A of the wildlife screen) and during Screens implementation, questions arose about how to interpret this phrase.

In response to the Colville National Forest's request for clarification about the "best available science" requirement, the Oversight Team produced an administrative policy letter stating that (Devlin 1998a):

> "Science of course means peer reviewed and published by credible sources, and does not include articles, comments, or input that is simply opinion or editorials by scientists. 'Expert opinion' can be helpful, but is not the same as 'new science'."

Although the criteria provided by the Oversight Team (Devlin 1998a) are not the only ones that could be used to identify "best available science," it is our judgment that:

(1) They are suitable for this purpose; and

(2) Using them for this purpose is consistent with administrative policy of the Pacific Northwest Region of the USDA Forest Service since at least 1998 (Devlin 1998a).

For these two reasons, the Devlin (1998a) science criteria will be used in this appendix to identify if reports and articles mentioned in comments to the School Fire Salvage Recovery Project are peer reviewed and published by credible sources, and whether they are articles, comments, or input considered to be opinion or editorials by scientists.

Beschta et al. Reports

The original Beschta Report (Beschta et al. 1995) was commissioned by Pacific Rivers Council. Apparently, it was neither peer-reviewed nor published in a credible source.

A similar version (Beschta et al. 2004) was subsequently published in a peer-reviewed journal called Conservation Biology. Since this version was peer reviewed and is available from a credible source, it is considered to have more scientific credibility than the original report.

Although the second Beschta report (Beschta et al. 2004) cited more literature than the first report to support the authors' points of view, it is considered to be an editorial or opinion piece.

One or both of the Beschta reports was mentioned by numerous respondents during public scoping or in response to the draft environmental impact statement. The Beschta report respondents generally advocated that natural recovery of burned landscapes, with little or no human intervention, is the optimal policy for public forests, and that this policy is supported by other literature such as American Lands Alliance (2005), DellaSala et al. (2006), Donato et al. (2006), Karr et al. (2004), Lindenmayer et al. (2004), and McIver and Starr (2000, 2001a).

The non-intervention respondents often stated that recovering economic value from dead trees is an inappropriate objective, particularly for public lands such as national forests, or that other values associated with dead trees (wildlife habitat, etc.) provide more net public benefit than revenue and related socioeconomic benefits (employment, income) derived from recovering the salvaged timber.

When US Forest Service research scientists reviewed the original Beschta report, they concluded that it was biased toward a custodial (hands off) approach (Everett 1995), and that it is generally accepted in the science community that limiting post-fire management to just a single approach (whether custodial or commodity) is inappropriate because forest sites encompass a wide range of variability, and this variability points to the need for site-specific plans addressing each salvage situation on a case-by-case basis (Everett 1995, McIver and Starr 2001b).

The Everett response (Everett 1995) to the original Beschta report (Beschta et al. 1995) was apparently not peer-reviewed or published in a credible source.

Relevance to the Forest Vegetation portion of the School Fire Salvage Recovery Project. We reviewed the Beschta Report (Beschta et al. 1995) and the Beschta journal article (Beschta et al. 2004). In our judgment, the School Fire Salvage Recovery Project includes an alternative that would react to the burned forest in a manner similar to what is recommended by Beschta et al. (1995, 2004) – the No Action alternative.

Specifically, the no action alternative would satisfy most or all of the Beschta et al. (1995, 2004) recommendations because it would not harvest trees in areas with steep slopes, sensitive soils, or severe fire intensity; it would not harvest trees in riparian areas; it would not build roads (whether temporary or permanent) to access harvest units; it would not harvest live trees (regardless of how tree mortality was determined); and it would not artificially regenerate (reforest) burned sites.

With these Beschta et al. (1995, 2004) limitations in place, most of the salvage timber harvest units in the proposed action (alternative B) would not be available for harvest, which means that the purpose and need for economic recovery of dead and dying trees would not be achieved.

A lack of agreement between the Beschta et al. (1995, 2004) recommendations and the School Fire Salvage Recovery Project proposed action is not surprising because the Beschta reports address ecosystem restoration goals, while the School Fire Salvage Recovery Project focuses on recovery of economic value.

American Lands Alliance "After the Fires" Report

The objective of the American Lands Alliance (ALA) report (American Lands Alliance 2005) is to "raise awareness among policy makers about the short- and long-term adverse ecological and economic impacts of post-fire logging." It draws extensively from the recent Beschta et al. (2004) article in Conservation Biology.

The ALA report provides an extensive list of individuals and organizations that helped to produce it. However, the ALA report does not appear to be peer-reviewed (or credit for peer review was not claimed) and it was not published in a credible source. The American Lands Alliance "After the Fires" report is considered to be an editorial or opinion piece.

The United States Forest Service prepared a response to the ALA report. It concluded that "ALA makes highly selective use of the scientific information that addresses this complex topic [logging after fires], ignores the legal mandates placed on the agency by Congress, and downplays the effects of inaction on public forests and local communities" (USDA Forest Service 2005).

The US Forest Service response to the ALA report was apparently not peer-reviewed or published in a credible source.

We reviewed the ALA "after the fires" report and the US Forest Service response to it. In our judgment, the School Fire Salvage Recovery Project includes an alternative that would react to the burned forest in a manner similar to what is recommended by the American Lands Alliance (2005) – the No Action alternative.

Our discussion about the Beschta et al. (1995, 2004) reports and their relevance to the School Fire Salvage Recovery Project, specifically the No Action alternative, also pertains to the ALA report, and it is incorporated here by reference.

McIver and Starr Salvage Logging Literature Synthesis and Review

The McIver and Starr report is entitled "Environmental effects of post-fire logging: literature review and annotated bibliography" (McIver and Starr 2000). The acknowledgments section of this report indicates that it was peer reviewed before being published by the Pacific Northwest Research Station in Portland, Oregon.

Results from the original General Technical Report (McIver and Starr 2000) were also reported in a peer-reviewed journal called the Western Journal of Applied Forestry (McIver and Starr 2001a), and this journal is a credible source.

The McIver and Starr report reviews the existing body of scientific literature about logging (timber harvest) following wildfire. Twenty-one post-fire logging studies were reviewed and interpreted. McIver and Starr concluded that while the practice of salvage logging after fires is controversial, the debate is conducted without the benefit of much scientific information (McIver and Starr 2000, 2001a).

They also concluded that the immediate environmental effects of post-fire logging are extremely variable and dependent on a wide variety of factors such as fire severity, slope steepness, soil texture and composition, the presence of preexisting roads, construction of new roads, timber harvest systems, and post-fire weather conditions (McIver and Starr 2000, 2001a).

Relevance to the Forest Vegetation portion of the School Fire Salvage Recovery Project. The McIver and Starr literature synthesis identified 21 studies worldwide that examined the environmental effects of post-fire salvage harvest (McIver and Starr 2000, 2001a).

Only 14 of the 21 studies included an unharvested control, which allows the effect of timber harvest to be isolated from unharvested areas with similar site conditions. Only 7 of the 14 studies with unharvested controls were replicated, which allows inferences from one study to be extrapolated or generalized to other areas with similar biophysical conditions (McIver and Starr 2000, 2001a).

Although 14 controlled studies might seem like an acceptable number, it is actually not very many when considering the extensive variability of site and ecosystem conditions exposed to salvage logging, particularly since the McIver and Starr report considered literature from around the world.

It is our judgment that any of the McIver and Starr salvage studies from areas outside the interior Pacific Northwest, the geographical region of the western United States containing the School Fire area, are likely to include site and ecosystem conditions differing from those found in the School Fire area.

Of the 14 primary studies with unharvested controls, seven of them do not apply to the School Fire area because they were conducted in geographical areas outside the interior Pacific Northwest: two studies from Australia, one study from Israel, and United States studies from central California, northwestern Wyoming, northern Arizona, and northwestern (coastal) California.

Because scientific information about salvage harvest was so sketchy, particularly for the geographic scope of their review ("the dry forested intermountain West"), McIver and Starr argued for the use of adaptive management techniques to monitor the effects of salvage logging, and to use monitoring results to adjust site-specific practices and prescriptions accordingly (McIver and Starr 2001a).

We reviewed the McIver and Starr report (McIver and Starr 2000) and its associated journal article (McIver and Starr 2001a). In our judgment, the McIver and Starr literature synthesis findings do not adopt a definitive position with respect to the suitability (or unsuitability) of salvage timber harvest as an activity for recovering economic value from dead and dying trees, so it is difficult to judge their relevance to the purpose and need for the School Fire Salvage Recovery Project.

Much of the salvage logging literature considered by McIver and Starr (2000, 2001a) is rather dated and was based on older techniques, equipment and silvicultural prescriptions. Of the 14 primary studies with unharvested controls, only seven of them are relevant to the School Fire area and the dates for these studies range from 1970 to 1997. Note that four of the seven relevant studies were replicated experiments and the other three were unreplicated experiments or modeling studies.

We are aware of little or no research examining the effects of salvage timber harvest in the context of contemporary techniques, equipment and prescriptions. For this reason, it is likely that some aspects of the McIver and Starr literature synthesis are not relevant to the School Fire Salvage Recovery Project.

ICBEMP Scientific Assessment for Ecosystem Management

At least one respondent to the School Fire Salvage Recovery Project scoping activity mentioned that salvage logging is not compatible with ecosystem management (specifically, the comment referred to a section on page 178 in Quigley et al. (1996) called "Can salvage timber sales be compatible with ecosystem-based management?").

The acknowledgments section of this Interior Columbia Basin Ecosystem Management Project (ICBEMP) report indicates that it was peer reviewed before being published by the Pacific Northwest Research Station in Portland, Oregon.

The ICBEMP scientific assessment section referred to in this comment deals primarily with removal of large-diameter trees, and it is discussed in the context of the "Taylor Salvage Rider" bill passed by the US Congress in 1995 (PL 104-19). Note that the Taylor Salvage Rider legislation is no longer in effect.

The section referenced above concludes that "ecosystem-based management would emphasize removing smaller green trees with greater attention to prevention of mortality rather than removal of large dead trees."

Relevance to the Forest Vegetation portion of the School Fire Salvage Recovery Project. We reviewed the ICBEMP salvage timber sales section (Quigley et al. 1996) referenced by the respondent. In our judgment, this section is not relevant to the School Fire Salvage Recovery Project for four reasons:

1. The purpose and need for the salvage timber harvest component of the School Fire Salvage Recovery Project does not include "ecosystem-based management" objectives;
2. The proposed action for the School Fire Salvage Recovery Project does not include any removal of smaller green trees, as was recommended by the ICBEMP salvage section;
3. The School Fire Salvage Recovery Project proposes to remove a range of tree diameters involving trees that are exclusively dead or dying, rather than emphasizing larger trees, "both green and recent dead," of economically desirable species (as is mentioned in the ICBEMP section);
4. The School Fire Salvage Recovery Project is not formulated or proposed in the context of the Taylor Salvage Law (PL 104-19), and most of the ICBEMP discussion deals with provisions or implementation characteristics associated with the Taylor salvage bill.

Donato et al. Article

On January 5, 2006, a short article was published in Sciencexpress, an on-line affiliate of a print journal called Science, with this title: "Post-Wildfire Logging Hinders Regeneration and Increases Fire Risk." The same or a slightly modified version was subsequently published as a single-page article in the full journal (Science) on January 20, 2006 (Donato et al. 2006a, 2006b).

Although this article was very small (one page only), it received widespread publicity in both large and small newspapers, and on National Public Radio, after being carried by the Scripps Howard News Service and the Associated Press (Stokstad 2006).

The Donato article (Donato et al. 2006a, 2006b) was published in a peer-reviewed journal and is available from a credible source.

An analysis of the Donato methodology indicates that there might be serious flaws with the study and its design, including the statistical analysis of data (Baird 2006). The Baird (2006) analysis was apparently not peer-reviewed or published in a credible source (although it was apparently submitted to Science to be considered as a peer-reviewed rebuttal to the original Donato et al. article).

The Donato et al. article (2006a, 2006b) presents preliminary results from a post-fire study conducted in the 2002 Biscuit Fire area of southwestern Oregon. It concluded "that postfire logging, by removing naturally seeded conifers and increasing surface fuel loads, can be counterproductive to goals of forest regeneration and fuel reduction."

This conclusion was based on an examination of early conifer regeneration and fuel loadings, and it used a spatially nested sampling design of both logged and unlogged plots replicated across a portion of the Biscuit Fire area.

Relevance to the Forest Vegetation portion of the School Fire Salvage Recovery Project. We reviewed the Donato et al. (2006a, 2006b) article and believe it is relevant to the School Fire Salvage Recovery Project in at least two respects:

1. **1.** The School Fire action alternatives (alternatives B and C) include artificial regeneration (tree planting) for all areas that would be affected by the salvage timber harvest activity. The Donato study showed that postfire logging reduced natural regeneration by 71% (Donato et al. 2006a, 2006b), so the tree planting portion of the School Fire proposed action would help mitigate for any salvage-caused loss of naturally regenerated seedlings.
2. **2.** As described in the Regeneration Analysis for the School Fire (appendix D), many of the regeneration areas are considered to be at high risk of complete tree loss if another fire occurs in the next 10-30 years, primarily because of uncharacteristically high fuel loads created by the School Fire (Martin 2006). The risk of a future reburn is one reason for reducing large fuels in the School Fire area, and salvage timber harvest is a proposed activity for reducing large fuels.

Findings from the Donato et al. (2006a, 2006b) article are not relevant to the School Fire Salvage Recovery Project in one important respect: the Biscuit Fire burned in 2002 and the salvage harvest occurred in 2005, and this time separation between the fire and the salvage harvest activity is longer than what is proposed for the School Fire Salvage Recovery Project.

Because the Donato article lacks specifics about when the salvage harvest occurred, it is not definitively known how many growing seasons occurred between the fire and the salvage harvest activity. If it is assumed that three growing seasons occurred between these events, then the finding about salvage logging causing a 71% reduction in natural regeneration is not unexpected because:

1. **1.** If post-fire weather conditions were conducive to germination of tree seeds, and if tree seeds were actually present, then we would expect some amount of natural tree regeneration to be established by three growing seasons after the fire (and if tree seed sources were functional during the entire 3-year period, the seedling amounts present in year 3 were probably greater than those in year 2, and the seedling amounts present in year 2 were probably greater than those in year 1);
2. **2.** If post-fire weather conditions were conducive to establishment of natural tree regeneration, and if obvious amounts of natural regeneration became established by avoiding mortality from competing vegetation or animal herbivory, then we would expect salvage harvest to have a negative effect on tree seedlings because they are too small to be avoided by harvest equipment, and they are too vulnerable to survive harvest-caused damage.

As described earlier in this document, the proposed salvage timber harvest activity is expected to occur during the first growing season following the School Fire, although some of it is also expected to occur during the second growing season.

Since the time interval between the School Fire and the proposed salvage harvest is shorter than for the Donato study, it is our judgment that the effect of salvage on natural regeneration would be less than what was reported by Donato because less natural regeneration is expected to be established by the first or second year after the fire than would be present if salvage occurred following the third growing season.

If the salvage timber harvest activity is implemented as proposed, thereby removing a reasonable proportion of the large-fuel component from affected areas, and if the associated small-fuel treatments are completed as proposed (see Martin 2006), then it is our judgment that regenerated stands (both natural and planted) would survive a future reburn to an extent that replanting would not be necessary to meet Forest Plan minimum stocking levels (table 1-2) (USDA Forest Service 1990a).

Lindenmayer et al. Salvage Harvest Article

The journal Science published a one-page article about salvage harvest on February 27, 2004 (Lindenmayer et al. 2004). Its position is that (1) salvage harvest undermines the ecosystem benefits of major disturbances; (2) removing biological legacies (large wood) can negatively affect many taxa; (3) salvage harvest can impair ecosystem recovery; and (4) some taxa might be maladapted to the interactive effects of two disturbance events in rapid succession (fire and salvage logging).

The Lindenmayer article (Lindenmayer et al. 2004) was published in a peer-reviewed journal and is readily available from a credible source. It is considered to be an editorial or opinion piece.

We reviewed the Lindenmayer et al. (2004) article. In our judgment, the School Fire Salvage Recovery Project includes an alternative that would respond to the burned forest in a manner similar to what is recommended by Lindenmayer et al. (2004) – the No Action alternative.

Our discussion about the Beschta et al. (1995, 2004) reports and their relevance to the School Fire Salvage Recovery Project, specifically the No Action alternative, also pertains to the Lindenmayer et al. (2004) article, and it is incorporated here by reference.

Society for Conservation Biology Scientific Panel Report

The Society for Conservation Biology published a white paper or report reviewing ecological science pertaining to fire management policies for western United States forests on February 24, 2006 (Noss et al. 2006).

The Society for Conservation Biology report (Noss et al. 2006) was apparently not peer reviewed (or credit for peer review was not claimed) and it was not published in a scientific journal or in another credible source.

The Society for Conservation Biology report is considered to be an editorial or opinion piece. This conclusion is based partially on the fact that no literature citations are provided for any of the key findings (or for any other statement or conclusion in the report), and the report does not include a “literature cited” section. These omissions make it more difficult for the reader to determine whether key findings and other statements are based on scientific literature, and to judge the veracity of key findings.

This report offers one or more “key findings” for each of the following primary topic or issue areas: (1) variable effects of fire exclusion, logging, livestock grazing, and plantations; (2) forests characterized by high-severity fires; (3) forests characterized by mixed-severity fires; (4) forests characterized by low-severity fires; (5) priorities and principles of ecologically-based forest restoration; (6) protected areas are essential for managing fire for ecological diversity; (7) management activities during wildfire; and (8) forest management after wildfire.

We reviewed the Society for Conservation Biology report (Noss et al. 2006). In our judgment, this report includes one topic or issue area that obviously pertains to the School Fire Salvage Recovery Project: the “forest management after wildfire” topic. This topic includes 10 key findings, and each of them will be discussed individually.

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

   Response: although this key finding provides no explicit definition or criteria for what constitutes natural recovery, it is our judgment that the School Fire Salvage Recovery Project includes an alternative that would respond to the burned forest in a manner similar to what is reported here: the No Action alternative. The No Action alternative adopts a passive management approach emphasizing natural recovery of burned landscapes and little or no human interaction with ecosystem recovery processes.

2. 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.

   Response: although this key finding provides no explicit definition or criteria for what constitutes ecological recovery, it is our judgment that the School Fire Salvage Recovery Project includes an alternative that would respond to the burned forest in a manner similar to what is reported here: the No Action alternative. Since the No Action alternative adopts a passive management approach emphasizing natural recovery of burned landscapes, it responds to the philosophy that removal of dead trees (using salvage timber harvest) makes an unfortunate situation even worse (Beschta et al. 1995, 2004).

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

   Response: this finding is similar to one of the two primary conclusions of the Donato et al. (2006) study, which is discussed earlier in this section. The School Fire action alternatives (alternatives B and C) include tree planting for all areas that would be affected by the salvage timber harvest activity. It is our judgment that this tree planting activity would help mitigate for any salvage-caused loss of natural tree regeneration.

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

   Response: the School Fire Salvage Recovery Project fuels analysis shows that salvage timber harvest will contribute to fuel loads that warrant treatment after harvest, but this result is expected for some of the salvage harvest units but not for all of them. When post-salvage fuel loads are predicted to exceed Forest Plan thresholds, then fuel treatments are proposed to reduce the salvage activity fuels to acceptable levels. This issue is addressed in more detail in the fuels analysis.

5. In forests subjected to severe fire and post-fire logging, streams and other aquatic ecosystems will take longer to return to historic conditions or may switch to a different (and often less desirable) state altogether.

   Response: this finding is beyond the scope of forest vegetation, so no response is offered. It is likely that this issue is addressed in the fisheries analysis.

6. Post-fire seeding of non-native plants generally damages natural ecological values, such as reducing the recovery of native plant cover and biodiversity, including tree regeneration.

   Response: this finding is beyond the scope of forest vegetation, so no response is offered. It is likely that this issue is addressed in the noxious weeds analysis.

7. Post-fire seeding of non-native plants is often ineffective at reducing soil erosion.

   Response: this finding is beyond the scope of forest vegetation, so no response is offered. It is likely that this issue is addressed in the noxious weeds and soils analyses.

8. 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-fire logging appear to be consistently negative.

   Response: it is our judgment that the School Fire Salvage Recovery Project includes a direct linkage between reforestation and post-fire salvage harvest, and this linkage is mandatory because Forest Service policy is that the National Forest Management Act requires salvage harvest units to be reforested within 5 years of harvest (Goodman 2002). It is our judgment that the claim that "ecological impacts of post-fire logging appear to be consistently negative" is opinion, and that it is not supported by scientific literature or other evidence (and Noss et al. cite no scientific literature in support of this claim).

9. Accelerated reestablishment of extensive closed forest conditions after fire is usually not an appropriate objective on sites managed with a major ecological focus.

   Response: although this key finding provides no explicit definition or criteria for what constitutes "sites managed with a major ecological focus," it is our judgment that the School Fire Salvage Recovery Project includes ecologically appropriate regeneration recommendations (see table 1-3) because they vary by potential vegetation category (i.e., plant association group). Sites whose ecological temperature-moisture regime is hot or warm, and dry, have dramatically lower seedling density levels (in table 1-3) than sites with a cool or moist temperature-moisture regime. It is our judgment that varying the regeneration recommendations by plant association group, as has been done in table 1-3, will reduce the potential for "extensive closed forest" getting reestablished on sites where it is an ecologically inappropriate condition (and closed forest is ecologically appropriate for some sites).

10. Where timber production, other societal management goals, or special ecological needs are the focus, planting or seeding some native trees and other plants using local seed sources may be appropriate.

    Response: Forest Service policy is that the National Forest Management Act has established a legal requirement to reforest salvage harvest units within 5 years of harvest (Goodman 2002). If natural tree regeneration is predicted to be insufficient or ineffective at meeting this legal requirement, then tree planting (artificial tree regeneration) is proposed in the School Fire Salvage Recovery Project. The rationale for natural and artificial regeneration assumptions is provided in the Regeneration Analysis for the School Fire (appendix D of this document). Tree seedlings and other native plant materials are always produced from local seed sources.

Logging and Forest Health (Insects and Diseases)

One respondent mentioned that salvage timber harvest (or any logging for that matter) should not be used as justification for reducing insect and disease effects in timber stands. This comment also asked that we consider the large body of research indicating that logging, roads and other human-caused disturbance promotes the spread of tree diseases and insect infestations.

Although not mentioned specifically in the comment, this sentiment is similar to what was embodied in a recent report called "Logging to control insects: the science and myths behind managing forest insect 'pests'" (Black 2005).

The Black report might have been peer-reviewed (as based on its acknowledgments section). It was not published in a scientific journal or similar source.

The United States Forest Service prepared a response to the Black report (USDA Forest Service 2006). It concluded that:

> "the Black report contains many examples of erroneous statements that are not even supported by the report's cited literature. Professional foresters and land managers will be able to see this deficit. Unfortunately, this report may be viewed by others as refuting hundreds of published papers on effectively managing forest insects and diseases, which it does not. It will be more unfortunate when a poorly written but popular document such as the Black report is used as supporting information during litigation. During any project analysis, such a document should be considered in the context of its biased authorship, limited credibility, and dubious scientific value. It is recommended that

> analysis teams refer directly to the appropriate refereed or peer-reviewed literature and site-specific data, rather than popular review reports such as this."

The US Forest Service response to the Black report was peer reviewed by professional entomologists and pathologists of the Pacific Northwest Region of the U.S. Forest Service. The Forest Service response to the Black report is not available to the wider scientific community from a credible science source such as a journal.

We reviewed the Black (2005) report. In our judgment, the School Fire Salvage Recovery Project appropriately considers "insect and disease damage" by using the Scott Guidelines to predict tree mortality (Scott et al. 2002, 2003), and the Scott Guidelines incorporate three insects or diseases as predisposing factors influencing post-fire tree mortality: dwarf mistletoe occurrence, root disease occurrence, and bark beetle pressure within or adjoining the fire area (Scott et al. 2002, 2003).

Using the Scott Guidelines for tree mortality estimation means that bark beetle activity in close proximity to the salvage harvest areas was considered as one criterion (in addition to outward indicators of first-order fire effects such as bark scorch, scorched or consumed foliage, and duff consumption at the tree base) when predicting tree mortality.

Comments About the Scott Guidelines

Several respondents to the School Fire Salvage Recovery Project commented that the project's basis for differentiating between dying and living trees is either questionable or untenable for scientific and other reasons. Often, these comments specifically addressed use of the Scott Guidelines (Scott et al. 2002, 2003), which is a protocol used to evaluate fire-injured trees and to predict their survival for up to one year after the fire (beyond one year after fire for mature or overmature ponderosa pine and grand fir or white fir).

The Scott Guidelines were apparently not peer-reviewed or published in a credible source.

Waring Report. One respondent provided a report (prepared by Richard Waring) describing an evaluation of the Scott Guidelines for the Easy and High Roberts salvage sales on the Malheur National Forest.

In this report, Waring concluded that using indirect indicators (such as the "crown and bole scorch" factors from the Scott Guidelines) to assess a tree's predisposition to fire-caused mortality is inappropriate, and that direct measurement of a tree's physiological processes (photosynthesis or transpiration) provides a better estimate of survival potential.

The Waring report was apparently not peer-reviewed or published in a credible source.

Waring's report contends that measurements of water stress, using either a pressure chamber (Waring and Cleary 1967) or by collecting increment cores and then analyzing the sapwood's relative water content (Waring and Running 1978), provides definitive estimates of tree health and survival potential.

We disagree with Waring's contention. Assessing the moisture status of fire-injured trees, such as measuring moisture stress with a pressure chamber (Waring and Cleary 1967) or by analyzing sapwood water content (Waring and Running 1978), indicates only that the tree's vascular system was functional when the measurement is taken. It provides no assurance that the tree's vascular system will continue to function in the future.

Ryan (2000) studied the effects of varying levels of fire-caused cambium injuries on the water relations of ponderosa pine, and he found that crown scorch and basal girdling had only minor effects on summer water relations.

He found that trees in the 100% basal-heating class, which experienced cambium kill over an average of 95% of the circumference at their base, had higher midday xylem pressure potentials (i.e., less stress) than non-girdled trees (Ryan 2000). This result was apparently due to phloem unloading that created a net water flow to the xylem tissue (Kozlowski 1992).

For the 100% basal-heating class, half of the trees died quickly and the other half were still alive at the end of the second growing season (two growing seasons was the length of the study period). The six surviving trees suffered no apparent decline in water relations despite the fact that three of them had basal girdling affecting 96% or more of their circumference.

If we assume that an extreme amount of basal girdling (96% or more of the circumference) will eventually result in tree death, then one possible conclusion from this study is that the ultimate effect of extreme basal girdling was not exhibited within two growing seasons of the injury (Ryan 2000).

Because mortality of basal-girdled trees can be delayed for several years (Agee 2003; Herman 1954; Kaufmann and Covington 2001; Kolb et al. 2001; McHugh and Kolb 2003; Ryan and Amman 1994, 1996; Sackett and Haase 1998; Swezy and Agee 1991; Thies et al. 2005, 2006; and Thomas and Agee 1986), and because the Scott Guidelines specifically address this basal-injury issue, it is our judgment that the Ryan (2000) study supports the Scott Guidelines as a physiologically appropriate protocol for predicting tree mortality.

Since the Ryan (2000) study also suggests that mortality of basal-girdled trees can be delayed for more than two growing seasons, it also refutes Waring's contention that a one-point-in-time measurement of water stress (i.e., Waring and Cleary 1967) provides a better methodology than the Scott Guidelines for differentiating between living and dying trees.

Relevance to the Forest Vegetation portion of the School Fire Salvage Recovery Project. In our judgment, it is appropriate that the School Fire Salvage Recovery Project adopted the Scott Guidelines to help predict which of the fire-affected trees might succumb to their injuries over a specific period of time (one year for all species and size classes except for mature and overmature ponderosa pine or grand fir and white fir, for which the time period is beyond one year after fire).

The decision to use the Scott Guidelines to predict tree mortality follows established administrative policy for the Pacific Northwest Region of the USDA Forest Service. Two administrative policy letters issued in 1998 (Devlin 1998a, 1998b) allow injured (dying) trees to be identified as dead if there is a professional determination that the trees will die within five years:

> "…dying trees can be counted as snags **if** there is a professional determination that the tree will definitely be dead within 5 years. Careful documentation is important. Trees that are weakened or defoliated from stress or disease, but which do not meet documented, professional criteria that they will definitely be dead in 5 years can not be counted as snags" (2430/2600 memo of September 10, 1998) (Devlin 1998a).
>
> "Rigorous application of a Forest Pest Management-written standard for identifying the level of infestation expected to be fatal, is sufficient to identify trees as dead. The standard should be included or referenced in the project planning documents" (2430/2600 memo of August 27, 1998) (Devlin 1998b).

It is our judgment that using the Scott Guidelines (Scott et al. 2002, 2003), which were prepared by professional entomologists and a pathologist in the field of Forest Health Protection (e.g., Forest Pest Management), to determine the probability of tree survival is a "professional determination" as defined by the Pacific Northwest Region (Devlin 1998a, 1998b).

Our judgment is supported by an administrative policy letter issued by the Pacific Northwest Regional Forester (Goodman 2005) in which she specifically referred to the Eastside Screens Oversight Team letters (Devlin 1998a, 1998b), and she further stated that:

> "These 'Scott' guidelines establish a scientific basis for determining the relative probability of post-fire tree survival. They describe conditions that result in tree death or will lead to delayed tree mortality and hence, implicitly define 'tree mortality.'"

It is our judgment that this administrative policy and direction means that:

(1) Administrative policy states that a "professional determination," defined as a Forest Pest Management-written standard, is sufficient to identify fire-injured trees as dead (Devlin 1998a, 1998b);

(2) The Regional Forester states that the Scott Guidelines are a scientific (professional) determination of tree survival (Goodman 2005);

(3) The Scott Guidelines were prepared by entomologists and a pathologist assigned to the Forest Health Protection group (this organization was previously called Forest Pest Management), so they qualify as a Forest Pest Management-written standard;

(4) In the context of the Eastside Screens amendment to the Forest Plan, delayed tree mortality identified using the Scott Guidelines is considered as dead trees (Devlin 1998a, 1998b; Goodman 2005);

(5) Although dead trees are used to meet the snag and down wood requirements, most of the Eastside Screens amendment applies to live trees only (Norris 2005, USDA Forest Service 1995);

(6) The Eastside Screens requirement in scenario A to "maintain all remnant late and old seral and/or structural live trees ≥ 21" DBH" (emphasis added) does not apply to dead trees; and

(7) The Eastside Screens do require that snags ≥ 21" DBH be maintained, but not necessarily all of them because snag retention is based on 100% potential population levels for primary cavity excavators.

It is our observation that using the Scott Guidelines for the School Fire Salvage Recovery Project is consistent with similar projects in the Pacific Northwest Region of the USDA Forest Service; the Scott Guidelines have recently been used with the Flagtail, Monument, High Roberts, and Easy fire salvage projects (Malheur National Forest); the B&B complex (Deschutes National Forest); and the Fischer fire (Okanogan-Wenatchee National Forests) (Scott 2005).

Critics of the Scott Guidelines contend that they overestimate tree mortality when compared with alternative tree mortality prediction models. Alternative models frequently mentioned by respondents to the School Fire Salvage Recovery Project are McHugh and Kolb (2003), Peterson and Arbaugh (1986), Ryan and Reinhardt (1988), Stephens and Finney (2002), and Thies et al. (2006).

In the context of the School Fire Salvage Recovery Project, we believe that the Scott Guidelines are more appropriate for predicting tree mortality than any of the alternative models individually. Our basis for this belief is that a comprehensive assessment of tree injury, and any associated prediction of fire-caused tree mortality, must consider the effect of fire injuries on the whole tree rather than just one or more of its parts (Connaughton 1936, Dieterich 1979, Fowler and Sieg 2004, Johnson and Miyanishi 2001, Lynch 1959, Regelbrugge and Conard 1993, Ryan 1990, Salman 1934, Wagener 1961, Weatherby et al. 2001).

As Jiminez (2004) observed: "*It is possible for a tree to survive if the cambial tissue is destroyed on only a portion of its circumference (Peterson and Arbaugh 1986, 1989, Peterson and Ryan 1986, Brown and DeByle 1987, Durcey et al. 1996, McHugh and Kolb 2003). But the combined effects of root, crown, and stem damage may kill a tree, even if the stem itself is not completely girdled (Ryan 2000, Dickinson and Johnson 2001, McHugh and Kolb 2003).*"

It is well established in the scientific literature that a comprehensive model of post-fire tree mortality should account for injuries to fine roots caused by smoldering combustion during duff consumption (e.g., Brown et al. 1991, Fowler and Sieg 2004, Hille and Stephens 2005, Johnson et al. 2001, Miller 2000, Miyanishi 2001, Miyanishi and Johnson 2002, Pyne et al. 1996, Ryan and Frandsen 1991, Stephens and Finney 2002, Swezy and Agee 1991, and others).

Cambial damage accompanying surface fire does not account for fine-root injury because surface fires are rarely of sufficient duration to cause this type of tree injury in the absence of smoldering combustion (Peterson and Ryan 1986).

Prescribed Fire Versus Wildfire. Some tree mortality prediction models have been developed using data from prescribed fires only (Scott et al. 2002). Since the School Fire was a wildfire, it might not be appropriate to use a mortality-prediction model based exclusively on prescribed fire effects.

A primary objective of prescribed fire is to modify the existing fuel loading of an area by igniting fire during weather conditions when fire behavior is expected to remain within designated parameters (Stratton 2004). The fire behavior parameters are designed to meet specific fire effects objectives such as minimizing unwanted tree mortality or unacceptable amounts of mineral soil exposure and associated erosion.

Fire effects are managed by selecting favorable weather conditions for prescribed fire. Prescribed fire is generally conducted under relatively benign weather conditions (e.g., 70° F. temperature, high relative humidity, low wind speeds, etc.) varying dramatically from late-summer conditions when the School Fire occurred (e.g., temperatures in the high 90s, low relative humidity, moderate or high wind speeds, etc.).

Unlike certain other regions of the country, prescribed fire in the Blue Mountains is typically implemented during time periods outside of the normal wildfire season (prescribed fire is implemented in April-May or October, whereas wildfire occurs in July-September). These timing differences provide another indication that prescribed fire differs from wildfire.

When comparing prescribed fire and wildfire, differing weather conditions produce differing fire behavior, which in turn produces differing fire effects. Since tree mortality prediction relies on some combination of fire effects (to the crown, stem and roots), the comparatively narrow range of fire effects for prescribed fire could limit a model's applicability for the broad range of fire effects associated with late-summer wildfires (Bevins 1980).

Because the School Fire was a late-summer wildfire with fire effects exceeding those typically produced by prescribed fire, it is our judgment that a tree mortality prediction model developed exclusively from prescribed fire data is not appropriate for use with the School Fire.

Our rationale for selecting the Scott Guidelines for use with the School Fire Salvage Recovery Project, rather than one or more of the suggested alternatives (McHugh and Kolb 2003, Peterson and Arbaugh 1986, Ryan and Reinhardt 1988, Stephens and Finney 2002, and Thies et al. 2006), is explained below.

1. The McHugh and Kolb (2003) model was developed using data from three wildfires in northern Arizona. It includes one conifer species (ponderosa pine) and it relates predicted tree mortality to two fire effects: total crown damage (scorch plus consumption), and bole char severity.

   It is our judgment that the McHugh and Kolb (2003) model is inappropriate for use with the School Fire Salvage Recovery Project for four reasons (table F-1):

   a. Its geographical scope is limited (northern Arizona);

   b. It assesses the crown and stem systems only (no direct consideration of the root system);

   c. Its tree species coverage is limited (ponderosa pine only); and

d. It lacks a measure addressing fine-root damage or basal stem girdling at the root crown (Ryan and Frandsen 1991).

2. The Peterson and Arbaugh (1986) model was based on tree survival patterns after late-summer wildfires in the northern Rocky Mountains. It includes two conifer species (Douglas-fir and lodgepole pine) and it relates predicted tree mortality to a wide variety of tree characteristics and fire effects: tree diameter, tree height, crown diameter and ratio, bark thickness, scorch height, crown scorch volume, basal scorch, bark char, and insect damage.

Although the variety of predictive factors included with this model is impressive, it is our judgment that the Peterson and Arbaugh (1986) model is inappropriate for use with the School Fire Salvage Recovery Project for three reasons (table F-1):

a. Its geographical scope is limited (northern Rocky Mountains of Montana, northwestern Wyoming, and Idaho);

b. It assesses the crown and stem systems only (no direct consideration of the root system); and

c. Its tree species coverage is limited (Douglas-fir and lodgepole pine only).

3. The Ryan and Reinhardt (1988) model was developed to predict tree mortality following prescribed fires in Idaho, Montana, Oregon and Washington. It includes seven conifer species and it relates predicted tree mortality to two factors: bark thickness, and crown volume killed by fire.

Several fire effects and fire behavior computer software applications have adopted the Ryan and Reinhardt (1988) model to predict post-fire tree mortality, thus making it widely available to fire analysts. It has been used to predict tree mortality in applications such as the "First Order Fire Effects Model" (FOFEM) (Reinhardt et al. 1997) and "BehavePlus" (Andrews and Bevins 1999).

The Ryan and Reinhardt (1988) equations are based on the assumption that differences in fire-caused tree mortality can be accounted for primarily by differences in bark thickness and the proportion of tree crown killed (Reinhardt et al. 1997). This model mainly addresses first-order fire effects – those occurring as a direct result of the fire combustion process (Reinhardt et al. 2001).

The authors of the Scott Guidelines used the Ryan and Reinhardt (1988) model when developing their rating procedure, in addition to other models and criteria that better account for the totality of fire effects (including root damage). It is well established that accurate predictions of tree mortality should account for injuries to all of the primary physiological systems of a tree: the crown, stem and roots (e.g., Fowler and Sieg 2004, Johnson and Miyanishi 2001, Ryan 1990, Wagener 1961).

It is our judgment that the Ryan and Reinhardt (1988) model is inappropriate for use with the School Fire Salvage Recovery Project for three reasons (table F-1):

(1) Its geographical scope is limited because the Oregon data came from the western or northern Cascade Mountains, or from the southwestern portion of the state near Medford;

(2) It assesses the crown and stem systems only, whereas the Scott Guidelines account for injuries to all three physiological systems (crown, stem, and roots) (Ryan and Frandsen 1991); and

(3) It was developed using prescribed fire data (see discussion above about the differences between prescribed fire and wildfire).

4. The Stephens and Finney (2002) model was developed to predict tree mortality following prescribed fire in the southern Sierra Nevada Mountains of California. It includes five conifer species and it relates predicted tree mortality to four factors: tree diameter, percent crown volume scorched, forest floor (duff) consumption, and crown scorch height.

It is our judgment that the Stephens and Finney (2002) model is inappropriate for use with the School Fire Salvage Recovery Project for three reasons (table F-1):

a. Its geographical scope is limited (southern Sierra Nevada Mountains);

b. Its tree species coverage is limited (of the five conifers included in this model, only ponderosa pine occurs in the School Fire area); and

c. It was developed using prescribed fire data (see discussion above about the differences between prescribed fire and wildfire).

5. The Thies et al. (2006) model was developed to predict tree mortality following prescribed fire in the southern Blue Mountains of northeastern Oregon. It includes one tree species (ponderosa pine) and it relates predicted tree mortality to five factors: live crown proportion, needle scorch proportion, bud kill proportion, basal char severe, and bole scorch proportion.

The size class variation for trees included in this study is quite limited due to similar stand replicates: pre-treatment tree diameter at breast-height (DBH) for control units averaged 28.4 cm (11.2 inches), and the diameters for trees in the fall and spring burning treatments averaged 26.6 cm (10.5 inches) and 27.4 cm (10.8 inches), respectively.

The authors of this study also caution about extrapolating its results, and using its mathematical models, beyond the geographical area of the sampled stands or with tree species other than ponderosa pine, until datasets are produced to validate the models for other geographical areas or tree species.

It is our judgment that the Thies et al. (2006) model is inappropriate for use with the School Fire Salvage Recovery Project for six reasons (table K-1):

(1) Its geographical scope is limited (a specific set of sampled stands in the southern Blue Mountains);

(2) Its ecological scope is limited (sampled stands are in the ponderosa pine potential vegetation series, and only 1.6% of the School Fire area is included in this series; see table B-1);

(3) Its tree species coverage is limited (ponderosa pine only);

(4) The tree-size variation included in the model-development dataset (a range of 10.5 to 11.2 inches average stand diameter across all replicates) is limited when compared with tree-size variation encountered in the School Fire area;

(5) It assesses the crown and stem systems only (no direct consideration of the root system); and

(6) It was developed using prescribed fire data (see discussion above about the differences between prescribed fire and wildfire).

Summary: The Scott Guidelines provide a methodology for predicting the relative probability of survival for fire-injured trees growing on a wide variety of site conditions, exposed to varying levels of pre-fire factors that can predispose a tree to fire-induced mortality depending upon their severity or magnitude (occurrence of dwarf mistletoe, root disease, and bark beetles), and experiencing widely varying levels of first-order fire effects to their crowns, stems and roots.

The possible combinations of these factors are almost limitless, leading inevitably to a decision to develop a prediction system relating site and tree factors (explanatory variables) to some type of probabilistic estimate of tree mortality. This regression or modeling approach is commonly used in science, particularly for complex situations such as wildland ecosystems (Rubinfeld 2000).

Since it is not possible to account for every combination of variables that could potentially result in tree death, there will always be some amount of uncertainty associated with a probabilistic rating system such as the Scott Guidelines.

This same statement about uncertainty applies to the alternative modeling approaches suggested by Dr. Royce and other respondents to the School Fire Salvage Recovery Project (i.e., McHugh and Kolb 2003, Peterson and Arbaugh 1986, Ryan and Reinhardt 1988, Stephens and Finney 2002, and Thies et al. 2006) because they provide an estimate (prediction) of tree mortality or tree survival, not an absolute or definitive determination

Table K-1. Comparison of Post-Fire Tree Mortality Models.

	McHugh and Kolb (2003)	**Peterson and Arbaugh (1986)**	**Ryan and Reinhardt (1988)**	**Scott et al. (2002, 2003)**	**Stephens and Finney (2002)**	**Thies et al. (2006)**
Geographical area included	Northern Arizona	Idaho, Montana, northwestern Wyoming	Idaho, Montana, western and southwestern Oregon, Washington	Northeastern Oregon (Blue and Wallowa Mountains)	Central California (Sequoia NP)	Northeastern Oregon (southern Blue Mountains)
Tree species included	Ponderosa pine	Douglas-fir Lodgepole pine	Douglas-fir Western larch Engelmann spruce Lodgepole pine Subalpine fir Western red cedar Western hemlock	Ponderosa pine Douglas-fir Engelmann spruce Lodgepole pine Western larch Grand/white fir Subalpine fir Western white pine	White fir Sugar pine Ponderosa pine Incense cedar Giant sequoia	Ponderosa pine
Fire type used for model development	Wildfire (spring, early summer, late summer)	Wildfire (late summer)	Prescribed fire (May through October)	Wildfire (mid to late summer)	Prescribed fire (fall)	Prescribed fire (spring and fall)

	McHugh and Kolb (2003)	**Peterson and Arbaugh (1986)**	**Ryan and Reinhardt (1988)**	**Scott et al. (2002, 2003)**	**Stephens and Finney (2002)**	**Thies et al. (2006)**
Tree mortality prediction factors or variables used	Crown damage Bole char severity	Crown scorch Basal scorch Bark char ratio Bark thickness Insect damage	Crown volume killed Bark thickness	Season of fire Pre-fire vigor, growth rate, site quality Down woody material Dwarf mistletoe occurrence Root disease occurrence Bark beetle pressure Crown volume scorch Bole scorch/char Total scorch height Duff consumption Bole/root char at ground surface	DBH Percent crown volume scorched Duff consumption Crown scorch height	Live crown proportion Needle scorch proportion Bud kill proportion Basal char severe Bole scorch proportion
Tree physiological systems included	Crown Stem/bole	Crown Stem/bole	Crown Stem/bole	Crown Stem/bole Roots	Crown Stem/bole Roots	Crown Stem/bole
Considers insect or disease agents	No	Yes	No	Yes	No	No
Other comments			Widely used for fire effects modeling (FOFEM, BehavePlus, etc.)			Tree-size variation included in study replicates was very narrow

Sources: McHugh and Kolb (2003), Peterson and Arbaugh (1986), Ryan and Reinhardt (1988), Scott et al. (2002, 2003), Stephens and Finney (2002), and Thies et al. (2006).

HYDROLOGY/WATER QUALITY

Beschta et al. Reports 1995, 2004

Relevance to the Hydrologic Analysis. Both the 1995 and 2004 documents were reviewed. Concerns were expressed regarding the sensitivity of riparian areas and recovery rates of stream ecosystems from fire effects, including providing for structural components for their recovery. Design features (Chapter 2, Table 2-3) for the proposed alternatives include designation of PACFISH RHCAs which provide protection to near channel areas by precluding harvest. Existing structural components would remain available to stream ecosystems and recovery rates would not be slowed. Other design features and BMPs have been identified to control and minimize effects of proposed actions, including temporary road construction and road use.

Everett, R. 1995, Memorandum to John Lowe, Review of Beschta Document.

Relevance to the Hydrologic Analysis. Dr. Everett states that some studies have shown increased soil disturbance and erosion following post fire logging. He cites literature that was reviewed, and in one case cited (Klock, 1975) in the hydrologic effects analysis. Soil disturbance and erosion is expected to increase following salvage logging, based on the hydrologic analysis. The analysis shows that increased erosion due to salvage and related activities would be small relative to increases resulting from the School Fire and would be of relatively short duration. Design features (Chapter 2, Table 2-3) and best management practices have been identified which would control and limit the magnitude of ground disturbance and erosion in action alternatives.

American Lands Alliance, After the Fires do No Harm

Relevance to the Hydrologic Analysis. This publication was reviewed. Concerns regarding riparian areas, recovery of stream ecosystems, and providing for structural components for that recovery were similar to those expressed in the Beschta et al. reports. The discussion for Beschta et al. pertains to the ALA report.

McIver, James D., Starr, Lynn, tech. eds. 2000

Relevance to the Hydrologic Analysis. McIver and Starr found 9 studies that looked erosion/sedimentation or water yield, two without an unlogged wildfire control. Differing results for the study parameters appear to be due to variability between sites, treatments, and weather patterns and does not reflect scientific controversy. Summarized results are consistent with other literature reviewed during the preparation of the EIS and was used in the discussion of environmental effects.

Other sources cited in comments

Relevance to the Hydrologic Analysis. Several sources were cited in comments which discussed elevated erosion from roads, effects of increased sediment loads and peakflows on channel morphology, and peakflow effects of green tree logging and road construction. These sources are within the body of scientific literature that informs hydrologic analysis. Other studies and especially the most recent literature available pertaining to post fire conditions and fire salvage logging were used in the analysis for this EIS. Erosion from roads post fire and from road use during proposed salvage logging was discussed and extensively analyzed in the hydrologic effects analysis. Peakflow and channel morphology changes were also discussed and analyzed.

FISHERIES

As noted by Bisson et al. (2003), wildfire, fuels management and fire suppression activities can all alter aquatic ecosystems, and recent developments in disturbance ecology have led conservation biologists and ecologists to recognize that landscapes are dynamic and should be managed in that context to restore natural processes to aquatic and terrestrial where they are operating outside the natural range of variability (Rieman et al.. 2003; Karr et al.; Everett et al. 1995). There is recognition by some supporters of passive recovery that active management following a fire could still be appropriate under certain circumstances. Beschta et al. 1995, for example, recommended removal of roads at hydrologic risk following fires to help to restore hydrologically appropriate drainage patterns at watershed-scale, as well as restore within-channel connectivity. As Bisson et al. (2003) noted, each fuels treatment or response to wildland fire is unique in its ecological circumstances and in its social context. As Rieman et al. (2003) noted, there are no universal answers that would apply to fire and fuels conditions on every forest and watershed in the western United States, given the ecological variability across the landscape that shapes the debate at local scales.

Beschta et al. Reports; Everett et al. 1995; McIver and Starr 2000, 2001

One or the other of the Beschta reports was mentioned by numerous respondents during the public scoping phase of the School Fire Salvage Recovery Project. The original Beschta Report (1995) was commissioned by Pacific Rivers Council. A similar version (Beschta et al. 2004) was subsequently published in a peer-reviewed journal called Conservation Biology. Beschta et al. (2004) was published in the Forum section of the Journal of Conservation Biology, which is a section of the journal reserved for commentary, policy advocacy and related articles based on scientific research and professional observation. In their 2004 article, they cited McIver and Starr (2000) (discussed below) in support of their recommendations. McIver and Starr (2000, 2001) reviewed and discussed commentaries by Beschta et al. (1995) and Everett et al. (1995). They noted that Everett et al. (1995) were more oriented towards active management strategies and case-by-case evaluations of salvage logging, whereas, Beschta et al. (1995) focused on re-establishment of natural disturbance regimes and supported post-fire logging, reseeding and replanting only under limited circumstances. The fisheries analysis assessed the effects to aquatic habitats and fish species from both active management alternatives and from natural disturbance processes associated with the No Action alternative

Both the 1995 and 2004 documents authored by Beschta and his associates were reviewed. Concerns were expressed regarding the sensitivity of riparian areas and recovery rates of stream ecosystems from fire effects, including providing for structural components for their recovery. Design features (Chapter 2, Table 2-3) for the proposed alternatives include designation of PACFISH RHCAs which provide protection to near channel areas by precluding harvest. Existing structural components would remain available to stream ecosystems and recovery rates would not be slowed. Other design features (Chapter 2, Table 2-3) and BMPs have been identified to control and minimize effects of proposed actions on sediment delivery and large wood recruitment, including temporary road construction and temporary use of pre-existing unauthorized roads, road use and hazard tree management.

When US Forest Service research scientists (Everett et al. 1995) reviewed the 1995 report by Beschta and his associates, they noted that forest ecosystems and fires as they have operated in recent decades encompass a wide range of variability and varying degrees to which disturbance processes and regimes have been altered, and that this variability points to the need for site-specific plans addressing each salvage situation on a case-by-case basis. This report, like Beschta et al. (1995), was categorized by

McIver and Starr (2000, 2001) as commentary by scientists. McIver and Starr (2000) was explicitly instigated by the exchange of views in the two 1995 commentaries, and was published as a Forest Service technical report following peer review. They compiled and evaluated available information published through August 1998 on the subject of post-fire salvage harvest on erosion, sediment production, and sediment delivery. McIver and Starr (2001) was essentially the same report, peer-reviewed and published in a non-Forest Service scientific journal.

McIver and Starr (2000, 2001) were able to find only seven scientific studies in the western United States which directly investigated effects of post-fire salvage harvest on erosion, sediment movement (sedimentation) and sediment delivery (to stream channels), with controls for comparison of effects of salvage following fire. During their review and annotation of those seven studies, they found that four of the seven studies detected increased erosion and sediment movement following post-fire logging. Two studies, Helvey (1980) and Helvey et al. (1985) in the eastern Cascades of Washington, detected increased sediment yields with post-fire logging relative to sediment yields generated by the fire itself. Chou et al. (1994b) found increased sedimentation from post-fire salvage logging in steep basins. Klock (1975) evaluated the relative effects of five different logging systems on soil erosion during post-fire salvage operations. He found that erosion effects varied depending on the method, and that erosion was highest with tractor logging, with decreasing impacts respectively with cable and helicopter logging

Maloney et al. (1995) monitored sediment transport following post-fire salvage on Boise National Forest. That study detected significant sediment delivery only where a skid trail crossed a class II (non-anadromous perennial stream). Other than at that one site, Maloney et al. (1995) found no management-related increases in erosion or sediment transport when best management practices (BMPs) were implemented. They found that, provided that appropriate BMPs were applied, ground-based logging and new temporary roads did not increase erosion or sediment transport. Potts et al. (1985) found that modeling results indicated that sediment yield from post-fire logging, though measurable, was still less than sediment yields from the fire alone. Potts et al. (1985) also noted that sediment yield increases were only severe when associated with steep slopes and large fires. In the remaining study, Chou et al. (1994a) was unable to detect management-related differences in sediment movement due to high variance in logging intensity and timing of implementation among sites logged, despite ecological similarities among sites compared.

McIver and Starr (2001a) were unable to find any studies that distinguished the effects of post-fire road building and use per se, but allowed that roads likely contribute as much to erosion in a post-fire setting as they do in an unburned environment, given findings by Helvey (1980) following the Entiat fire in the eastern Washington Cascades (McIver and Starr 2000, 2001a).

Based on review of those seven studies, and a couple studies done without controls, McIver and Starr (2000, 2001) concluded that the immediate environmental effects of post-fire logging in terms of soil disturbance leading to erosion and excess sedimentation to streams are variable and depend on a wide variety of factors such as fire severity, slope steepness, soil texture and composition, the presence of pre-existing roads, construction of new roads, timber harvest systems, and post-fire weather conditions. Because scientific information about salvage harvest following wildfire was so sketchy, they urged caution and encouraged the use of adaptive management by approaching post-fire activities as opportunities for learning which could add to the existing knowledge base on the effects of management in a post-fire environment (McIver and Starr 2000, 2001a).

Relevance to the Fisheries portion of School Fire Salvage Recovery Project. Beschta et al. 1995) and Beschta et al. 2004, together with Everett et al. 1995 and McIver and Starr (2000, 2001) were reviewed.

Concerns were expressed in both Beschta articles regarding the sensitivity of riparian areas and recovery rates of stream ecosystems from fire effects, including providing for structural components for their recovery. The no action alternative (Alternative A) would satisfy most or all of the Beschta et al. (1995, 2004) recommendations related to logging, erosion, and sedimentation impacts to aquatic habitats because it would not harvest trees in areas with steep slopes, sensitive soils, or severe fire intensity; it would not harvest trees in riparian areas; it would not build roads (whether temporary or permanent) to access harvest units; it would not harvest live trees (regardless of how tree mortality was determined).

Consistent with concerns expressed by Beschta et al. (1995) and Beschta et al. (2004), the sensitivity of riparian areas and recovery rates of stream ecosystems from fire effects, including providing for structural components for their recovery were also recognized in development of both action alternatives. Design features (Chapter 2, Table 2-3) for the proposed alternatives include protection of PACFISH RHCAs and stream-floodplain connectivity for PACFISH Category I, II and 4 streams by applying non-harvest buffers with additional operational restrictions, and go beyond PACFISH requirements by providing buffers and operational restrictions to protect ephemeral draws upslope of intermittent drainages, even though these were places the team did not feel met criteria for Category 4 RHCAs even in the post-fire environment. Structural components in these buffers would remain available to stream ecosystems and recovery rates would not be slowed. Road use will be restricted whenever risk of erosion and sediment delivery is high due to soil moisture, and dust control measures will help prevent dry ravel and sediment movement during dry conditions. Other design features (Chapter 2, Table 2-3) and BMPs have been identified to control and minimize effects of proposed actions including temporary road construction. Although Maloney et al. (1995) detected significant sediment delivery in Idaho where a skid trail crossed a class II (non-anadromous perennial stream), School Fire Salvage Recovery Project design features expressly prohibit placement of skid trails across any drainages, even ephemeral draws, and require full suspension across such sites.

Some of the recommendations provided by Beschta et al. (1995 and 2004) are incompatible with the purpose and need of the School Fire Salvage Recovery Project, which is focused solely on recovery of economic value, consistent with laws relevant to fisheries resources on NFS lands in the Tucannon subbasin, such as Section 7 of the Endangered Species Act and the National Forest Management Act. Accordingly, action alternatives that meet the specified purpose and need are unable to fully adopt recommendations offered by Beschta et al. (1995, 2004), and alternatives were analyzed to address those concerns site-specifically.

Even so, both of the action alternatives (Alternatives B and C) would satisfy some but not all of the above recommendations: Regardless of whether the no action or one of the action alternatives is selected, no tree harvest would take place in riparian areas and post-suppression rehabilitation of firelines has already taken place, as has curtailment of livestock grazing until soils and vegetative recovery are determined to be sufficient to support resumed grazing. No construction of near- or instream structures are contemplated as post-fire restoration actions, nor is the seeding of non-native species for erosion control, consistent with recommendations from Beschta and his associates.

As Everett et al. (1995) acknowledged, some studies have shown increased soil disturbance and erosion following post-fire logging. They cite literature that was reviewed, and in one case cited (Klock, 1975). Soil disturbance and erosion are expected to increase following salvage logging, based on the hydrologic analysis for School Fire EIS. The hydrologic analysis also shows that increased erosion due to salvage and related activities would be small relative to increases resulting from the School Fire and would be of relatively short duration. Design features (Table 2-3) and best management practices have been identified which would control and limit the magnitude of ground disturbance and erosion, and minimize the risk of accelerated sediment delivery in action alternatives.

Contrary to recommendations in the Beschta (1995, 2004) articles, the No Action alternative would not act to eliminate unauthorized roads present on the pre-fire landscape, however, such action would occur under both action alternatives and into the foreseeable future, consistent with recommendations provided by Beschta and his associates. Remedial action to eliminate unauthorized roads in the near future is most likely to be achieved through selection of an action alternative that meets the economic purpose and need for the project, and which could generate revenue to fund removal of some or most of the unauthorized roads within the next 5 years. McIver and Starr (2000; 2001) noted that even when the primary objective of post-fire logging has been economic, often other objectives (e.g. erosion control) have also been achieved. In the case of School Fire Salvage Recovery Project, action alternatives were constructed with such "other" objectives in mind, allowing for natural rates of recruitment of large wood to deficient streams, reducing cumulative surface erosion from fire and salvage activities to near-natural levels through combinations of design features (Chapter 2, Table 2-3) and post-harvest decommissioning of some unauthorized roads in existence prior to the fire, facilitated by aspects of timber sale layout and contract specifications. McIver and Starr's (2000, 2001) summarized results and relevant studies they cited are consistent with other literature reviewed and used during the preparation of the Fisheries Analysis, and effects identified in the Fisheries Specialist Report are within the range of effects noted in literature reviewed by McIver and Starr.

American Lands Alliance (ALA) Report(s) 2005-"After the Fires"), 2003-"Salvaging Timber, Scuttling Forests"

The ALA "After the Fires" (2005) article was mentioned by numerous respondents during the public scoping phase of the School Fire Salvage Recovery Project. Concerns raised in the article relevant to aquatic ecosystems include loss of biological legacies (downed wood) and sediment runoff into streams. The article draws extensively from policy recommendations contained in the recent Beschta et al. (2004) article in Conservation Biology, and cites literature already considered, specifically McIver and Starr (2000), Beschta et al. (1995), Everett et al. (1995), as well as a variety of literature on general ecological processes related to landscape disturbance and recovery. An earlier more detailed article produced by Ingalsbee (2003) for the American Lands Alliance expressed similar concerns for additive effects of salvage logging on aquatic ecosystems with respect to sediment delivery, large wood recruitment and function. The Ingalsbee (2003) article was mentioned by one commenter. It cites relevant literature already discussed, specifically Helvey (1980), McIver and Starr (2000), Beschta et al. (1995), Everett et al. (1995) and Klock (1975).

Relevance to the Fisheries portion of School Fire Salvage Recovery Project. The ALA "After the Fires" report was reviewed, and the 2003 article by Ingalsbee which contained notably more citations was reviewed. The articles have relevance to School Fire Salvage Recovery project. In the professional judgment of the fisheries biologist, the action alternatives include design features (Chapter 2, Table 2-3) and mitigations which address concerns for aquatic ecosystems as expressed by both of the ALA-sponsored articles and the level of anticipated effects from active management are within the range of effects already noted in the literature. Relevant literature cited in the ALA (2003) report by Ingalsbee and Beschta et al. (2004) cited in the ALA (2005) article were previously assessed. Earlier comments on literature sources they cited are applicable to concerns raised in the two ALA articles. The earlier discussions above for Beschta et al. (1995, 2004), Everett et al. (1995), McIver and Starr (2000) and their review of relevant studies also pertain to the ALA reports.

Other literature cited by Ingalsbee regarding post-fire structure, function and processes in the aquatic environment is consistent with effects of alternatives and literature cited in the Fisheries Effects Analysis.

Lindenmayer Salvage Harvesting Policies Article

The journal Science published a short, one-page article on February 27, 2004 (Lindenmayer et al. 2004). Its position is that (1) salvage harvest undermines the ecosystem benefits of major disturbances; (2) removing biological legacies (large wood) can negatively affect many taxa; (3) salvage harvest can impair ecosystem recovery; and (4) some taxa might be maladapted to the interactive effects of two disturbance events in rapid succession (fire and salvage logging).

The article was published in the Policy Forum section of Science, which is a section of the journal reserved for articles of commentary, policy advocacy and related articles based on scientific research and professional observation on subjects of scientific interest. The discussion for Beschta et al. (1995, 2004), McIver and Starr (2000, 2001), Everett et al., and ALA (American Lands Alliance 2005) reports also pertains to Lindenmayer et al. (2004) and is hereby incorporated by reference.

Relevance to the Fisheries portion of School Fire Salvage Recovery Project. The Lindenmayer et al. (2004) article was review. School Fire Salvage Recovery Project includes an alternative that would react to the burned watersheds in a manner similar to what is recommended by Lindenmayer et al. (2004) – the No Action alternative. Both action alternatives include design features (Chapter 2, Table 2-3) and mitigations which effectively address all four of the concerns listed by Lindenmayer and his associates as they pertain to listed, sensitive and management indicator fish species and their habitats. Most of the habitat indicators selected for analysis were based on primary and secondary habitat factors limiting recovery of bull trout, steelhead and Chinook salmon in the affected subwatersheds, which were previously identified in the Recovery Plan for listed species in southeast Washington (Snake River Salmon Recovery Board. 2005). Analysis of selected indicators discussed changes to indicators in terms of post-disturbance processes and ecosystem benefits, the degree to which biological legacies will be affected (Large Wood recruitment and retention), potential for impairment of aquatic ecosystem recovery, and resiliency of the respective sensitive, listed and management indicator fish species in the Upper Tucannon and Upper Pataha watersheds to two disturbance events, School Fire followed by either of the action alternatives.

Karr et al. 2004

The scientific journal BioScience, published a five-page peer-reviewed article by Karr et al. (2004) in the Forum section of the journal, which is reserved for articles of commentary, policy advocacy and related articles based on scientific research and professional observation on subjects of scientific interest. The article identified concerns for salvage logging impacts on aquatic ecosystems similar to those noted in commentary articles previously discussed, and cites several of those articles in support of their concerns and recommendations, including Beschta et al. 1995, 2004; Lindenmayer et al. 2004) and presented recommendations to curb ecological damage from post-fire salvage logging, which were very similar to recommendations offered by Beschta et al. (1995, 2004).

Other literature cited by Karr et al. regarding post-fire structure, function and processes in the aquatic environment is consistent with effects of alternatives and literature cited in the Fisheries Effects Analysis.

Other sources cited in comments

Relevance to the Fisheries portion of School Fire Salvage Recovery Project. Several sources were cited in comments which discussed elevated erosion from roads, effects of increased sediment loads on aquatic biota, pool development, temperature and ineffectiveness of BMPs to protect salmonids from cumulative degradation from roads and logging. These sources are within the range of scientific literature that informed the fisheries analysis. Other studies and especially the most recent literature available pertaining to post-fire conditions, erosion, sediment delivery and transport, and fire salvage logging were used in the analysis for this EIS. Erosion from roads post-fire and from road use during proposed salvage logging, including effectiveness of BMPs was discussed and extensively analyzed in the hydrologic effects analysis. Peakflow and channel morphology changes were also discussed and analyzed. Findings from the hydrology analysis informed the fisheries effects analysis. Effects to salmonids and other sensitive fish species, temperature and pool development from the fire itself and the additive effects of logging, road construction and road use were evaluated.

FUELS - FIRE HAZARD

Beschta et al. Reports

One or the other of the Beschta reports was mentioned by numerous respondents during the public scoping phase of the School Fire Salvage Recovery Project. These respondents generally advocated that natural recovery of burned landscapes, with little or no human intervention, is the optimal policy for public forests, and that this policy is supported by literature other than Beschta et al. (1995, 2004) such as American Lands Alliance (2005), DellaSala et al. 2006, Donato et al.. 2006, Lindenmayer et al. (2004), McIver and Starr (2000, 2001), and others.

When US Forest Service research scientists reviewed the original Beschta report, they concluded that it was biased toward a custodial (hands off) approach, and that it is generally accepted in the science community that limiting post-fire management to just a single approach (whether custodial or commodity) is inappropriate because forest sites encompass a wide range of variability, and this variability points to the need for site-specific plans addressing each salvage situation on a case-by-case basis (Everett 1995).

Relevance to the Fire Hazard portion of School Fire Salvage Recovery Project. The Beschta Report (Beschta et al. 1995) and the Beschta journal article (Beschta et al. 2004) was reviewed. The School Fire Salvage Recovery Project includes an alternative (the No Action alternative) that would react to the burned forest in a manner similar to what is recommended by Beschta et al. (1995, 2004). From a fire hazard risk and fuels management perspective, we concur that making fire prevention a high priority management goal is a commitment to continuous fire suppression and fails to capitalize on the self-repairing and self-perpetuating capabilities of ecosystems. It is not a matter of if another fire will occur in this fire prone ecosystem, but when it will occur and how it will burn. The large woody fuel created by the dead trees falling will not increase the risk of wildfire in the short term, but it will influence fire behavior (intensity and rate of spread) in the future. The Federal Wildland Fire Management Policy mandates that wildland fire, as a critical natural process, must be reintroduced into the ecosystem and allowed to function as nearly as possible in its natural role to achieve the long-term goals of ecosystem health. School Fire Salvage Recovery project will allow this by removing the excess fuels which have accumulated because of fire suppression over the last century. The removal of this excessive fuel loading will help enable fire to play its historical ecological role in the ecosystem without unnecessary risk to forest resources, firefighters, and public. Past actions have increased probabilities that various series of natural events will be viewed as catastrophic (Beschta et al. 1995). Without removal of excess fuels, this problem will be perpetuated. The School Fire was uncharacteristic with high intensity, stand replacement fire in a historically low intensity fire environment. Without the removal of excess fuels, the next fire will also likely be high intensity stand replacement fire.

Fires in forested ecosystems normally burn in mosaic patterns that can range from a beneficial low intensity burn to very high intensity fires. Some forest types are not well adapted to extremely severe, uncharacteristic fire events. These forests will not recover quickly without management intervention. (USDA Forest Service 2005)

Beschta (1995, 2004) recommendations describe ecosystem restoration goals, which in the case of the School Fire area may be harder to attain in the absence of post fire salvage logging. Even though the School Fire Salvage Recovery Project is focused on recovery of economic value only, one effect of salvage logging is the reduction of large woody fuels and alteration of the way wildfire and prescribed fire will burn through stands in the future, as discussed in the Fire Hazard section of this document.

Large fuels (greater than 3" diameter) do not contribute greatly to fire spread. but they do contribute to fire severity. Due to large dead and down woody fuel contributions to fire behavior and resistance to control, reducing the amount of large, dead and down woody debris would increase the potential for using fire (prescribed or natural), which in turn will help keep the fine fuel load at a relatively low level. Torching, crowning, and spotting, which contribute to large fire growth, are greater where large woody fuels have accumulated under a forest canopy and can contribute to surface fire heat release. If the large woody fuel is decayed and broken up (as it will be in 30 years), its contribution is considerably greater, similar to fire in heavy slash. Higher severity burning than would typically occur during earlier periods is possible depending on extent of soil coverage by large woody pieces (Brown 2003). If a conifer overstory exists, crowning coupled with burnout of duff could amplify the burn severity. However, a fire involving optimum quantities of large woody debris should not lead to unusually severe fire effects. Historically, fires probably often occurred in the understory and mixed fire regime types when large downed woody fuels were in the optimum range (Brown 2003).

American Lands Alliance "After the Fires" Report

The ALA "After the Fires" (2005) article was mentioned by numerous respondents during the public scoping phase of the School Fire Salvage Recovery Project. The article draws extensively from policy recommendations contained in the recent Beschta et al. (2004) article in Conservation Biology, and cites literature already considered, specifically McIver and Starr (2000), Beschta et al. (1995), Everett et al. (1995), as well as a variety of literature on general ecological processes related to landscape disturbance and recovery.

Relevance to the Fire Hazard portion of School Fire Salvage Recovery Project. The ALA "After the Fires" report and the US Forest Service response to it was reviewed. Concerns regarding effects of salvage logging on fire hazard and fires natural role in the ecosystem were similar to those expressed in the Beschta et al. reports. The fire hazard discussion above for Beschta et al. (1995, 2004) also pertains to the ALA report.

McIver and Starr Salvage Logging Report

The McIver and Starr report is entitled "Environmental effects of post-fire logging: literature review and annotated bibliography" (McIver and Starr 2000). The McIver and Starr report reviews the existing body of scientific literature about logging (timber harvest) following wildfire. Twenty-one post-fire logging studies were reviewed and interpreted. McIver and Starr concluded that while the practice of salvage logging after fires is controversial, the debate is conducted without the benefit of much scientific information.

They also concluded that the immediate environmental effects of post-fire logging are extremely variable and dependent on a wide variety of factors such as fire severity, slope steepness, soil texture and composition, the presence of preexisting roads, construction of new roads, timber harvest systems, and post-fire weather conditions.

Relevance to the Fire Hazard portion of School Fire Salvage Recovery Project. The McIver and Starr report found only 14 studies that isolated the actual effect of logging burned timber as compared to an unlogged control. Because scientific information about salvage harvest was so sketchy, McIver and Starr argued for the use of adaptive management techniques to monitor the effects of salvage logging and to use monitoring results to adjust site-specific practices and prescriptions accordingly (McIver and Starr 2001).

McIver and Starr found no studies that looked at reduction in fire severity in burned stands that had been logged. The following are their findings in reference to fire hazard: "Although fuel accumulations owing to spruce budworm (*Choristoneura fumiferana*)-caused tree death can result in unusually severe wildfires (Stocks 1987), there is no similar information on severity of subsequent fires in stands killed by wildfire.

In general, logging of large-diameter material in green tree stands will lead to decreases in total fuel accumulations over the intermediate term but increases in fine activity fuels (<3 in. in diameter) over the short term (Brown 1980). Logging in post-fire stands, however, would be expected to produce less fine activity fuel because the fine material burned, and one would expect removal of large diameter material to have an intermediate-term effect similar to green tree stands. Retrospective studies that look at twice burned stands in which different levels of fuel reduction were undertaken after the first fire would possibly shed light on the issue of postfire logging, fuel reduction, and reburn severity."

Donato et al. Article

On January 5, 2006, a short article was published in Sciencexpress, an on-line affiliate of a print journal called Science, with the title: "Post-Wildfire Logging Hinders Regeneration and Increases Fire Risk." The same or a slightly modified version was subsequently published as a one-page article in the full journal (Science) on January 20, 2006 (Donato et al. 2006a, 2006b).

The Donato et al. article (2006a, 2006b) concluded "that postfire logging, by removing naturally seeded conifers and increasing surface fuel loads, can be counterproductive to goals of forest regeneration and fuel reduction." This conclusion was based on a study of early conifer regeneration and fuel loads after the 2002 Biscuit Fire in southwestern Oregon

Relevance to the Fire Hazard portion of School Fire Salvage Recovery Project. The Donato et al. article (2006a, 2006b) was reviewed and is relevant to the School Fire Salvage Recovery Project in that many areas are considered to be at high risk of complete tree loss if another fire should occur, primarily because of uncharacteristically high fuel loads. This high severity fire potential is one reason for completing fuel reduction activities in the School Fire area, with salvage timber harvest proposed for reducing larger fuels and other activities for smaller fuels.

We concur that after logging, the mitigation of short-term fire risk is not possible without subsequent fuel reduction treatments. Short-term fire risk will be mitigated by implementing fuel treatments such as yarding tops attached and jackpot burning in conjunction with salvage timber harvest. Appropriate fuel treatments are planned to ensure small woody fuel loads do not pose undue fire hazard risk to existing and future forest stands.

The School Fire area is a fire dependent ecosystem. It is not a matter of if it will burn, but when and how. The proposed salvage timber harvest activity is expected to help manage fuels both in the short -erm and the long-term. If the salvage timber harvest activity is implemented as proposed, which would remove a reasonable proportion of the large-fuel component from these areas, and if the associated fine-fuel treatments are completed, then it is our judgment that salvage-related effects to reduce the potential intensity of future fires to ensure forest sustainability in treated stands would be both positive and efficacious.

Lindenmayer Salvage Harvesting Policies Article

The journal Science published a short, one-page article on February 27, 2004 (Lindenmayer et al.. 2004). Its position is that (1) salvage harvest undermines the ecosystem benefits of major disturbances; (2) removing biological legacies (large wood) can negatively affect many taxa; (3) salvage harvest can impair ecosystem recovery; and (4) some taxa might be maladapted to the interactive effects of two disturbance events in rapid succession (fire and salvage logging).

The Lindenmayer et al. (2004) article was reviewed. School Fire Salvage Recovery Project includes an alternative that would react to the burned watersheds in a manner similar to what is recommended by Lindenmayer et al. (2004) – the No Action alternative.

Relevance to the Fire Hazard portion of School Fire Salvage Recovery Project. The article did not raise specific issues in regard to fire hazard and fuels.

SOILS

Beschta et al. Reports - With regards to soils the following are statements from the Beschta reports:

"**No management activity should be undertaken which does not protect soil integrity."**

(a). "Soil loss and compaction are associated with both substantial loss of site productivity and with off-site degradation (water quality)."

(b). "Reduction of soil loss is associated with maintaining the litter layer."

(c)."Although post-burn soil conditions may very depending upon fire severity, steepness of slope, inherent erodibility, etc., soils are particularly vulnerable in burned landscapes."

(d). "Post-burn activities that accelerate erosion or create soil compaction must be prohibited."

Relevance to the Soils portion of School Fire Salvage Recovery Project. The EIS includes analysis of soil conditions due to pre-fire management activity and those predicted as a result of proposed activities. Changes in surface conditions due to loss of down wood and litter (surface cover) from high and moderate burn severity are accounted for the in predicted effects. While the initial susceptibility of the soil to erosion is elevated due to loss of cover, the recovery of vegetation has and will continue to occur on these areas under uninhibited post-fire rates. Disturbance of recovering vegetation is limited to very small percentages of the units in the proposed action.

Logging in units within the fire area will produce soil disturbance, some exceeding criteria for detrimental levels in degree, primarily in the form of compaction, disturbance of vegetation by crushing and uprooting, especially in units using ground-based harvest and yarding systems. Harvest and yarding systems have been selected to minimize these impacts based on soil characteristics and slope. Helicopter and cable yarding systems are proposed for units averaging over 30 percent slopes. The ground-based system selected is the harvester/forwarder system which limits the area of compaction and exposes very little mineral soil subject to erosion. Units within high and moderate burn severity would increase surface cover of fine and some coarse wood as salvage operations would leave unmerchantable tops and branches scattered on site. Subsoiling rehabilitation would be used to relieve compaction on highly compacted areas, such as landings, including areas of preexisting compaction reused in this project.

"Recovery logging should be prohibited in sensitive areas."

(a). "Logging on sensitive areas is often associated with accelerated erosion and soil compaction."

(b). "Recovery logging by any method must be prohibited on sensitive sites, including: severely burned areas (no duff layer), on erosive soils, on fragile soils, in roadless areas, in riparian areas, on steep slopes, or any site where accelerated erosion is possible."

Relevance to the Soils portion of School Fire Salvage Recovery Project. Selection of harvest and yarding systems, and erosion control and mitigation measures (Best Management Practices), were selected based on sensitivity (risk based on soil characteristics) of the soils in the project area, including burn severity from the fire. Hand-felling and helicopter and cable-yarding are to be used on units where slopes average over 30 percent. Unmerchantable tops and branches would be retained on site in high burn severity areas, lopped and scattered adding to ground cover in these units. No activities are proposed within inventoried roadless areas. Riparian buffers have been designed in with additional buffering of sensitive steep, ephemeral draws.

Appendix N

Eastside Screens

APPENDIX B

REVISED

INTERIM MANAGEMENT DIRECTION
ESTABLISHING RIPARIAN, ECOSYSTEM AND WILDLIFE STANDARDS
FOR TIMBER SALES

REGIONAL FORESTER'S FOREST PLAN AMENDMENT #2

6/12/95

REGIONAL FORESTER'S EASTSIDE FOREST PLAN AMENDMENT NO. 2
ALTERNATIVE 2, as adopted

1. All timber sales, except as identified below, will be designed to incorporate the interim riparian, ecosystem and wildlife standards.
2. The following types of sales will not be subject to the interim standards: personal use firewood sales; post and pole sales; sales to protect health and safety; and sales to modify vegetation within recreation special use areas. NEPA and required consultation under Section 7 of the Endangered Species Act must be completed.
3. Five other types of sales will not be subject to the interim ecosystem standard, but must apply the interim riparian and wildlife standards: precommercial thinning sales; sales of material sold as fiber; sales of dead material less than 7-inch dbh, with incidental green volume (ref. RO 2430 ltr, 8/16/93); salvage sales, with incidental green volume, located outside currently mapped old growth (ref. RO 2430 ltr. 8/16/93); and commercial thinning and understory removal sales located outside currently mapped old growth.
4. Interim riparian standard: Timber sales (green and salvage) will not be planned or located within riparian areas as described below:
   a. Perennial and intermittent fish-bearing streams: consists of the stream and the area on either side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance (600 feet including both sides of the stream channel), whichever is greatest.
   b. Perennial nonfish-bearing streams: consists of the stream and the area on either side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance (300 feet, including both sides of the stream channel), whichever is greatest.
   c. Intermittent non-fish bearing streams: consists of the stream channel from the edges of the stream channel to the top of the inner gorge, or to the outer edges of the riparian vegetation, or to the extent of landslides or landslide-prone area, or to a distance of 100 feet slope distance (200 feet, including both sides of the channel), whichever is greatest.

      See FSM 2526 9/80 R-6 Supp 42 for definitions of Perennial and Intermittent stream.
   d. Ponds, lakes, reservoirs, seeps and springs, bogs and wetlands consist of the body of water or wetland and/or seeps/spring source and the area to the outer edges of the riparian vegetation, or to the extent of the seasonally saturated soil, or to the extent of moderately and highly unstable areas, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance from the edge of the maximum pool elevation of constructed ponds and reservoirs or from the edge of the wetland, pond or lake, whichever is greatest.
5. Interim ecosystem standard:
   a. Characterize the proposed timber sale and its associated watershed for patterns of stand structure by biophysical environment and compare to the Historic Range of Variability

(HRV). The HRV should be based on conditions in the pre-settlement era; however 1900s photography may be acceptable. HRV should be developed for large landscapes across which forest types, environmental settings, and disturbance regimes (fire and insects/disease) are relatively uniform. Each component watershed should not be expected to reflect the average conditions for the larger landscape, but the sum of conditions across watersheds within the area for which HRV is developed should reflect ranges of conditions determined in the HRV evaluation. Note: LOS, a term used in the interim wildlife standard, refers to the structural stages where large trees are common, i.e. Multi-stratum with Large Trees, and Single-stratum with Large Trees. See Table 1.

b. Ecosystem characterization steps to determine HRV:

   1) Describe the dominant historical disturbance regime, i.e. the disturbance types and their magnitudes and frequencies.

   2) Characterize the landscape pattern and abundance of structural stages (Table 1) maintained by the disturbance regime. Consider biophysical environmental setting (Table 2) across the large landscape to make this determination.

   3) Describe spatial pattern and distribution of structural stages under the HRV disturbance regime, and

   4) Map the current pattern of structural stages and calculate their abundance by biophysical environmental setting.

c. Characterize the difference in percent composition of structural stages between HRV and current conditions (Table 3). Identify structural conditions and biophysical environment combinations that are outside HRV conditions to determine potential treatment areas.

Table 1. Structural stages for use with HRV analysis. Structural stage is not necessarily associated with stand age or to seral (species composition) development.

Structural Stage	Definition	Description
Stand Initiation	Growing space is reoccupied following a stand replacing disturbance, typically by seral species.	One canopy stratum (may be broken or continuous), one dominant cohort[2] of seedlings or saplings. Grass, forbs, or shrubs may also be present with early seral trees.[3]
Stem Exclusion: Open Canopy	Occurrence of new tree stems is excluded (moisture limited). Crowns are open grown. Canopy is discontinuous. This structure can be maintained by frequent underburning or management.	One discontinuous canopy stratum. One cohort of trees. New tree stems excluded by competition. Trees may be poles or of small or medium diameter. Understory shrubs, grasses, or forbs may be present.
Stem Exclusion: Closed Canopy	Occurrence of new tree stems is excluded (light or moisture limited). Crowns are closed and abrading.	Canopy layer is closed and continuous. One or more canopy strata may be present. Lower canopy strata, if present, is the same age class as the upper stratum. Trees may be poles or of small or medium diameter. Understory shrubs, grasses, or forbs may be present.
Understory Reinitiation	A second cohort of trees is established under an older, typically seral, overstory. Mortality in the overstory creates growing space for new trees in the understory. Large trees are uncommon.	The overstory canopy is discontinuous. Two or more canopy layers are present. Two or more cohorts of trees are present. Overstory trees may be poles or of small or medium diameter. Understory trees are seedlings, saplings or poles.
Multi-stratum, without large trees	Several cohorts of trees are established. Large overstory trees are uncommon. Pole, small, and medium sized trees dominate.	The overstory canopy is discontinuous. Two or more canopy layers are present. Large trees are uncommon in the overstory. Horizontal and vertical stand structure and tree sizes are diverse. The stand may be a mix of seedlings, saplings, poles, or small or medium diameter trees.
Multi-stratum, with large trees	Several to many cohorts and strata of trees are present. Large trees are common.	The overstory canopy is broken or discontinuous. Two or more canopy layers are present. Two or more cohorts of trees are present. Medium and large sized trees dominate the overstory. Trees of all sizes may be present. Horizontal and vertical stand structure and tree sizes are diverse.
Single stratum, with large trees	A single stratum of large trees is present. Large trees are common. Young trees are absent or few in the understory. Park-like conditions may exist.	The single dominant canopy stratum consists of medium sized or large trees. One or more cohorts of trees may be present. An understory may be absent or consist of sparse or clumpy seedlings or saplings. Grasses, forbs, or shrubs may be present in the understory.

[1] Adapted from an unpublished report by K. O'Hara, Assistant Professor of Silviculture, University of Montana, under contract to the Interior Columbia Basin Ecosystem Project for the Eastside EIS.

Modifications developed by Miles Hemstrom, USFS Regional Office, Portland, Oregon, with input from Paul Hessburg, USFS/PNW Research Station, Wenatchee Lab, Wenatchee, Washington.

[2] A cohort is a class of trees arising after a common natural or artificial disturbance.

[3] "Trees" refers to live trees, not snags or other dead trees.

Table 2. Example biophysical environments matrix. Analysis areas may have more or fewer kinds of biophysical environments and characteristics of each environment may differ from those shown. This table is only provided as an example. The biophysical environments listed are not comprehensive. Each landscape area may have these or different environments.

Biophysical Environment[4]	Dominant Disturbance Factors	Disturbance Regime[5]	Average Disturbance Patch	Typical Landform Setting	Typical Elevation Range	Typical Aspects
Hot, Dry: PIPO, ABGR	Fire, insects, and disease	Low	<l acre	Ridge tops and steep side slopes	2500-4000 feet	S, SW
Warm, Dry: PSME, ABGR	Fire, insects, and disease	Moderate	<5 acres	Side slopes	3000-5000 feet	S, SW
Cool, Mesic: PSME, ABGR, ABLA2, PIEN	Fire, insects, and disease	High	80-120 acres	Various	3000-5000 feet	Various
Cool, Wet: ABGR, ABLA2, TSME	Insects and disease, fire	High	>250 acres	Bottom lands	3000-5000 feet	NE, N, NW, Flat

[4] Temperature and moisture regime, characteristic late seral species, first two letters of genus and species.

[5] Agee (1990). "The historical role of fire in Pacific Northwest forests", Natural and Prescribed Fire in Pacific Northwest Forests, Oregon State University Press.

Low severity regime: 1-25 year return interval, 0% to 20% mortality of large trees.
Moderate severity regime: 26-100 year return interval, 26% to 70% mortality of large trees.
High severity regime: >100 year return interval, >70% mortality of large trees.

Table 3. Example biophysical environment by structural stage matrix. This is only an example. The number and kind of biophysical environments and the historic and current distribution of structural conditions vary by landscape. H% is the estimated range of the percent extent of each condition from HRV assessment. C% is the estimated percent extent of each condition at present in the watershed under examination. D% is a range indicating the difference between H% and C%; D% = C%-H%. Negative values indicate a reduction from historical conditions. *This table is only provided as an example. The biophysical environments listed are not comprehensive. Each landscape area may have these or different environments.*

	Stand Initiation			Stem Exclusion: Open Canopy			Stem Exclusion: Closed Canopy			Understory Reinitiation			Multi-stratum, without large trees			Multi-stratum, with large trees			Single-stratum, with large trees		
Envt	H%	C%	D%	H%	C%	D%	H%	C%	D%	H%	C%	D%	H%	C%	D%	H%	C%	D%	H%	C%	D%
Hot, Dry	5 to 15	15	0 to 10	5 to 20	20	0 to 15	NA	NA	NA	NA	NA	NA	5 to 10	30	20 to 25	2 to 15	20	5 to 18	20 to 70	15	-5 to -55
Warm, Dry	1 to 15	5	4 to -10	5 to 20	20	0 to 15	1 to 10	10	0 to 9	1 to 10	10	0 to 9	5 to 25	25	0 to 20	5 to 20	35	15 to 30	15 to 55	5	-10 to -50
Cool, Mesic	1 to 5	2	1 to -3	NA	NA	NA	5 to 25	5	0 to -20	5 to 25	5	0 to -20	50 to 70	65	15 to -5	5-25	24	19 to -1	NA	NA	NA
Cool, Wet	1 to 10	1	0 to -10	NA	NA	NA	1 to 10	3	2 to -7	5 to 25	10	5 to -15	20 to 50	40	20 to -10	30 to 60	46	16 to -14	NA	NA	NA

6. Interim wildlife standard:

   a. The interim wildlife standard has two possible scenarios to follow based on the Historical Range of Variability (HRV) for each biophysical environment within a given watershed. For the purposes of this standard, late and old structural stages (LOS) can be either “Multi-strata with Large Trees,” or “Single Strata with Large Trees,” as described in Table l of the Ecosystem Standard. These LOS stages can occur separately or in some cases, both may occur within a given biophysical environment.

   b. LOS stages are calculated separately in the interim ecosystem standard. Use Scenario A whenever any one type of LOS is below HRV. If both types occur within a single biophysical environment and one is above HRV and one below, use Scenario A. Only use Scenario B when both LOS stages within a particular biophysical environment are at or above HRV.

   c. The following sale types were exempted from consideration of HRV through the interim ecosystem standard, but must still meet the intent of the wildlife standards by following the direction provided in Scenario A, 1) through 4), as applicable to the type of sale being proposed, and regardless of whether the stand is LOS or not:

      1. precommercial thinning sales,
      2. sales of material sold as fiber,
      3. sales of dead material less than sawlog size (7-inch dbh) with incidental green volume,
      4. salvage sales with incidental green volume located outside currently mapped old growth,
      5. commercial thinning and/or understory removal sales located outside currently mapped old growth.

The interim wildlife standard only altered portions of current Forest Plans. All additional Forest Plan wildlife standards and guidelines not altered in this direction still apply.

   d. Scenario A

   If either one or both of the late and old structural (LOS) stages falls BELOW HRV in a particular biophysical environment within a watershed, then there should be NO NET LOSS OF LOS from that biophysical environment. DO NOT allow timber sale harvest activities to occur within LOS stages that are BELOW HRV.

      1) Some timber sale activities can occur within LOS stages that are within or above HRV in a manner to maintain or enhance LOS within that biophysical environment. It is allowable to manipulate one type of LOS to move stands into the LOS stage that is deficit if this meets historical conditions.

      2) Outside of LOS, many types of timber sale activities are allowed. The intent is still to maintain and/or enhance LOS components in stands subject to timber harvest as much as possible, by adhering to the following standards:

         a) Maintain all remnant late and old seral and/or structural live trees ≥ 21" dbh that currently exist within stands proposed for harvest activities.

b) Manipulate vegetative structure that does not meet late and old structural (LOS) conditions (as described in Table 1 of the Ecosystem Standard), in a manner that moves it towards these conditions as appropriate to meet HRV.

c) Maintain open, park-like stand conditions where this condition occurred historically. Manipulate vegetation in a manner to encourage the development and maintenance of large diameter, open canopy structure. (While understory removal is allowed, some amount of seedlings, saplings, and poles need to be maintained for the development of future stands).

3) Maintain connectivity and reduce fragmentation of LOS stands by adhering to the following standards:

INTENT STATEMENT: While data is still being collected, it is the best understanding of wildlife science, today, that wildlife species associated with late and old structural conditions, especially those sensitive to “edge,” rely on the connectivity of these habitats to allow free movement and interaction of adults and dispersal of young. Connectivity corridors do not necessarily meet the same description of “suitable” habitat for breeding, but allow free movement between suitable breeding habitats. Until a full conservation assessment is completed that describes in more detail the movement patterns and needs of various species and communities of species in eastside ecosystems, it is important to insure that blocks of habitat maintain a high degree of connectivity between them, and that blocks of habitat do not become fragmented in the short-term.

a) Maintain or enhance the current level of connectivity between LOS stands and between all Forest Plan designated “old growth/MR” habitats by maintaining stands between them that serve the purpose of connection as described below:

(1) Network pattern – LOS stands and MR/Old Growth habitats need to be connected with each other inside the watershed as well as to like stands in adjacent watersheds in a contiguous network pattern by at least 2 different directions.

(2) Connectivity Corridor Stand Description – Stands in which medium diameter or larger trees are common, and canopy closures are within the top one-third of site potential. Stand widths should be at least 400 ft. wide at their narrowest point. The only exception to stand width is when it is impossible to meet 400 ft with current vegetative structure, AND these “narrower stands” are the only connections available (use them as last resorts). In the case of lodgepole pine, consider medium to large trees as appropriate diameters for this stand type.

If stands meeting this description are not available in order to provide at least 2 different connections for a particular LOS stand or MR/Old Growth habitat, leave the next best stands for connections. Again, each LOS and MR/Old Growth habitat must be connected at least 2 different ways.

(3) Length of Connection Corridors – The length of corridors between LOS stands and MR habitats depends on the distance between such stands. Length of corridors should be as short as possible.

(4) Harvesting within connectivity corridors is permitted if all the criteria in (2) above can be met, and if some amount of understory (if any occurs) is left in patches or scattered to assist in supporting stand density and cover. Some understory removal, stocking control, or salvage may be possible activities, depending on the site.

b) To reduce fragmentation of LOS stands, or at least not increase it from current levels, stands that do not currently meet LOS that are located within, or surrounded by, blocks of LOS stands should not be considered for even-aged regeneration, or group selection at this time. Non-regeneration or single tree selection (UEAM) activities in these areas should only proceed if the prescription moves the stand towards LOS conditions as soon as possible.

4) Adhere to the following specific wildlife prescriptions. These standards are set at MINIMUM levels of consideration. Follow Forest Plan standards and guidelines when they EXCEED the following prescriptive levels:

a) Snags, Green Tree Replacements and Down Logs:

INTENT STATEMENT – Most (if not all) wildlife species rely on moderate to high levels of snags and down logs for nesting, roosting, denning and feeding. Large down logs are a common and important component of most old and late structural forests. Past management practices have greatly reduced the number of large snags and down logs in managed stands.

(1) All sale activities (including intermediate and regeneration harvest in both even-age and uneven-age systems, and salvage) will maintain snags and green replacement trees of ≥ 21 inches dbh (or whatever is the representative dbh of the overstory layer if it is less than 21 inches), at 100% potential population levels of primary cavity excavators. This should be determined using the best available science on species requirements as applied through current snag models or other documented procedures. NOTE: for Scenario A, the live remnant trees (≥ 21" dbh) left can be considered for part of the green replacement tree requirement.

(2) Pre-activity (currently existing) down logs may be removed only when they exceed the quantities listed below. When pre-activity levels of down logs are below the quantities listed, do not remove downed logging debris that fits within the listed categories. It is not the intention of this direction to leave standing trees for future logs in addition to the required snag numbers, nor to fall merchantable material to meet the down log requirements. The snag numbers are designed to meet future down log needs in combination with natural mortality. Exceptions to meeting the down log requirement can be made where fire protection needs for life and property cannot be accomplished with this quantity of debris left on site.

The down log criteria are not intended to preclude the use of prescribed burning as an activity fuels modification treatment. Fire prescription parameters will ensure that consumption will not exceed 3 inches total (1½ inch per side) of diameter reduction in the featured large logs (sizes below).

Tools such as the CONSUME and FOFEM computer models, fire behavior nomograms, and local fire effects documentation can aid in diameter reduction estimates.

Leave logs in current lengths; do not cut them into pieces. Longer logs may count for multiple "pieces" without cutting them. Cutting them may destroy some habitat uses and also cause them to decay more rapidly. It is also not expected that the "pieces" left will be scattered equally across all acres.

SPECIES	PIECES PER ACRE	DIAMETER SMALL END	PIECE LENGTH AND TOTAL LINEAL LENGTH	
Ponderosa Pine	3-6	12"	>6 ft.	20-40 ft.
Mixed Conifer	15-20	12"	>6 ft.	100-140 ft.
Lodgepole Pine	15-20	8"	>8 ft.	120-160 ft.

b) GOSHAWKS:

INTENT STATEMENT: Goshawks are known to use interior forest habitats of mature/old growth structure. Habitat uses, nesting stand characteristics, and key habitat structural components in eastern Oregon/Washington are currently being studied. Until further information is known and management plans approved to insure species viability, the following standards are to be met as a minimum. Forest Plan standards and guidelines that EXCEED the levels described below should be used instead of, or in addition to, the following:

(1) Protect every known active and historically used goshawk nest-site from disturbance. "Historical" refers to known nesting activity occurring at the site in the last 5 years. Seasonal restrictions on activities near nest sites will be required for activity types that may disturb or harass pair while bonding and nesting.

(2) 30 acres of the most suitable nesting habitat surrounding all active and historical nest tree(s) will be deferred from harvest.

(3) A 400-acre "Post Fledging Area" (PFA) will be established around every known active nest site. While harvest activities can occur within this area, retain the LOS stands and enhance younger stands towards LOS condition, as possible.

e. Scenario B

Within a particular biophysical environment within a watershed, if the single, existing late and old structural (LOS) stage is WITHIN OR ABOVE HRV, OR if both types of LOS stages occur and BOTH are WITHIN OR ABOVE HRV, then timber harvest can occur within these stages as long as LOS conditions do not fall below HRV. Enhance LOS structural conditions and attributes as possible, consistent with other multiple use objectives.

The intent of the following direction is to maintain options by impacting large and/or contiguous stands of LOS as little as possible, while meeting other multiple use objectives.

1) Harvest activities, (any and all types being considered), can occur in the following stand types in order of priority:
    a) Activities should occur within stands other than LOS as a first priority.
    b) Second priority for harvest activities is within smaller, isolated LOS stands <100 acres in size, and/or at the edges (first 300 ft) of large blocks of LOS stands (≥ 100 acres).
    c) Some harvesting can occur, but only as a last priority, within the interior of large LOS stands (≥ 100 acres); REGENERATION AND GROUP SELECTION ACTIVITIES ARE NOT ALLOWED. REFER TO NON-FRAGMENTATION STANDARDS, 3), BELOW.
2) Maintain connectivity as directed in Scenario A, 3)
3) Non-fragmentation standards – Within the interior of large LOS stands ≥ 100 acres, (beyond 300 ft from edge), harvest activities are limited to non-fragmenting prescriptions such as thinning, single-tree selection (UEAM), salvage, understory removal, and other non-regeneration activities. Group selection (UEAM) is only allowed when openings created either mimic the natural forest pattern, and do not exceed ½ acre in size.
4) Adhere to wildlife prescriptions provided in SCENARIO A, 4) a) for snags, green tree replacements, and down logs; and 5) for goshawks with the following exception for goshawk post fledging areas in 5) c):

    A 400-acre "Post Fledging Area" (PFA) will be established around every active nest site. While harvesting activities can occur within this area, up to 60% of the area should be retained in an LOS condition, (i.e., if 35% of the area is now in LOS stands then it all needs to be retained; if 75% of the area is now in LOS stands then some can be harvested, as long as this late and old stand structure does not drop below 60% of the area).