United States Department of Agriculture | Forest Service | Umatilla National Forest | 2517 S.W. Hailey Avenue
Pendleton, OR 97801

File Code: 1900

Date: April 20, 2006

Dear Interested Party:

A Draft Environmental Impact Statement (DEIS) has been completed for School Fire Salvage Recovery Project. The project planning area is approximately 28,000 acres and is located in Columbia and Garfield Counties, Washington. Umatilla National Forest proposes to salvage harvest, reforest salvage units, treat activity fuels, and remove potential danger trees within the School Fire Salvage Recovery Project area. The attached vicinity map shows the location of the project on the Pomeroy Ranger District. The Forest Service proposes implementing this project in 2006. Proposed activities are outside the boundary of Willow Springs inventoried roadless area, Pataha Research Natural Area, and any congressionally designated areas, such as wilderness.

Three alternatives, including the No Action alternative, were analyzed in the DEIS. Alternative A is the No Action alternative. Alternative B, the proposed action and preferred alternative, would salvage harvest dead and dying trees on 9,432 acres, and remove danger trees along haul routes, open forest routes and developed recreation sites, and administrative sites. Alternative C is designed to remove danger trees and salvage harvest primarily dead trees on 4,188 acres where fire effects were obviously severe enough to kill 90 percent of trees, along with incidental amounts (less than 10 percent) of trees with visible green needles, within a unit. Both action alternatives (B and C) include Forest Plan amendments. The Forest Plan would be amended, for this site-specific project, to incorporate objectives, standards, and guidelines for Canada lynx, and would be amended to allocate new C1-Dedicated Old Growth areas to replace C1 areas changed by the fire and no longer functioning as old growth.

If you would like to view the DEIS check the internet at www.fs.fed.us/r6/uma/projects/readroom. If you would like an electronic copy of the DEIS on a CD-ROM or a paper copy, please contact Terri Jeffreys at the Pomeroy Ranger District office at (509) 843-1891.

It is anticipated that the Umatilla National Forest will be seeking an Emergency Situation Determination (ESD) based on substantial loss of economic value from the Chief of the Forest Service for part of the area analyzed in School Fire Salvage Recovery Project. The Chief will determine if an emergency situation exists pursuant to 36 CFR 215.10 (b). An emergency situation is defined in 36 CFR 215.2 as "A situation on National Forest System (NFS) lands for which immediate implementation of all or part of a decision is necessary for relief from hazards threatening human health and safety or natural resources on NFS or adjacent lands; or that would result in substantial loss of economic value to the federal government if implementation of the decision were delayed." The determination that an emergency situation exists does not exempt an activity from appeal. The determination only eliminates the automatic stays built into the appeal review process. If the Chief grants an ESD, notification to the public will occur in the legal notice of decision.

Public comments will be accepted for 45 days following the date of publication of the notice of availability (NOA) in the Federal Register that will occur on April 28, 2006. The purpose of this comment period is to provide an opportunity for the public to provide early and meaningful participation on a proposed action prior to a decision being made by the Responsible Official. Timing for the request for comments is in accordance with 36 CFR 215.5 dated June 4, 2003. Those who provide substantive comments during this comment period are eligible to appeal the decision under federal regulation 36 CFR 215.13. Written comments can be sent to the Responsible Official, Kevin D. Martin, Forest Supervisor, 2517 S.W. Hailey Avenue, Pendleton, Oregon 97801 or by fax (541) 278-3730. Oral comments must be provided at the Responsible Official's office during normal business house via telephone (541) 278-3716, TDD/TTY (541) 278-3995, or in person. Those wishing to provide oral comments should contact the Forest Supervisor or his representative to schedule their presentation. Electronic comments can be sent to comments-pacificnorthwest-umatilla@fs.fed.us. Electronic comments must be submitted as part of the actual e-mail message, or as an attachment in Microsoft Word, rich text format or portable document format only. E-mails submitted to e-mail addresses other than the one listed above or in other formats that those listed or containing viruses will be rejected. Comments may be hand delivered to 2517 S.W. Hailey Avenue, Pendleton, Oregon between 7:45 a.m. and 4:30 p.m., Monday through Friday.

Only persons who submit timely and substantive comments will be accepted as appellants. For appeal eligibility, each individual or representative from each organization submitting substantive comments must either sign the comments or verify identity upon request.

Please note that all comments received in response to this solicitation, including names and addresses of those who comment, will be considered part of the public record on this proposed action, and will be available for public inspection. Comments submitted anonymously will be accepted and considered; however, those who submit anonymous comments will not have standing to appeal the subsequent decision under 36 CFR Parts 215 or 217. Additionally, pursuant to 7 CFR 1.27 (d), any person may request the agency to withhold a submission from the public record by showing how the Freedom of Information Act (FOIA) permits such confidentiality. Persons requesting such confidentiality should be aware that under the FOIA, confidentiality may be granted in only very limited circumstances such as to protect trade secrets. The Forest Service will inform the requester of the agency's decision regarding the request for confidentiality, and where the request is denied; the agency will return the submission and notify the requester that the comments may be resubmitted with or without name and address (within 10 days).

The decision document for this project will be mailed to those who request it and/or to those individuals who submit comments during the 45-day comment period. If you need more information please contact Dean Millett, Project Leader, at the Pomeroy District office (509) 843-1891.

I appreciate the interest you have shown in this project and request your continued assistance in strengthening the management of resources in this area.

Sincerely,

KEVIN D. MARTIN
Forest Supervisor

Map attached

School Fire Salvage Recovery Project

Draft Environmental Impact Statement

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

United States Department of Agriculture

Forest Service

April 2006

Publication Number F14-POM-02-06

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

Lead Agency: **USDA Forest Service**

Responsible Official: **Kevin D. Martin, Forest Supervisor**
Umatilla National Forest
2517 S.W. Hailey Avenue
Pendleton, Oregon 97801

For Information Contact: **Dean Millett, Project Leader**
Pomeroy Ranger District
71 W. Main Street
Pomeroy, Washington 99347
(509) 843-1891

Abstract: The USDA Forest Service is proposing to salvage harvest fire-killed (dead) and fire-damaged (dying) trees, reforest salvage units, treat activity fuels and improve public safety by removing potential danger trees within the School Fire Salvage Recovery Project area. This project is located in Columbia and Garfield Counties, Washington on the Pomeroy Ranger District.

Three alternatives, including the No Action alternative, were analyzed in the DEIS. Alternative A is the No Action alternative. Alternative B, the proposed action and preferred alternative would salvage harvest dead and dying trees (9,432 acres), and remove danger trees along haul routes, open forest routes and developed recreation sites, and administrative sites. Alternative C is designed to salvage harvest primarily dead trees (4,188 acres) where fire effects were obviously severe enough to kill 90 percent of trees along with incidental amounts (less than 10 percent) of trees with visible green needles within a unit. Alternative C would also remove danger trees in the same sites as Alternative B.

The Responsible Official must receive comments on this Draft Environmental Impact Statements 45 days after the Environmental Protection Agency's (EPA) notice of availability appears in the Federal Register.

Reviewers should provide the Forest Service with their comments during the review period of the draft environmental impact statement. This will enable the Forest Service to analyze and respond to the comments at one time and to use information acquired in the preparation of the final environmental impact statement, thus avoiding undue delay in the decisionmaking process. Reviewers have an obligation to structure their participation in the National Environmental Policy Act process so that it is meaningful and alerts the agency to the reviewers' position and contentions. Vermont Yankee Nuclear Power Corp. v. NRDC, 435 U.S. 519, 553(1978). Environmental objections that could have been raised at the draft stage may be waived if not raised until after completion of the final environmental impact statement. City of Angoon v. Hodel (9th Circuit, 1986) and Wisconsin Heritages, Inc. v. Harris, 490 F. Supp. 1334, 1338 (E.D. Wis. 1980). Comments on the draft environmental impact statement should be specific and should address the adequacy of the statement and the merits of the alternatives discussed (40 CFR 1503.3).

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SUMMARY

INTRODUCTION

The Forest Service has prepared this Draft Environmental Impact Statement (DEIS) for the proposed salvage harvest of fire-killed (dead) and fire-damaged (dying) trees, and removal of potential danger trees along open forest travel routes, haul routes used for timber sale activity, recreation sites, and administrative sites within a portion of the School Fire perimeter.

This DEIS addresses: 1) the proposed action and two additional alternatives – including no action; 2) issues associated with the proposal; and 3) direct, indirect, and cumulative environmental effects that would result from implementation of the proposed action or any of the alternatives.

LOCATION and AREA

School Fire Salvage Recovery project area is located within the burned area perimeter of the August 2005 School Fire. This project specifically considers that portion of School Fire on National Forest System (NFS) land (approximately 28,000 acres). It is located on Pomeroy Ranger District in Columbia and Garfield Counties, Washington in T. 9 N., R. 40 E., Sections 13, 24, and 25; T. 9 N., R. 41 E., Sections 1-4, and 8-36; and T. 9 N., R. 42 E., Sections 1-12, 14-23, and 29-32 (see Vicinity Map at the end of this Chapter other maps are located in Appendix A).

It is within Upper Touchet River Watershed (North Patit Creek subwatershed); Upper Tucannon River Watershed (Little Tucannon River, Cummings Creek, Tumalum Creek, Headwaters of Tucannon River subwatersheds), and Pataha Creek Watershed (Headwaters Pataha Creek subwatershed). It contains habitat for federally listed Snake River/Columbia Basin anadromous fish and resident fish species, including bull trout.

Willow Springs inventoried roadless area (IRA) and Pataha Natural Research Area are located within School Fire Salvage Recovery project area.

BACKGROUND

School Fire was reported on August 5, 2005, in School Canyon approximately 17 miles southwest of Pomeroy, Washington on Washington Department of Fish and Wildlife (WDFW) land within Umatilla National Forest boundary, along Forest road (FR) 47. Within a short time the fire grew to approximately 50 acres in size. Once established in School Canyon, erratic winds sparked new starts on the east side of Tucannon River, generating uncharacteristic fire behavior for the remainder of the day. On August 6^{th} School Fire grew from 170 acres to nearly 30,000 acres. By August 13^{th} the fire had grown to 49,000 acres. Extreme fire weather conditions coupled with dry fuel conditions and high fuel loadings contributed to the intensity of the fire. On August 19^{th} the fire was declared 100 percent contained by the Incident Commander, and the burned area was listed at approximately 51,000 acres. Over half of the burned area was on Umatilla National Forest land (28,000 acres). Approximately 25 percent was on WDFW land, and the remaining portion on private and county lands (Columbia and Garfield Counties, WA).

A portion of WDFW land lies within School Fire Salvage Recovery project area, the remainder lies immediately north of the project area. WDFW operates Tucannon Fish Hatchery, W. T. Wooten Wildlife Area station and residence, and Camp Wooten, an Environmental Learning Center, which is leased to Washington State Parks and Recreation.

On private land, School Fire destroyed 109 residences/cabins and 106 additional outbuildings. Recreation residences at Stentz and Rose Springs escaped damage due to combined efforts of firefighters, rural fire departments, and private citizens.

Public safety measures and immediate restoration activities on burned areas of NFS lands occurred and have been a high priority for Pomeroy Ranger District personnel. During fire suppression approximately 8 miles of hand line (6 miles on NFS land) and 33 miles of dozer fire line and safety zones (21 miles of dozer line on NFS lands) were constructed. During fire suppression, Forest Service suppression crews removed imminent danger trees along designated roads.

Immediately following School Fire, a Burned Area Emergency Rehabilitation (BAER) team met to evaluate threats to resources, property, and human life. Burned Area Emergency Response (BAER) assessment team evaluated fire related erosion and runoff risk to life, property, and resources and made recommendations for emergency stabilization and weed reduction measures. Recommendations were based on results from fire severity mapping, evaluation of resource values at risk, and analysis of the cost-effectiveness of mitigation treatments. Treatments were targeted at high priority areas including: Pataha Creek, upper Tumalum, Cummings Creek, and an unnamed tributary to Camp Wooten where mulching treatments occurred in the headwaters.

In areas of steep terrain helicopters were used to spread seed. Mulch treatments (hydro-mulch, wheat straw mulch, and wood straw mulch) have been implemented on approximately 150 acres. Monitoring stations have been installed to evaluate treatment implementation and effectiveness of the three mulch types. Approximately 120 acres in Cummings Creek have been planted with shrubs (5,000 stems). Four culverts (plastic pipe) burned in School Fire have been replaced. Two catch basins were cleaned and rolling dips and drivable waterbars were constructed between culvert locations. Hand-pulling of knapweed in areas adjacent to the burn has been completed on approximately 25 acres. Other planned restoration projects such as riparian tree planting will occur in the spring and fall of 2006.

PURPOSE AND NEED FOR ACTION

The purpose of School Fire Salvage Recovery project is to salvage harvest dead and dying trees as a result of School Fire, and within the burned vicinity improve public safety by removing danger trees.

Field reconnaissance and post-fire satellite imagery were used to identify areas of low, moderate, and high mortality burning of overstory vegetation. First-order fire effects refer to the direct or immediate consequences of fire-caused heat injury (Reinhardt et al. 1997). Trees dying as a result of first-order fire effects have some combination of cambium, crown and root tissues killed by heat. For NFS lands in School Fire Salvage Recovery project area, about 15,830 forested acres may have experienced first-order fire effects severe enough to kill 75 percent or more of the trees (see map 1.1 on the following page). Second-order fire effects refer to the indirect or delayed consequences of fire-caused heat injury. Trees with injured cambium, crown or roots (a first-order fire effect) may be subsequently killed by insects, diseases or drought. Fire-caused injuries predispose trees to attack by insects or diseases (a second-order fire effect) and many of the attacks will result in tree mortality.

After a tree dies, it begins to deteriorate and lose economic value. Wood deteriorates in two ways; physical deterioration and grade deterioration. Wood borers and other insects, pouch fungus and similar decay fungi, are common agents causing physical wood deterioration (Lowell et al. 1992). The most common type of weather-related physical deterioration is checking[1] which typically causes a split or crack in the outside (sapwood) portion of a tree, or in a manufactured board. Grade deterioration is caused by fungi that stain the wood. While stain itself does not result in a physical deterioration of wood fiber, it does reduce the value of the final product.

Wood deterioration varies by species and refers to changes in wood strength or appearance that render wood unsuitable for traditional or general uses such as lumber products (Lowell et al. 1992). Estimates for all species combined on this project indicates that after one year merchantable volume will be reduced by 8.7 percent and value reduced by 12.2 percent. In year two and three, wood deterioration would increase rapidly with a commensurate reduction in value. By the end of year four both merchantable volume and value will have been reduced by 94 percent (McKetta and Carroll, 2006). There is a need to salvage harvest as rapidly as practicable to maximize economic benefits.

During fire suppression efforts, trees that posed an imminent danger were removed, however, additional standing dead, dying, and unsound green trees that represent a threat and danger to public safety have been identified. Within the burned vicinity there is a need to improve public safety by removing danger trees along open forest travel routes, haul routes used for timber sale activity, developed recreation sites, and administrative sites.

The fire killed trees in Canada lynx habitat and some of these areas could be impacted by timber, road, and fire management activities of the School Fire Salvage Recovery project. The current Forest Plan does not have management direction (objectives, standards, and guidelines) specific to Canada lynx. Management direction specific to Canada lynx applied to timber, road, and fire management activities of School Fire Salvage Recovery project would help avoid potential negative impacts to Canada lynx and its habitat. Therefore, there is a need to amend the Forest Plan to incorporate management direction for Canada lynx.

The fire killed trees in four Dedicated Old Growth management areas (C1), totaling approximately 1,600 acres. All or portions of these areas no longer function as old growth habitat. The Forest Plan states "in the event of catastrophic loss of existing designated old growth habitat causing a drop below the minimum distribution requirements, replacement units in the most advanced successional stage available will be selected in close proximity to the original locations" (FP p. 4-145). There is a need to allocate new C1 Dedicated Old Growth management areas to replace those changed by the fire.

PROPOSED ACTION

The ID team utilized information from site-specific reconnaissance, post-fire satellite data, and direction from the Forest Plan, as amended, to develop the proposed action. A more detailed description of the proposed action can be found in Chapter 2.

Umatilla National Forest proposes to salvage harvest, reforest salvage units, treat activity fuels, and remove potential danger trees within the School Fire Salvage Recovery project area. The Forest Service proposes implementing the project this project in 2006. Proposed activities are outside the boundary of

[1] The most common type of weather-related deterioration is checking, which is defined as a "separation of weed fibers on any surface of a log, timber, or board resulting from the release of tensile stresses set-up during drying" (Helms 1998).

Willow Springs inventoried roadless area, Pataha Research Natural Area, any congressionally designated areas, such as wilderness, and RHCAs, except for felling danger trees that would remain in RHCAs as coarse woody debris. Following are brief descriptions of activities proposed for implementation:

- ***Salvage Harvest* -** Salvage dead and dying trees from an estimated 9,432 acres. Only trees not likely to survive and having economic value would be harvested.
- ***Logging Systems* -** Ground-based harvesting by forwarder[2] would occur on approximately 2,624 acres in areas with a sustained slope less than 35 percent. Skyline logging[3] would occur on approximately 4,137 acres in areas where road systems are generally in place and topography is suited for this type of logging. Helicopter logging would occur on approximately 2,671 acres in areas where other systems of logging are not suitable.
- ***Reforestation* -** Reforestation by hand planting of trees would occur on an estimated 9,432 acres (salvage units). Small unmerchantable dead trees would be cut followed by broadcast burning on approximately 1,483 acres.
- ***Fuel Treatments* -** Treat activity fuels created by salvage harvest (approximately 9,432 acres) by lopping and scattering on an estimated 7,579 acres. This treatment includes cutting limbs and tops removed from the main stem of the tree (bole) and scattering them (downed wood and slash that is dropped in the trail in front of the processor, and driven over by the forwarder, distributes the weight of the machinery and reduces soil compaction levels). The remaining 1,853 acres would have trees yarded with tops attached. Of the estimated 9,432 acres treated for activity fuels, approximately 3,132 acres would be jackpot burned to further reduce activity fuels.
- ***Road Management* -** Utilize approximately 45 miles of open system roads, and 26 miles of closed system road to facilitate haul. Approximately 15 miles of previously decommissioned and unauthorized[4] roads would be used in a temporary manner. New temporary road construction would be less than 6 miles. All new temporary roads constructed and those used in a temporary manner would be decommissioned after project activity use. All system roads would remain the same after project use (open roads would remain opened and closed roads would continue to be closed).

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[2] Forwarder yarding utilizes two or more pieces of equipment. Trees are felled by either a track based feller/buncher or a processor. Hand felling is also an option with this system. Trees are then processed in the unit with branches and tops (slash) placed on the trail. Yarding of logs is accomplished with a forwarder. A forwarder is a wheeled piece of equipment that transports logs fully suspend from the ground. Since the trees are processed in the unit very little landing area is needed. Where available, most of the equipment operates on a slash mat. Operating on a slash mat, along with smaller landings, results in less soil disturbance than conventional ground based systems.

[3] Both skyline and helicopter systems utilize hand felling. In a skyline system, logs are yarded up the hill by a system of cables, and logs are either partially of fully suspended to reduce soil disturbance. In a helicopter system, logs are flown fully suspended from the unit to the landing. Skyline yarding landings are slightly smaller than conventional ground-based systems. Helicopter landings are larger than conventional ground based systems, but fewer landings are required than conventional ground-based systems. Both systems result in less ground disturbance than conventional ground based systems.

[4] Unauthorized or temporary road, formerly also referred to as a classified road. These are defined as roads on NFS lands that are not managed as part of the forest transportation system, such as unplanned roads, abandoned travel way, and off-road vehicle tracks that have not been designated and managed as a trail, and those roads that were once under permit or other authorization and were not decommissioned upon termination of authorization. Roads not authorized or necessary for long-term resource management.

- ***Danger Trees*** **-** Provide for public safety by cutting and removing danger trees. Danger trees would be removed 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, 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 removed along an estimated 71 miles of road. Danger trees that are within Riparian Habitat Conservation Areas (RHCAs) would be felled and left as coarse woody debris. All other danger trees would be removed and sold as part of a salvage sale if economically feasible.

- ***Snag Retention*** **–** Within each unit/stand proposed for salvage harvest, a minimum of 3 snags/acre ≥ 21 inches in diameter at breast height (dbh), if available, would be retained after treatments. If snags ≥21 inches in diameter are not available the next largest snags would be substituted. Hard snags would be selected for retention, with a preference for ponderosa pine and Douglas-fir. Soft snags are not considered merchantable, and therefore would not be removed from the unit. Snags would be distributed as individuals, scattered across the unit and in groups (3-5 snags). Generally, non-merchantable snags, < 10 inches) would be maintained within the unit, however, harvest activities may knockdown and/or breakup a portion of these snags. In addition, all salvage harvest units greater than 15 acres in size would retain clumps of snags no smaller than one acre in size and no larger than 3 acres. A clump would occur on every 15 acres in the unit. All snags, regardless of diameter would be retained within the clump. All snags in designated riparian corridors, within the harvest unit, would also be retained. In addition, all snags within RHCAs, inventoried roadless areas, ephemeral buffers, and untreated areas would be left across the landscape (see Appendix B-Implementation /Marking Guide).

- ***Stream Buffers*** **-** Designate stream buffers to meet Forest Plan standards as amended by PACFISH.

- ***Forest Plan Amendments*** **-** Amend the Forest Plan to incorporate management direction (objectives, standards, and guidelines) for Canada lynx (see Chapter 2 and Appendix J for details). The amendment applies only for the duration of School Fire Salvage Recovery project and to those actions proposed in lynx habitat. Amend the Forest Plan to reallocate four C1-Dedicated Old Growth management areas, totaling approximately 1,600 acres (see Appendix J for details).

TRIBAL and PUBLIC INVOLVEMENT

The scoping process required by NEPA (40 CFR 1501.7) to have an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action was followed. Umatilla Forest invited participation from Federal and State agencies, local Tribes, environmental groups and individuals interested in, or affected by, the proposed action.

Tribal contact:

- September 28, 2005 - Information sharing with Cultural Resource Department of Confederated Tribes of the Umatilla Indian Reservation (CTUIR) and Forest Zone Archeologist on School Fire Salvage Recovery.
- October 4, 2005 - Meeting with Cultural Resource Department of CTUIR to review project area with maps provided.
- October 7, 2005 – Letters sent to Tribes informing them of field trips (October 18th and October 20th) to tour the School Fire Salvage Recovery project area.

- November 15, 2005 – Field trip tour with Watershed Assessment representatives of Nez Perce Tribe (Ira Jones, Emmitt Taylor, and Paul Kraynak).

Public contact:

- October 7, 2005 – Approximately 230 letters were sent to individuals, State, Federal and local agencies and organizations, informing them of field trips (October 18^{th} and October 20^{th}) to tour the School Fire Salvage Recovery project area.
- Listing of proposed project in several editions of the Umatilla National Forest's quarterly publications of the Schedule of Proposed Actions (SOPA) beginning with the 2005 fall edition.
- October 18, 2005 – Field trip tour of School Fire Salvage Recovery project area -12 interested parties attended.
- October 25, Field trip tour of School Fire Salvage Recovery project area – 25 interested parties attended.
- October 26, 2005 - Notice of Intent published in the Federal Register (Vol. 70 No. 206).
- October 27, 2005 - Scoping letter and maps mailed to approximately 230 interested and affected parties. The letter described the proposed project and invited the public to comment on project activities.
- October 29, 2005 – Field trip tour of School Fire Salvage Recovery project area – 10 interested parties attended.
- November 1, 2005 – Field trip tour of School Fire Salvage Recovery project area for Pomeroy High School Agricultural Business Class to discuss social, political, economic, and environmental issues associated with the School Fire and proposed project. – 20 interested parties attended.
- November 8, 2005 – Open House at Pomeroy Ranger District to share information on proposed School Fire Salvage Recovery – 9 interested participants.
- November 8, 2005 – Field trip tour with Judi Olsen, aide to Patti Murray, U. S. Senator from Washington State.
- November 10, 2005 – Field trip tour with environmental reporter and photographer from Tri-City Herald newspaper.
- November 15, 2005 – Interview with Eric Barker of Lewiston Morning Tribune newspaper to discuss School Fire, and proposed School Fire Salvage Recovery.
- January 10, 2006 – Presentation by Chris Shulte to Lewiston Lions Club discussing School Fire spread, suppression efforts – initial and extended attack, and proposed salvage harvest.
- January 18, 2006 – Presentation by D. Groat to Asotin County Sportsman's Club, Clarkston, WA on proposed School Fire Salvage Recovery Project (10-15 individuals in attendance).
- February 6, 2006 – Presentation by D. Groat at the request of Washington State University Cooperative Extension Office in Garfield County, WA on the proposed School Fire Salvage Recovery Project (50-75 individuals in attendance).
- February 8, 2006 – Presentation by D. Groat to Native Plants Society, Whitman College, Walla Walla, WA (15-20 individuals in attendance).

Coordination has occurred with other Federal, State, and local government agencies. U.S. Fish and Wildlife Service (USFWS) have been kept informed of proposed activities. Numerous meetings have taken place throughout project planning, with Washington Department of Fish and Wildlife (WDFW) and Pomeroy Ranger District staff. WDFW has also kept Pomeroy District personnel informed of rehabilitation and salvage projects occurring and planned on State land, which is located within the School Fire Salvage Recovery project area.

Twenty-four responses were received from public scoping. All comments were reviewed by the Responsible Official and ID team.

ISSUE IDENTIFICATION

Tribes, federal and state agencies, individuals, and organized groups raised concerns during the scoping process about potential environmental impacts of the proposed action. Based on public input the ID team recommended and the Responsible Official approved the analysis topics listed below for study. Each topic is briefly described in this section and presented again in detail in the affected environment and environmental consequences (Chapter 3). Significant issues are discussed at the end of this section.

- **Soil Resources** – Loss of ground cover and surface organics following School Fire may have elevated the sensitivity of soils to additional effects from proposed activities. Proposed activities may change soil productivity as measured by changes in the amounts of detrimental soil disturbance caused by increased soil compaction, etc. On some areas, past activities may have already negatively affected soil productivity.

- **Water Quality/Fish Habitat –** Areas burned in the School Fire are especially susceptible to accelerated runoff, erosion, and sedimentation. Salvage harvest, road use, and prescribed burning may affect water quality, quantity, and time of flows through alteration of soil, site characteristics, and other conditions. The primary physical stream and riparian characteristics and fish habitat properties that may be affected by salvage harvest are streamside vegetation and water temperature; sediment and turbidity; and stream geomorphology featuring instream woody material and streambank stability.

- **Forest Vegetation –** School Fire killed trees within the fire perimeter causing changes in forest composition, structure, and density. Tree planting activities, consistent with the Forest Plan, will change the forested composition, structure, and density compared to areas reforested using natural regeneration.

- **Fuels –** School Fire altered the type, pattern, configuration, and availability of fuels. Post fire salvage harvest will add activity fuels (slash from limbs and tree tops) impacting short-term fire hazards.

- **Noxious Weeds –** School Fire altered the vegetation creating conditions conducive to the spread of noxious weeds. Proposed activities have the potential to introduce or spread existing populations of noxious weeds.

- **Proposed and Listed Threatened, Endangered, and Sensitive (TE&S) Species –** Aquatic, terrestrial, and plant TE&S species and their habitats could be affected by proposed management activities.

- **Wildlife Habitat -Old Growth -Snags–**School Fire burned approximately 1,600 acres of dedicated old growth within four designated areas (Management Area C1). The Cummings Creek area was completely burned over with 100 percent mortality and the other areas received varying amounts of mortality. Salvage harvest would affect the number of snags and down wood in the project area

- **Wildlife Habitat - Management Indicator Species - Neo-tropical Migratory Birds–** Proposed salvage harvest and road use could affect habitat characteristics for management indicator species and neo-tropical birds present within the project area.

- **Heritage Resources –** Project activities could affect heritage sites. Heritage resources are non-renewable resources that can be destroyed or damaged by ground disturbing activity.

- **Range –** The Pomeroy Cattle & Horse Allotment is within the School Fire Salvage Recovery project area. Grazing operations could be impacted by timber falling, yarding, and hauling.

- **Visuals/Scenery–** School Fire changed the scenery within the fire perimeter. Activities that include salvage harvest will further change the visual characteristics and scenery of the area.

- **Air Quality** – Post fire salvage harvest activities such as jackpot and broadcast burning may impact air quality of communities down wind. Dust created during timber haul can also affect air quality. Impacts to air quality must be consistent with the Clean Air Act.

- **Recreation** –A wide variety of recreational activities occurred in the area before the fire including dispersed camping, hunting, hiking and recreational site-seeing. All of these activities occurred both on and off roads. Proposed salvage activities such as timber falling, yarning, hauling, and road use restrictions could affect public safety, recreation use, and access to authorized forest roads

- **Economic and Social Analysis –** The economic returns from the proposed project will affect local and regional economies. Economic benefits and the financial efficiency to be derived from the proposed harvest will be evaluated.

- **Inventoried Roadless Areas (IRAs) -** Willow Springs IRA is within School Fire Salvage Recovery project area and Meadow Creek IRA is adjacent to the project area. No activities are proposed within either IRA, but proposed activities adjacent to them could impact the opportunity for solitude in both IRAs.

- **Undeveloped Character -** The undeveloped character within the School Fire perimeter could be impacted by salvage harvest and new road construction. Natural integrity characteristics such as scenic condition, fish and wildlife habitat, etc. as well as changes in the degree of solitude and primitive experience may be impacted.

Significant issues describe a dispute or present an unresolved conflict associated with potential environmental effects of the proposed action. Based on public input the ID team recommended and the Responsible Official approved the significant issues listed below for detailed study. Each significant issue described below includes a narrative statement with criteria or methods to measure change (effects).

No Harvest/Natural Reforestation

Some environmental groups and individuals who commented during the scoping period believe recovering economic value from dead trees is an inappropriate objective, particularly for public lands such as national forests. They believe the values associated with dead trees, such as snags and down wood are more important than potential revenues and related socioeconomic benefits (employment, income) derived from selling the salvaged timber. In addition, they also suggested there is no need for active reforestation and the best approach is to allow disturbance and successional processes to proceed unimpeded without human intervention. They offered the following publications in support of their position; American Lands Alliance (2005), Beschta et al. 1995, 2004, DellaSala et al. 2006, Donato et al. 2006, Karr et al. 2004, Lindenmayer et al. 2004, McIver and Starr (2000, 2001), and others. Some suggested the Forest Service end all commercial logging (green and salvage) on National Forests because the damage that could occur outweighs the potential economic benefits of commercial salvage logging.

Indicators:

- ♦ Acres harvested
- ♦ Socioeconomic indicators such as potential revenues
- ♦ Quality and quantity of available habitat for dependent wildlife

Harvesting Dying Trees
A number of respondents, who commented during the scoping period, expressed concern the proposed action will harvest trees that may have lived. The controversy centers on what constitutes a dead tree in a post-fire context and how that determination is made. They believe trees that currently have green needles should not be logged so they may contribute to future snags and provide habitat for wildlife and fish species. Only trees obviously dead (crowns totally consumed or scorched) should be considered for harvest.

Indicators:

- ♦ Acres of salvage harvest of dead trees.
- ♦ Acres of salvage harvest of dying trees.
- ♦ Quality and quantity of available habitat for dependent wildlife.

ALTERNATIVES CONSIDERED IN DETAIL

Alternative A – No Action

Purpose and Design:

- Alternative A responds to the significant issues of no harvest and natural reforestation and harvesting of dying trees.
- Provides a comparison between natural reforestation and effects associated with commercial harvest and reforestation using tree planting.
- Alternative A responds to the requirement to consider a no action alternative and serves as a baseline to compare effects.

Description:

In this document the no action alternative means all activities identified in the proposed action would not be approved or occur in the School Fire Salvage Recovery project area. Salvage harvest of fire-killed and damaged trees and tree planting in harvested units would not be authorized. There would be no construction of temporary roads or use of previously closed, decommissioned, and unauthorized roads in support of salvage harvest. No monitoring will be required in Alternative A.

Previously approved (ongoing) activities such as fire protection, monitoring, road maintenance, and including recommended BAER projects would continue as authorized and would proceed. Current biological and ecosystem functions would continue at their present rates. Removal of danger trees along open forest travel routes, developed recreation sites, and administrative sites and other tree planning to reforest the area would be analyzed in a separate NEPA document.

Alternative B – Proposed Action (Preferred Alternative)

Purpose and Design:

- Alternative B was designed to respond to the agency's purpose of and need for action.
- Salvage harvest to recover the maximum economic value of a portion of dead and dying trees consistent with the Forest Plan.
- Improve public safety by removing danger trees along open forest travel routes (including haul routes used for timber sale activity), developed recreation sites, and administrative sites.
- Alternative B is the proposed action and preferred alternative.
-

Description:

Salvage Harvest – An estimated 9,432 acres would be commercially harvested. Only dead and dying trees would be removed. Mortality determination would be based on the Blue Mountain National Forest's standard protocol to evaluate fire-injured trees when determining the probability of their survival for up to one year after a fire (up to five years for mature, large-diameter ponderosa pine) would be used. This protocol is known as the "Scott Guidelines" (Scott et al. 2002, 2003). The specific measurement criteria the District proposed to use to implement the protocol was reviewed by Don Scott, the primary author of the Guidelines and he concurred with them (Scott 2005). The protocol is also compatible with Pacific Northwest Region direction regarding conifer mortality determination (Goodman 2005, Schmitt and Filip 2005).

This alternative would salvage harvest clearly dead trees, trees rated by Scott Guidelines with a low probability to survive, and trees with a moderate probability to survive having dead cambium on three or more quadrants (see Appendix B – Implementation/Marking Guide for additional information).

Salvage harvest would begin in 2006. An estimated 85 million board feet (MMBF) of wood fiber would be recovered. No commercial treatments are planned within any PACFISH riparian habitat conservation areas (RHCAs), inventoried roadless areas, or research natural areas. Harvest of dead trees over 21 inches in diameter would occur where consistent with the Forest Plan (see Appendix C for Consistency with Eastside Screens).

Harvest Methods – Ground-based harvesting by forwarder would occur on approximately 2,624 acres in areas with a sustained slope less than 35 percent. Forwarder yarding utilizes two or more pieces of equipment. The trees are felled by either a track based feller/buncher or a processor. Hand felling is also an option with this system. Trees are then processed in the unit with branches and tops (slash) placed on the trail. Yarding of logs is accomplished with a forwarder. A forwarder is a wheeled piece of equipment that transports logs fully suspend from the ground. Since the trees are processed in the unit very little landing area is needed. Where available, most of the equipment operates on a slash mat. Operating on a slash mat, along with smaller landings, results in less soil disturbance than conventional ground based systems.

Skyline logging would occur on approximately 4,137 acres in areas where road systems are generally in place and topography is suited for this type of logging. Helicopter logging would occur on approximately 2,671 acres in areas where other systems of logging are not suitable. Timber would be felled by hand (chainsaws in skyline and helicopter units) and by either hand or feller buncher in forwarder units.

Both skyline and helicopter systems utilize hand felling. In a skyline system, logs are yarded up the hill by a system of cables, and logs are either partially of fully suspended to reduce soil disturbance. In a helicopter system, logs are flown fully suspended from the unit to the landing. Skyline yarding landings are slightly smaller than conventional ground-based systems. Helicopter landings are larger than conventional ground based systems, but fewer landings are required than conventional ground-based systems. Both systems result in less ground disturbance than conventional ground based systems.

Reforestation – Reforestation by hand planting of trees would occur on an estimated 9,432 acres (salvage units). Approximately 1,483 acres of the salvaged area would be treated for site preparation and long-term site protection. Treatment would include cutting of small unmerchantable dead trees followed by broadcast burning.

Activity Fuels Treatments **–** Treat activity fuels created by salvage harvest (approximately 9,432 acres) by lopping and scattering on an estimated 7,579 acres. This treatment includes cutting limbs and tops removed from the main stem of the tree (bole) and scattering them (downed wood and slash that is dropped in the trail in front of the processor, and driven over by the forwarder, distributes the weight of the machinery and reduces soil compaction levels). The remaining 1,853 acres would have trees yarded with tops attached. Of the estimated 9,432 acres treated for activity fuels, approximately 3,132 acres would be jackpot burned to further reduce activity fuels.

Road Management – Approximately 45 miles of open system roads, and 26 miles of closed system roads would be used for hauling. Approximately 15 miles of previously decommissioned and unauthorized roads would be temporarily used. Approximately 6 miles of new temporary road would be constructed. System roads would remain the same after the project is completed (open roads would remain opened and closed roads would continue to be closed). Public access would be restricted in some areas during active haul for public and operational safety.

All new temporary roads constructed and those used in a temporary manner would be decommissioned after project activity use.

Danger Tree Removal **-** Danger trees would be removed 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, 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 removed 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.

Along roadways a danger tree is considered to be any tree that has an imminent or likely potential to fail within one and one-half tree lengths of an open Class 3 or higher system road, any road designated for hauling, and developed recreation or administrative sites. Danger trees would be evaluated in accordance with the *Field Guide for Danger Tree Identification and Response*, Pacific Northwest Region, 2005. Trees considered likely to fail include all dead trees and some live trees with specific diseases and/or damage. Trees that have a potential to reach roads, developed recreation sites, and administrative sites would be evaluated based on tree height, slope, lean, and other factors.

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.*

Snag Retention – Within each unit/stand proposed for salvage harvest, a minimum of 3 snags/acre ≥ 21 inches in diameter at breast height (dbh), if available, would be retained after treatments. If snags ≥21 inches in diameter are not available the next largest snags would be substituted. Hard snags would be selected for retention, with a preference for ponderosa pine and Douglas-fir. Soft snags are not considered merchantable, and therefore would not be removed from the unit. Snags would be distributed as individuals, scattered across the unit and in groups (3-5 snags). Generally, non-merchantable snags, < 10 inches) would be maintained within the unit, however, harvest activities may knockdown and/or breakup a portion of these snags. In addition, all salvage harvest units greater than 15 acres in size would retain clumps of snags no smaller than one acre in size and no larger than 3 acres. A clump would occur on every 15 acres in the unit. All snags, regardless of diameter would be retained within the clump. All snags in designated riparian corridors, within the harvest unit, would also be retained. In addition, all snags within RHCAs, inventoried roadless areas, ephemeral buffers, and untreated areas would be left across the landscape (see Appendix B-Implementation /Marking Guide).

Forest Plan Amendments – the following amendments are proposed for this alternative.

- ► The Umatilla National Forest Land and Resource Management Plan would be amended to incorporate objectives, standards, and guidelines for Canada lynx. Objectives would be incorporated into the Forest Plan on page 4-29, below Table 4-10 and above the paragraph starting with "Biological evaluation…" Standards and guidelines would be incorporated into the Forest Plan on page 4-91; bottom of the page, following Peregrine Falcon Habitat, with a heading for Canada lynx. The amendment would apply only for the duration of, and to those actions proposed in lynx habitat for the site-specific project called School Fire Salvage Recovery. Appendix J provides a description of the objectives, standards, and guidelines to be incorporated in the Forest Plan for this site-specific project).

- ► Amend the Forest Plan to re-locate four C1- Dedicated Old Growth management areas to new locations. Appendix A contains a map displaying the changes in land allocation. Appendix J includes two tables that display the changes in acreage by land allocation.

Design Features and Management Requirement - Design features and management requirements address the following resources:

- Water Quality
- Air Quality
- Soils
- Noxious Weeds
- Cultural Resource
- Wildlife
- Recreation
- Public Safety

Monitoring - Forest Service personnel will conduct monitoring for this proposed project prior to project activity, during project activity, and post project activity as described Chapter 2. Anticipated effectiveness of each monitoring element for School Fire Salvage Recovery project area is considered high.

Alternative C

Purpose and Design:

- Alternative C responds to the significant issues - harvesting of dying trees and no harvest and natural reforestation.
- Harvests primarily dead trees where fire effects were obviously severe enough (100 percent crown consumption or scorch) to kill at least 90 percent of trees. Trees with visible green needles would comprise 10 percent or less within a given unit.
- It responds to concerns about the values associated with dead trees, such as snags and down wood, Alternative C prohibits salvage harvest in the four former C1-Dedicated Old Growth management areas and prohibits harvest of trees over 21 inches in diameter.
- Improves public safety by removing danger trees (not removed during fire suppression) along open forest travel routes, developed recreation sites, and administrative sites.

Description:

Salvage Harvest – An estimated 4,188 acres would be commercially harvested. Obviously dead trees (100 percent crown consumption or scorch) would be removed. Trees with visible green needles would comprise 10 percent or less within a given unit. Scott Guidelines would be used to determine mortality on incidental trees with green needles within these units.

There would be no salvage harvest in any of the four former C1-Dedicated Old Growth management areas reallocated to new management area designations.

Salvage harvest would begin in 2006. This alternative would recover an estimated 39 MMBF of wood fiber. There would be no harvest of trees over 21 inches in diameter. No commercial treatments are planned within any PACFISH riparian habitat conservation areas (RHCAs), inventoried roadless areas, or research natural areas.

Harvest Methods. Ground-based harvesting by forwarder would occur on approximately 951 acres in areas with a sustained slope less than 35 percent. Skyline logging would occur on approximately 1,626 acres in areas where road systems are generally in place and topography is suited for this type of logging. Helicopter logging would occur on approximately 1,611 acres in areas where other systems of logging are not suitable. Timber would be felled by hand (chainsaws in skyline and helicopter units) and by either hand or feller buncher in forwarder units.

Reforestation –Reforestation by hand planting would occur on an estimated 4,188 acres in areas affected by salvage harvest. Of these acres, approximately 925 acres would be treated for site preparation and long-term site protection. Treatment would include cutting of small unmerchantable dead trees followed by broadcast burning.

Tree planting objectives and planting recommendations are the same as Alternative B.

Fuels Treatment – Treat activity fuels created by salvage harvest (approximately 4,188 acres) by lopping and scattering on an estimated 3,687 acres. This treatment includes cutting limbs and tops removed from the main stem of the tree (bole) and scattering them to reduce fuel concentration and to provide for soil stability. The remaining 501 acres would have trees yarded with tops attached. Of the estimated 4,188 acres treated for activity fuels, approximately 760 acres would be jackpot burned to further reduce activity fuels.

Road Management – Approximately 45 miles of open system roads, and 18 miles of closed system road would be used for hauling merchantable material. Less than 10 miles of previously decommissioned would be used in a temporary manner. Approximately 3 miles of new temporary road would be constructed. All new temporary roads constructed and those used in a temporary manner would be decommissioned after use for project activities. System road use would remain the same after the project is completed (open roads would remain opened and closed roads would continue to be closed). Public access will be restricted in some areas during active haul of merchantable material.

Decommissioning would be the same as described in Alternative B.

Danger Tree Removal – This alternative would use the same criteria for identifying danger trees as described in Alternative B. For this alternative, danger trees would be removed from an estimated 63 miles of road.

Snag Retention – Same as Alternative B.

Forest Plan Amendment**s** – Same as Alternative B.

Design Features and Management Requirements **–** Same as Alternative B.

Monitoring – Same as Alternative B.

COMPARISON OF ALTERNATIVES

The following tables compare alternatives by activity and effects.

Table S-1 Comparison of Alternatives by Activity

Activity	Unit Of Measure	Alternative A	Alternative B	Alternative C
Harvest				
Salvage harvest	Acres % of area	0 0	9,432 (34% of 28,000 acres)	4,188 15% of 28,000 acres)
Estimated volume of timber removed	million board feet (MMBF)	0	85	39
Logging System				
Forwarder Skyline Helicopter	acres acres acres	0 0 0	2,624 4,137 2,671	951 1,626 1,611
Fuels Treatment (Activity Fuels)				
Lop and Scatter	acres	0	7,579	3,687
Tops yarded	acres	0	1,853	501
Jackpot Burn	acres	0	3,132	760
Reforestation				
Plant	acres	0	9,432	4,188
Site Prep (Slash and Broadcast Burn)	acres	0	1,483	925
Roads				
New temporary construction	miles	0	6	3
Unauthorized or previously decommissioned roads used in a temporary manner	miles	0	15	10
Open roads used for haul	miles	0	45	45
Closed roads used for haul	miles	0	26	18
Danger Tree Removal	miles	0	71	63
Forest Plan Amendments **(1) Incorporate management direction for lynx** **(2) Reallocated C1-Dedicated Old Growth units and replace with new C1 units**	Yes/No	No No	Yes Yes	Yes Yes

Table S-2 Comparison of Effects by Issue and Alternative

ISSUE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
SOILS			
Detrimental Soil Condition (Acres)	657 acres (out of 9,432)	726 acres (out of 9,432) (increase of 69 acres)	
	366 acres (out of 4,188)		292 acres (out of 4,188 (decrease of 74 acres)
Effective Ground Cover	Recover at current rate	No unit would have effective ground cover below Forest Plan standards and guidelines because of implementation of operational design criteria, choice of operation systems, use of BMPs, and contractual control. Both alternatives would meet Forest Plan standards and guidelines. Effects would be short-term.	
Woody Debris	Wood levels would not be changed in any area.	All units would retain sufficient organic matter to maintain long-term soil and site productivity.	
HYDROLOGY/WATER QUALITY			
Riparian Condition and Function	No difference in the quality or timeframe of the recovery of riparian condition or function would be seen between Alternative A – No Action and Alternatives B and C.		
Road Density (during project activity)	No change	0.1 to 0.4 increase by subwatershed	0.1 to 0.2 increase by subwatershed
Road Density – net reduction (post-project activity)	0 miles	6miles - unauthorized roads decommissioned	4 miles – unauthorized roads decommissioned
Miles of Road in RHCAs	No change between Alternative A – No Action, and Alternatives B and C		
Wood Recruitment Potential	No change between Alternative A – No Action, and Alternatives B and C		
Water Temperature	There would be no difference between Alternative A and Alternatives B and C in the recovery of water temperature that is related to shade.		
Sediment (modeled tons)	Year 3 – 24,026 tons Year 4 – 24,026 tons Year 5 – 24,026 tons	Year 3- 25,052 tons Year 4 – 24,271 tons Year 5 – 23,996 tons	Year 3 – 24,741 tons Year 4 – 24,229 tons Year 5 – 24,007 tons
FISH			
Temperature	Increase likely due to loss of shade until shade restored to pre-fire levels	Slightly accelerated (5 years) shade development with riparian replanting within 5 years.	Same as Alternative B

ISSUE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Substrate Conditions (cobble embeddedness, percent fine sediment)	First 5 years: Increase through natural processes likely first 2 years post-fire. Decrease with time thereafter to natural levels. Long-term: (5 years plus). Chronic inputs at pre-fire levels	First 5 years: Potential increase relative to Alternative A (< 3% total over 2 years). Decline with time to levels comparable to Alternative A. Long-term (5 years plus). Chronic levels reduced slightly relative to Alternative A	First 5 years: Potential increase relative to Alternative A (<2 percent total over 2 years). Decline with time to levels Comparable to Alternative A. Long-term (5 years plus). Chronic levels reduced more than with Alternative A, less than with Alternative B.
Large Wood	Increase through natural processes over next 5-15 years	Same as Alternative A	Same as Alternative A
Pools	Naturally variable through natural post-fire processes; long-term increase likely on NFS lands, associated with increases in Large Wood	Same as Alternative A, except pool frequencies slightly lower due to management-induced 2-year pulse of additional sediment (<3 percent) may fill some pools.	Same as Alternative B, except <2 percent additional sediment relative to Alternative A.
Fish Passage	Fish passage at 3 culverts may be intermittently affected by bedload movement in unstable channels.	Long-term improvement with culvert upgrades within 5 years.	Same as Alternative B.
VEGETATION			
Species Composition (Year 2015) Nonstocked (Percent of acres)	64%	56%	56%
Forest Structure (Year 2055) Stand Initiation Old Forest (Percent of acres)	46% 15%	21% 18%	21% 18%
Tree Density (Year 2055) Low density (Percent of acres)	73%	56%	56%

ISSUE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
FUELS			
Fuel Loading (CWD) Above historic and acceptable range in year 2035 (acres and percent of area)	16,238 acres (79% of Area)	8,153 acres (40% of Area)	11,825 acres (58% of Area)
Resistance-to-Control Extreme rating in year 2035 (acres and percent of area)	7,004 acres (34% of Area)	3,468 acres (17% of Area)	4,618 acres (22% of Area)
NOXIOUS WEEDS			
Acres at High Risk to infestations	3,510 acres	4,490 acres	Subset of Alt. B (exact acres at high risk not modeled)
TE&S PLANTS			
Effects Determination Threatened & Endangered Sensitive	No Effect No Impact	No Effect No Impact	No Effect No Impact
WILDLIFE			
Effects to Threatened, Endangered, and Sensitive Wildlife Species	No impacts or effects to TES species.	Calif. Wolverine (S) - No Impact Gray Wolf (E) – No Effect Canada Lynx (T) and Bald Eagle (T) - May affect, but will not likely adversely affect Canada lynx and bald eagle.	Same as Alternative B.
Dedicated Old Growth (C-1) and late old structure stands.	Replacements would not be designated to compensate for the burned Dedicated Old Growth.	Consistent with the Forest Plan, replacement C1 Dedicated Old Growth areas would be designated.	Same as Alternative B.
	Burned C1 would remain classified as Dedicated Old Growth until the Forest Plan is revised.	Consistent with Forest Plan, C1 units would be allocated to a new management area.	Same as Alternative B.
	No harvest would occur in burned Dedicated Old Growth (C1) or in other late old stand structure.	Harvest would occur consistent with new land allocation.	No harvest would occur in management areas previously allocated to C1.

ISSUE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Elk (MIS). Cover, forage, roads	A gradual increase in cover and decrease in forage would occur.	No areas currently classified as satisfactory or marginal cover would be changed to a forage condition. Conifer tree planting establishes forest cover sooner as compared to natural plant succession.	Same as Alternative B Open road densities would not change.
	Open road densities would not change.	Same as Alternative A	Same as Alternative A
Martin, Pileated woodpecker' and cavity excavators (MIS): affected habitat and snag density.	Habitat for some MIS species would not be affected.	Activities would not occur in existing marten or pileated woodpecker habitat.	Same as Alternative B.
	Snag densities for primary cavity excavators exceed Forest Plan standards.	Same As Alternative A	Same as Alternative A
Percent of habitat ≥ 50 percent tolerance interval in School Fire Salvage Recovery analysis area			
Lewis's woodpecker (≥ 10")	79%	46%	64%
Lewis's woodpecker (≥ 20")	59%	34%	59%
White-headed woodpecker	70%	37%	55%
Three-toed woodpecker	77%	63%	68%
Black-backed woodpecker	46%	25%	35%
Level of assurance for selected primary cavity excavators in the Tucannon-Asotin analysis area			
Lewis woodpecker (≥ 10")	Moderate to High	Moderate	Moderate to High
Lewis's woodpecker (≥ 20")	Moderate	Low to Moderate	Moderate
White-headed woodpecker	Moderate	Low to Moderate	Moderate
Three-toed woodpecker	Moderate	Moderate	Moderate
Black-backed woodpecker	Moderate	Low	Low to Moderate

ISSUE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
HERITAGE			
Disturbance to sites	None	None	None
RANGE			
Forage Response	In the short-term forage response would increase, but in the long-term forage availability would decrease because of an abundance of dead and down material which would reduce the capability of new forage growth.	Forage would be readily available over a longer period of time due to removal of dead and dying trees and less accumulation of material on the ground.	Same as Alternative B
Permittee Access	No effect to current access	Same as Alternative A	Same as Alternative A
Livestock Distribution	Over time as snags fall and material accumulates on the ground livestock distribution and grazing patterns would be disrupted.	Removal of dead and dying trees would reduce livestock distribution and grazing patterns.	Same as Alternative B
VISUAL/SCENERY			
Visual Quality Objective (VQO)	Does not meet	Does not meet VQO, but fits exception	Does not meet VQO, but fits exception
Rehabilitation	No rehabilitation	Rehabilitation of 9,432 acres	Rehabilitation of 4,188 acres
AIR QUALITY			
Air quality conditions	No Effect	Over the long-term future prescribed fire entries and wildfires would have lower smoke emissions than Alternative C because more acres (9,432 acres) have large woody debris reduced by treatments	Over the long-term future prescribed fire entries and wildfires would have more smoke emissions than Alternative B because less acres (4, 188 acres) have large woody debris reduced by treatments

ISSUE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
RECREATION			
Recreational Use	Any reduction in use would be because of fire effects such as, loss of wildlife and habitat, short-term loss of visual quality, and opportunities for personal use forest products. No major reduction in recreational use is anticipated.	In addition to any reduction in use because of the effects of the fire there would be some short-term public safety restrictions in use during harvesting activities. Temporary closing of roads and delays on arterial roads during project activity are expected. Upon completion of project activities recreational use would return to similar to pre-School Fire levels.	Same as Alternative B
Public Safety	All snags would be retained, except for those identified as unsafe. Threat to public safety remains.	Danger trees would be removed along approximately 71 miles of designated Class 3, 4, and 5 Forest roads, along haul routes for timber sale activities (regardless of Class), in developed recreation sites , and administrative sites. Threat to public safety reduced.	Same as Alternative B, except danger trees would be removed along approximately 63 miles of road. Threat to public safety reduced.
SOCIAL AND ECONOMIC ANALYSIS			
Gross Spending – Garfield County	$0	$1,042,305	$427,384
Vicinity Direct Income Increase	$0	$2,512,290	$1,075,250
Employment (local and non-local) number of jobs	0	133.8	57.3
Project Costs	$0	$4,765,307	$2,175,503
INVENTORIED ROADLESS AREAS			
Natural Integrity	No Effect	No Effect	No Effect
Opportunity for Solitude	No Effect	Short-term audio and visual effects from salvage harvest activities near the area. Short-term presence of smoke during fire treatments	Same as Alternative B
Appearance and Attractions	No Effect	No Effect	No Effect

ISSUE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
UNDEVELOPED CHARACTER			
Natural Integrity	No Effect	Short-term visual and audio effects from salvage harvest activities and fire treatments. Short-term presence of smoke during fire treatments Beneficial long-term effect of decommissioning unauthorized temporary roads in the area.	Same as Alternative B
Opportunity for Solitude	Activities on adjacent state and private land would continue	Short-term visual and audio effects from salvage harvest activities and fire treatments. Short-term presence of smoke during fire treatments Activities on adjacent private and state land would continue.	Same as Alternative B
Appearance and Attractions	No Effect	No Effect	No Effect
NO HARVEST/NATURAL REFORESTATION			
Acres Harvested	0	9,432	4,188
Potential Revenues	$0	$11,597,258	$5,223,133
Quality and Quantity of available habitat for dependent wildlife	See Wildlife section	See Wildlife section Some dead and dying trees 21 inch or greater dbh would be harvested.	See Wildlife section No dead trees 21 inch or greater dbh would be harvested.
HARVESTING DYING TREES			
Acres of predominantly dead trees salvage harvested	0	4,188	4,188
Acres of predominantly dying trees salvage harvested	0	5,244	0
Quality and Quantity of available habitat for dependent wildlife	Same as above.		

Table S-3 Comparison of How Each Alternative Responds to the Purpose and Need

PURPOSE AND NEED	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Need to salvage harvest as rapidly as practicable before decay and other wood deterioration occurs to maximize potential economic benefits.			
% Volume Lost by Year Year 1 Year 2 Year 3 Year 4 Year 5	No salvage harvest	-8.7% -44.2% -75.1% -94.0% -100.0%	-8.2% -42.9% -73% -92.5% -100.0%
% Value Lost by Year Year 1 Year 2 Year 3 Year 4 Year 5	No salvage harvest	-12.2% -48.1% -77.5% -94.7% -100%	-11.7% -47.1% -75.8% -93.5% -100.0%
Need to improve public safety by removing danger trees along open forest travel routes, haul routes used for timber sale activity, developed recreation sites, and administrative sites.			
Public Safety	See effects under Recreation in table above.		
Need to amend the Forest Plan to incorporate management direction for Canada lynx			
Forest Plan Amendment included	No	Yes	Yes
Need to amend the Forest Plan to allocate new C1 Dedicated Old Growth management areas to replace those changed by the fire			
Forest Plan Amendment included	No	Yes	Yes

Chapter 1

Purpose and Need

School Fire

Salvage Recovery Project

Chapter 1

Purpose and Need

INTRODUCTION

The Forest Service has prepared this Draft Environmental Impact Statement (DEIS) for the proposed salvage harvest of fire-killed (dead) and fire-damaged (dying) trees, and removal of potential danger trees along open forest travel routes, haul routes used for timber sale activity, recreation sites, and administrative sites within a portion of the School Fire perimeter.

This DEIS addresses: 1) the proposed action and two additional alternatives – including no action; 2) issues associated with the proposal; and 3) direct, indirect, and cumulative environmental effects that would result from implementation of the proposed action or any of the alternatives.

Maps for this document are located in Appendix A.

DOCUMENT ORGANIZATION

This DEIS has been prepared in compliance with the National Forest Management Act (NMFA), the National Environmental Policy Act (NEPA), other relevant Federal and State laws and regulation, and Umatilla National Forest Land and Resource Management Plan (Forest Plan).

Format for this DEIS follows the Council on Environmental Quality (CEQ) recommended format (40 CFR 1502.10). Chapters contain the following information:

Chapter 1– Purpose and Need: Includes a brief description of the area, purpose of and need for action, the agency's proposal for achieving the purpose and need, and a listing of what decisions are to be made.

Chapter 2 – **Alternatives**: Describes in more detail the agency's proposed action as well as alternative methods of achieving the purpose and need, and measures used to mitigate environmental effects. It includes information on how the public was informed, and a description of "key" and other tracking issues relevant to the proposed action. .

Chapter 3 - Affected Environment and Environmental Consequences: This chapter describes the affected environment, the current condition of resources involved, and the environmental effects of implementing the proposed action and other alternatives. This chapter is organized by resource.

Chapter 4 – **List of Preparers and Public Involvement** Contains a list of those who helped prepare this document, and a list of individuals, organizations, and agencies receiving this document. It also provides a glossary of terms, literature cited, and index.

Appendices - Provides more detailed information and maps used to support the analysis presented in the DEIS.

LOCATION and AREA

School Fire Salvage Recovery project area is located within the burned area perimeter of the August 2005 School Fire. This project specifically considers that portion of School Fire on National Forest System (NFS) land (approximately 28,000 acres). It is located on Pomeroy Ranger District in Columbia and Garfield Counties, Washington in T. 9 N., R. 40 E., Sections 13, 24, and 25; T. 9 N., R. 41 E., Sections 1-4, and 8-36; and T. 9 N., R. 42 E., Sections 1-12, 14-23, and 29-32 (see Vicinity Map at the end of this Chapter other maps are located in Appendix A).

It is within Upper Touchet River Watershed (North Patit Creek subwatershed); Upper Tucannon River Watershed (Little Tucannon River, Cummings Creek, Tumalum Creek, Headwaters of Tucannon River subwatersheds), and Pataha Creek Watershed (Headwaters Pataha Creek subwatershed). It contains habitat for federally listed Snake River/Columbia Basin anadromous fish and resident fish species, including bull trout.

Willow Springs inventoried roadless area (IRA) and Pataha Natural Research Area are located within School Fire Salvage Recovery project area.

BACKGROUND

School Fire was reported on August 5, 2005, in School Canyon approximately 17 miles southwest of Pomeroy, Washington on Washington Department of Fish and Wildlife (WDFW) land within Umatilla National Forest boundary, along Forest road (FR) 47. Within a short time the fire grew to approximately 50 acres in size. Once established in School Canyon, erratic winds sparked new starts on the east side of Tucannon River, generating uncharacteristic fire behavior for the remainder of the day. On August 6th School Fire grew from 170 acres to nearly 30,000 acres. By August 13th the fire had grown to 49,000 acres. Extreme fire weather conditions coupled with dry fuel conditions and high fuel loadings contributed to the intensity of the fire. On August 19th the fire was declared 100 percent contained by the Incident Commander, and the burned area was listed at approximately 51,000 acres. Over half of the burned area was on Umatilla National Forest land (28,000 acres). Approximately 25 percent was on WDFW land, and the remaining portion on private and county lands (Columbia and Garfield Counties, WA).

A portion of WDFW land lies within School Fire Salvage Recovery project area, the remainder lies immediately north of the project area. WDFW operates Tucannon Fish Hatchery, W. T. Wooten Wildlife Area station and residence, and Camp Wooten, an Environmental Learning Center, which is leased to Washington State Parks and Recreation.

On private land, School Fire destroyed 109 residences/cabins and 106 additional outbuildings. Recreation residences at Stentz and Rose Springs escaped damage due to combined efforts of firefighters, rural fire departments, and private citizens.

Public safety measures and immediate restoration activities on burned areas of NFS lands occurred and have been a high priority for Pomeroy Ranger District personnel. During fire suppression approximately 8 miles of hand line (6 miles on NFS land) and 33 miles of dozer fire line and safety zones (21 miles of dozer line on NFS lands) were constructed. During fire suppression, Forest Service suppression crews removed imminent danger trees along designated roads.

Immediately following School Fire, a Burned Area Emergency Response (BAER) team met to evaluate threats to resources, property, and human life. Burned Area Emergency Response (BAER) assessment team evaluated fire related erosion and runoff risk to life, property, and resources and made recommendations for emergency stabilization and weed reduction measures. Recommendations were based on results from fire severity mapping, evaluation of resource values at risk, and analysis of the cost-effectiveness of mitigation treatments. Treatments were targeted at high priority areas including: Pataha Creek, upper Tumalum, Cummings Creek, and an unnamed tributary to Camp Wooten where mulching treatments occurred in the headwaters.

In areas of steep terrain helicopters were used to spread seed. Mulch treatments (hydro-mulch, wheat straw mulch, and wood straw mulch) have been implemented on approximately 150 acres. Monitoring stations have been installed to evaluate treatment implementation and effectiveness of the three mulch types. Approximately 120 acres in Cummings Creek have been planted with shrubs (5,000 stems). Four culverts (plastic pipe) burned in School Fire have been replaced. Two catch basins were cleaned and rolling dips and drivable waterbars were constructed between culvert locations. Hand-pulling of knapweed in areas adjacent to the burn has been completed on approximately 25 acres. Other planned restoration projects such as riparian tree planting will occur in the spring and fall of 2006.

PURPOSE AND NEED FOR ACTION

The purpose of School Fire Salvage Recovery project is to salvage harvest dead and dying trees as a result of School Fire, and within the burned vicinity improve public safety by removing danger trees.

Field reconnaissance and post-fire satellite imagery were used to identify areas of low, moderate, and high mortality burning of overstory vegetation. First-order fire effects refer to the direct or immediate consequences of fire-caused heat injury (Reinhardt et al. 1997). Trees dying as a result of first-order fire effects have some combination of cambium, crown and root tissues killed by heat. For NFS lands in School Fire Salvage Recovery project area, about 15,830 forested acres may have experienced first-order fire effects severe enough to kill 75 percent or more of the trees (see Figure 1.1 on the following page). Second-order fire effects refer to the indirect or delayed consequences of fire-caused heat injury. Trees with injured cambium, crown or roots (a first-order fire effect) may be subsequently killed by insects, diseases or drought. Fire-caused injuries predispose trees to attack by insects or diseases (a second-order fire effect) and many of the attacks will result in tree mortality.

After a tree dies, it begins to deteriorate and lose economic value. Wood deteriorates in two ways; physical deterioration and grade deterioration. Wood borers and other insects, pouch fungus and similar decay fungi, are common agents causing physical wood deterioration (Lowell et al. 1992). The most common type of weather-related physical deterioration is checking[1] which typically causes a split or crack in the outside (sapwood) portion of a tree, or in a manufactured board. Grade deterioration is caused by fungi that stain the wood. While stain itself does not result in a physical deterioration of wood fiber, it does reduce the value of the final product.

[1] The most common type of weather-related deterioration is checking, which is defined as a "separation of weed fibers on any surface of a log, timber, or board resulting from the release of tensile stresses set-up during drying" (Helms 1998).

Figure 1-1 (map 1-1) Predicted tree mortality (fire severity) for National Forest System lands in the School Fire analysis area. Fire severity characterizes the effect of fire on the ecosystem; for forestland ecosystems, trees are the dominant lifeform and fire severity is characterized as ranges of predicted tree mortality.

Wood deterioration varies by species and refers to changes in wood strength or appearance that render wood unsuitable for traditional or general uses such as lumber products (Lowell et al. 1992). Estimates for all species combined on this project indicates that after one year merchantable volume will be reduced by 8.7 percent and value reduced by 12.2 percent. In year two and three, wood deterioration would increase rapidly with a commensurate reduction in value. By the end of year four both merchantable volume and value will have been reduced by 94 percent (McKetta and Carroll, 2006).

Harvesting dead and dying trees in the School Fire Salvage Recovery project could provide direct and indirect benefits to the local and regional economy. In addition, revenues produced by selling the salvage timber (Knutson-Vandenberg trust funds collected from the timber purchaser) could be available to help finance post-fire restoration activities. There is a need to salvage harvest as rapidly as practicable before decay and other wood deterioration occurs to maximize potential economic benefits.

During fire suppression efforts, trees that posed an imminent danger were removed, however, additional standing dead, dying, and unsound green trees that represent a threat and danger to public safety have been identified. Within the burned vicinity there is a need to improve public safety by removing danger trees along open forest travel routes, haul routes used for timber sale activity, developed recreation sites, and administrative sites.

The fire killed trees in Canada lynx habitat and some of these areas could be impacted by timber, road, and fire management activities of the School Fire Salvage Recovery project. The current Forest Plan does not have management direction (objectives, standards, and guidelines) specific to Canada lynx. Management direction specific to Canada lynx applied to timber, road, and fire management activities of School Fire Salvage Recovery project would help avoid potential negative impacts to Canada lynx and its habitat. Therefore, there is a need to amend the Forest Plan to incorporate management direction for Canada lynx.

The fire killed trees in four Dedicated Old Growth management areas (C1), totaling approximately 1,600 acres. All or portions of these areas no longer function as old growth habitat. The Forest Plan states "in the event of catastrophic loss of existing designated old growth habitat causing a drop below the minimum distribution requirements, replacement units in the most advanced successional stage available will be selected in close proximity to the original locations" (FP p. 4-145). There is a need to allocate new C1 Dedicated Old Growth management areas to replace those changed by the fire.

The purpose and need for this project is responsive to and consistent with the following Forest Plan goals:

- ► To recover some economic value for the community from the burned timber ("salvage harvest") before it loses its value and meet local, regional, and national social and economic needs (FP p. 4-1).
- ► Provide for timber harvest to help meet local and national demand for wood products consistent with various resource objectives (FP p. 4-2).
- ► Provide and manage a safe and economical road and trail system and facilities needed to accomplish the land and resource management and protection objectives on the Forest (FP p. 4-3).
- ► Provide for production of wood fiber consistent with various resource objectives, environmental constraints, and considering cost efficiency (FP p.4-67).

PROPOSED ACTION

The ID team utilized information from site-specific reconnaissance, post-fire satellite data, and direction from the Forest Plan, as amended, to develop the proposed action. A more detailed description of the proposed action can be found in Chapter 2.

Umatilla National Forest proposes to salvage harvest, reforest salvage units, treat activity fuels, and remove potential danger trees within the School Fire Salvage Recovery project area. The Forest Service proposes implementing the project this project in 2006. Proposed activities are outside the boundary of Willow Springs inventoried roadless area, Pataha Research Natural Area, any congressionally designated areas, such as wilderness, and RHCAs, except for felling danger trees that would remain in RHCAs as coarse woody debris. Following are brief descriptions of activities proposed for implementation:

- ♦ ***Salvage Harvest* -** Salvage dead and dying trees from an estimated 9,432 acres. Only trees not likely to survive and having economic value would be harvested.
- ♦ ***Logging Systems* -** Ground-based harvesting by forwarder[2] would occur on approximately 2,624 acres in areas with a sustained slope less than 35 percent. Skyline logging[3] would occur on

[2] Forwarder yarding utilizes two or more pieces of equipment. Trees are felled by either a track based feller/buncher or a processor. Hand felling is also an option with this system. Trees are then processed in the unit with branches and tops (slash) placed on the trail. Yarding of logs is accomplished with a forwarder. A forwarder is a wheeled piece of equipment that transports logs fully suspend from the ground. Since the trees are processed in the unit very little landing area is needed. Where available, most of the equipment operates on a slash mat. Operating on a slash mat, along with smaller landings, results in less soil disturbance than conventional ground based systems.

approximately 4,137 acres in areas where road systems are generally in place and topography is suited for this type of logging. Helicopter logging would occur on approximately 2,671 acres in areas where other systems of logging are not suitable.

- ***Reforestation -*** Reforestation by hand planting of trees would occur on an estimated 9,432 acres (salvage units). Small unmerchantable dead trees would be cut followed by broadcast burning on approximately 1,483 acres.

- ***Fuel Treatments -*** Treat activity fuels created by salvage harvest (approximately 9,432 acres) by lopping and scattering on an estimated 7,579 acres. This treatment includes cutting limbs and tops removed from the main stem of the tree (bole) and scattering them (downed wood and slash that is dropped in the trail in front of the processor, and driven over by the forwarder, distributes the weight of the machinery and reduces soil compaction levels). The remaining 1,853 acres would have trees yarded with tops attached. Of the estimated 9,432 acres treated for activity fuels, approximately 3,132 acres would be jackpot burned to further reduce activity fuels.

- ***Road Management -*** Utilize approximately 45 miles of open system roads, and 26 miles of closed system road to facilitate haul. Approximately 15 miles of previously decommissioned and unauthorized[4] roads would be used in a temporary manner. New temporary road construction would be less than 6 miles. All new temporary roads constructed and those used in a temporary manner would be decommissioned after project activity use. All system roads would remain the same after project use (open roads would remain opened and closed roads would continue to be closed).

- ***Danger Trees -*** Provide for public safety by cutting and removing danger trees. Danger trees would be removed 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, 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 removed along an estimated 71 miles of road. Danger trees that are within Riparian Habitat Conservation Areas (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.

- ***Snag Retention –*** Within each unit/stand proposed for salvage harvest, a minimum of 3 snags/acre ≥ 21 inches in diameter at breast height (dbh), if available, would be retained after treatments. If snags ≥21 inches in diameter are not available the next largest snags would be substituted. Hard snags would be selected for retention, with a preference for ponderosa pine and Douglas-fir. Soft snags are not considered merchantable, and therefore would not be removed

[3] Both skyline and helicopter systems utilize hand felling. In a skyline system, logs are yarded up the hill by a system of cables, and logs are either partially of fully suspended to reduce soil disturbance. In a helicopter system, logs are flown fully suspended from the unit to the landing. Skyline yarding landings are slightly smaller than conventional ground-based systems. Helicopter landings are larger than conventional ground based systems, but fewer landings are required than conventional ground-based systems. Both systems result in less ground disturbance than conventional ground based systems.

[4] Unauthorized or temporary road, formerly also referred to as a classified road. These are defined as roads on NFS lands that are not managed as part of the forest transportation system, such as unplanned roads, abandoned travel way, and off-road vehicle tracks that have not been designated and managed as a trail, and those roads that were once under permit or other authorization and were not decommissioned upon termination of authorization. Roads not authorized or necessary for long-term resource management.

from the unit. Snags would be distributed as individuals, scattered across the unit and in groups (3-5 snags). Generally, non-merchantable snags, < 10 inches) would be maintained within the unit, however, harvest activities may knockdown and/or breakup a portion of these snags. In addition, all salvage harvest units greater than 15 acres in size would retain clumps of snags no smaller than one acre in size and no larger than 3 acres. A clump would occur on every 15 acres in the unit. All snags, regardless of diameter would be retained within the clump. All snags in designated riparian corridors, within the harvest unit, would also be retained. In addition, all snags within RHCAs, inventoried roadless areas, ephemeral buffers, and untreated areas would be left across the landscape (see Appendix B-Implementation /Marking Guide).

- ***Stream Buffers* -** Designate stream buffers to meet Forest Plan standards as amended by PACFISH.

- ***Forest Plan Amendments* -** Amend the Forest Plan to incorporate management direction (objectives, standards, and guidelines) for Canada lynx (see Chapter 2 and Appendix J for details). The amendment applies only for the duration of School Fire Salvage Recovery project and to those actions proposed in lynx habitat. Amend the Forest Plan to reallocate four C1-Dedicated Old Growth management areas, totaling approximately 1,600 acres (see Appendix J for details).

LAWS AND POLICY

Development of this DEIS follows implementing regulations of the National Forest Management Act (NMFA); Title 36, Code of Federal Regulations, Part 219 (36 CFR 219); and Council of Environmental Quality, Title 40; CFR, Parts 1500-1508, National Environmental Policy Act (NEPA).

Many federal and state laws, including the Endangered Species Act, Clean Air Act, and Clean Water Act also guide this analysis. Following is a brief description of the laws and policies applicable to this analysis:

American Antiquities Act of 1906

This Act makes it illegal to appropriate, excavate, injure, or destroy any historic, prehistoric ruin or monument, or any object of antiquity, situated on lands owned by the Government of the United States, without permission of the Secretary of the Department of the Agency having jurisdiction over the lands on which said antiquities are situated.

National Historic Preservation Act of 1966, as amended

This Act requires Federal agencies to consult with American Indian Tribes, State and local groups before nonrenewable cultural resources, such as archaeological and historic structures, are damaged or destroyed. Section 106 of this Act requires Federal agencies to review the effect project proposals may have on cultural resources in the project area.

Endangered Species Act of 1973, as amended

The purposes of this Act are to "*provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such tests as may be appropriate to achieve the purpose of the treaties and conventions set forth in subsection (a) of this section.*" The Act also states "*It is further declared to be the policy of congress that all Federal departments and agencies shall seek to* *conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of this Act.”*

Migratory Bird Treaty Act of 1918

This Act is to establish an international framework for the protection and conservation of migratory birds. The Act makes it illegal, unless permitted by regulation, to *pursue, hunt, take, capture, deliver for shipment, ship, cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, including in this Convention…for the protection of migratory birds…or any part, nest, or egg of any such bird”* (16 USC 703). The original 1918 statue implemented the 1916 Convention between the United States and Great Britain (for Canada). Later amendments implemented treaties between the United States and Mexico, Japan, and the Soviet Union (now Russia).

National Environmental Policy Act (NEPA) of 1969 as amended

Purposes of this Act are “To declare a national policy which will encourage productive and enjoyable harmony between man and his environment, to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nations; and to establish a Council on Environmental Quality” (42 USC Sec. 4321). The law further states “*it is the continuing policy of the Federal Government, in cooperation, to use all practical means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of the present and future generation of Americans.”* This law essentially pertains to public disclosure and participation, environmental analysis, and documentation.

Clean Water Act, as amended in 1977 and 1982

Primary objective of this Act is to restore and maintain the integrity of the Nation’s waters. This objective translates into two fundamental national goals: 1) Eliminate the discharge of pollutants into the nation’s waters; and 2) Achieve water quality levels that are fishable and swimmable. This Act established a non-degradation policy for all federally proposed projects. Under Section 303(d) of the Clean Water Act, the State has identified water quality-limited water bodies in Washington.

Clean Air Act, as amended in 1990

Purposes of this Act are “*to protect and enhance the quality of the Nation’s air resources so as to promote the public health and welfare and the productive capacity of its population; to initiate and accelerate a national research and development program to achieve the prevention and control of air pollution; to provide technical and financial assistance to state and local governments in connection with the development and execution of their air pollution prevention and control programs; and to encourage and assist the development and operation of regional air pollution prevention and control programs.”*

Multiple-Use Sustained-Yield Act of 1960

This Act requires the Forest Service to manage National Forest System lands for multiple uses (including timber, recreation, fish and wildlife, range, and watershed). All renewable resources are to be managed in such a way that they are available for future generations. The harvesting and use of standing timber can be considered a short-term use of a renewable resource. As a renewable resource, trees can be re-established and grown again if the productivity of the land is not impaired.

Migratory Bird Executive Order (EO) 13186

On January 10, 2001, President Clinton signed an Executive Order (EO 13186) titled "Responsibilities of Federal Agencies to Protect Migratory Birds." This EO required the "*environmental analysis of Federal actions, required by NEPA or other established environmental review processes, evaluated the effects of actions and agency plans on migratory birds, with emphasis on species of concern."*

Floodplains and Wetlands (EO 11988 and 11990)

These 1977 orders are to "*…avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development…"* and similarly "*…avoid to the extent possible the long and short-term adverse impact associated with the destruction or modification of wetlands.*"

Executive Order 13112 (invasive species)

This 1999 order requires Federal agencies whose actions may affect the status of invasive species to identify those actions and within budgetary limits, "*(i) prevent the introduction of invasive species; (ii) detect and respond rapidly to and control populations of such species… (iii) monitor invasive species populations… (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded, … (v) promote public education on invasive species… and not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species… unless, pursuant to guidelines that it has prescribed, the agency had determined and made public… that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions."*

Executive Order 13287 (preserve America)

This 2003 order's intent is to preserve America's heritage though "*actively advancing the protection, enhancement, and contemporary use of the historic properties owned by the Federal Government… The Federal Government shall recognize and manage the historic properties in its ownership as assets that can support department and agency missions while contributing to the vitality and economic well-being of the Nation's communities and fostering a broader appreciation for the development of the United States and its underlying values…"*

Environmental Justice (EO 12898)

On February 11, 1994, President Clinton signed Executive Order 12898. This order directs each Federal agency to make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. On the same day the President also signed a memorandum emphasizing the need to consider these types of effects during NEPA analysis. On March 24, 1995, the Department of Agriculture completed an implementation strategy for the executive order. Where Forest Service proposals have the potential to disproportionately and adversely affect minority or low-income populations these effects must be considered and disclosed (and mitigated to the degree possible) through the NEPA analysis and documented.

Prime Farmland, Rangeland, and Forestland Memorandum

All alternatives are in accordance with the Secretary of Agriculture's Memorandum 1827 for prime farmland, rangeland, and forestland. "Prime" forestland is a term used only for non-Federal land.

Consumers, Civil Rights, Minorities, and Women

No adverse effects on civil rights, women, and minorities not already identified in the FEIS for the Forest Plan would be expected to result from implementation of any alternative. All action alternatives would be governed by Forest Service contracts, which are awarded to qualified contractors and/or purchasers regardless of race, color, sex, religion, etc. Such contracts also contain nondiscrimination requirements.

National Forest Management Act (NFMA) of 1976

This act guides development and revision of National Forest Land Management Plans and has several sections to it ranging from required reporting that the Secretary must submit annually to Congress to preparation requirements for timber sale contracts. There are several important sections within the act.

The National Forest Management Act of 1976 (NFMA), as implemented by the Code of Federal Regulations, states that “when trees are cut to achieve timber production objectives, the cuttings shall be made in such a way as to assure that the technology and knowledge exists to adequately restock the lands within 5 years after final harvest” (36 CFR 219.27(c) (3)).

FOREST PLAN DIRECTION

The Land and Resource Management Plan for Umatilla National Forest (referred to as the Forest Plan) (USDA Forest Service 1990), provides most of the management direction for the School Fire Salvage Recovery project.

The Forest Plan made land allocations using management areas, each of which emphasizes a particular Desired Future Condition (DFC). Forest Plan standards and guidelines provide direction for achieving the DFC.

Additional management direction is provided by Forest Plan amendments approved since 1990, including two amendments in particular:

- “Interim Management Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales” (USDA Forest Service 1995; also known as Eastside Screens); and
- “Interim Strategies for Managing Anadromous Fish-Producing Watersheds on Federal Lands in Eastern Oregon and Washington, Idaho and Portions of California” (USDA Forest Service and USDI Bureau of Land Management 1994; also known as PACFISH).

PACFISH (FP amendment #10; approved 2/24/1995) establishes management direction designed to arrest and reverse declines in anadromous fish habitat (USDA Forest Service and USDI Bureau of Land Management 1994).

The Eastside Screens (FP amendment #11; approved 6/12/1995) focuses on the potential impact of timber sales on riparian habitat, historical vegetation patterns, and wildlife fragmentation and connectivity (USDA Forest Service 1995).

The following table gives a brief description of goals, and standards and guidelines (relative to the proposed action) for the nine Forest Plan management areas located within the project area (28,000 acres).

Salvage harvest activities are proposed in management areas A4, C3, C4, C8, and E2 (see Appendix A for Management Area maps).

Table 1-1 lists management areas within School Fire Salvage Recovery project area by pre-fire acres, and by acres that would be reallocated from the burned C1-Dedicated Old Growth areas that no longer function as old growth. The selection of reallocated management areas was based on the adjacency to the burned C1 units.

Table 1-1 Designated Management Areas within School Fire Salvage Recovery Project Area

Management Area	Description	Goal	Acres Pre-fire	Acres After Reallocation of burned C1 units
A4	Viewshed 2	Manage the area seen from a travel route, use area, or water body, where forest visitors have a major concern for the scenic qualities as a natural appearing to slightly altered landscape. Productive (capable) forestlands within an A4 allocation area are suitable for timber management (scheduled); salvage timber harvest, tree planting and all other timber management practices and intensities are permitted when consistent with visual quality objectives (FP, pages 4-105 to 110). “Exceptions to created opening size and maximum percentage in created openings at one time are permitted under conditions of catastrophic occurrence such as blow down, insect and disease attacks, wildfire and others. Landscapes will be rehabilitated under these conditions.” Low intensity prescribed fire is acceptable.	828	828
A6	Developed Recreation	Provide recreation opportunities that are dependent on the development of structural facilities for user conveniences where interaction between users and evidence of others is prevalent. Created openings or tree removal shall occur to accommodate facility development, provide scenic views, or meet vegetation management goals within, and surrounding, the developed recreation sites. Productive (capable) forestlands within an A6 allocation area are not suitable for timber management (nonscheduled); salvage timber harvest or any other tree removal is nonscheduled and would occur only to meet recreation objectives such as reducing the risk of public injury from hazardous trees (FP, pages 4-117 to 120).	133	133

Management Area	Description	Goal	Acres Pre-fire	Acres After Reallocation of burned C1 units
C1	Dedicated Old Growth	Provide and protect sufficient suitable habitat for wildlife species dependent upon mature and/or overmature forest stands, and promote a diversity of vegetative conditions for such species. Productive (capable) forestlands within a C1 allocation area are not suitable for timber management and tree harvest will not be scheduled or permitted. Fuelwood cutting, salvage timber harvest or the removal of any dead or down material will not be permitted unless an old-growth unit is lost as a result of catastrophic conditions (FP, pages 4-144 to 146). Natural fuel treatments are permitted	1,598	0
C3	Big Game Winter Range	Manage big game winter range to provide high levels of potential habitat effectiveness and high quality forage for big game species. Productive (capable) forestlands within a C3 allocation area are suitable for timber management (scheduled); all timber management practices and intensities are permitted when they are consistent with the big game and wildlife habitat goals. Salvage timber harvest of tree mortality is permitted, consistent with meeting big game winter range objectives. All types of prescribed fire may be used.	8,323	8,816
C4	Wildlife Habitat	Manage forest lands to provide high levels of potential habitat effectiveness for big game and other wildlife species with emphasis on size and distribution of habitat components (forage and cover areas for elk, and snags and dead and down materials for all cavity users). Unique wildlife habitats and key use areas will be retained of protected. Productive (capable) forestlands within a C4 allocation area are suitable for timber management (scheduled); salvage timber harvest, tree planting and all other timber management practices and intensities are permitted when consistent with the wildlife habitat goals (FP, pages 4-158 to 162). All types of prescribed fire may be used.	543	543

Management Area	Description	Goal	Acres Pre-fire	Acres After Reallocation of burned C1 units
C5	Riparian and Wildlife	Maintain or enhance water quality, and produce a high level of potential habitat capability for all species of fish and wildlife within the designated riparian while providing for a high level of habitat effectiveness for big game. Productive (capable) forestlands within a C5 allocation area are suitable for timber management (scheduled); salvage timber harvest, tree planting and all other silvicultural practices and intensities are permitted when compatible with water quality and anadromous fish and wildlife habitat goals (FP, pages 4-163 to 166). Prescribed fire may be used.	694	873
C8	Grass-Tree Mosaic	On areas known as grass-tree mosaic, provide high levels of potential habitat effectiveness, high quality forage for big game wildlife species, visual diversity, and protect erosive soils. Productive (capable) forestlands within a C8 allocation area are not suitable for timber management (nonscheduled), although silvicultural activities (harvest, reforestation, etc.) are permitted when analysis shows they are needed to achieve objectives for big-game habitat and other wildlife species. Salvage timber harvest is permitted only as a result of catastrophic conditions (FP, pages 4-171 to 174). Prescribed fire may be used.	2,440	2,785
D2	Research Natural Area	Preserve naturally occurring physical and biological units where natural conditions and processed are maintained. Productive (capable) forestlands within a D2 allocation area are not suitable for timber management (non-scheduled), and any cutting and removal of vegetation is prohibited except as part of an approved scientific investigation (FP, pages 4-175 to 177). Prescribed fire must be authorized in a management plan to be used as a tool to mimic natural fire …	63	63

Management Area	Description	Goal	Acres Pre-fire	Acres After Reallocation of burned C1 units
E2	Timber and Big Game	Manage forest lands to emphasize production of wood fiber (timber), encourage forage production, and maintain a moderate level of big game and other wildlife habitat. Timber management activities for E2 areas will maintain a blend of tree species with a preference for ponderosa pine, western larch, interior Douglas-fir and lodgepole pine. Emphasis will be on prevention of stand and fuels conditions favoring pest increases above endemic levels. Productive (capable) forestlands within an E2 allocation area are suitable for timber management (scheduled); salvage timber harvest, tree planting and all other silvicultural practices and intensities are permitted (FP, p. 4-182 to 186). Prescribed fire may be used.	13,050	13,633
		Total	27,672	27,672

TIERING AND INCORPORATING BY REFERENCE

In order to eliminate repetition and focus on site-specific analysis, this DEIS is tiered to the following documents as permitted by 40 CFR 1502.20.

- The ***Umatilla National Forest Land and Resource Management Plan (Forest Plan)*** **FEIS** and Record of Decision (ROD) dated June 11, 1990 and all subsequent NEPA analysis for amendments, and the accompanying ***Land and Resource Management Plan(LRMP)*** **as amended (Forest Plan).** The Forest Plan guides all natural resource management activities and establishes management standards and guidelines for the Umatilla National Forest. It describes resource management practices, levels of resource production and management, and the availability and suitability of lands for resource management.

- This DEIS is tiered to a broader scale analysis (**the Pacific Northwest Region Final Environmental Impact Statement for the Invasive Plant Program, 2005, hereby referred to as the R6 2005 FEIS**). The R6 2005 FEIS culminated in a Record of Decision (R6 2005 ROD) that amended the Umatilla National Forest Plan by adding management direction relative to invasive plants. This project is intended to comply with the new management direction.

This DEIS also incorporates by reference the following documents:

- The **Biological Opinion for the** ***Implementation of Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH***) from National Marine Fisheries Service dated January 23, 1995. PACFISH itself does not propose any ground-disturbing actions, but sets in place certain riparian management goals and management direction with the intent of arresting the degradation and beginning the restoration of riparian and stream habitats.

- The **Biological Opinion on the *Land and Resource Management Plans for the Boise, Challis, Nez Perce, Payette, Sawtooth, Umatilla and Wallowa-Whitman National Forests*** from National Marine Fisheries Service, dated March 1, 1995. National Marine Fisheries has identified a set of goals, objectives, and guidelines that will apply to watershed and site-specific consultations until Land and Resource Management Plans are amended. Conformance with the provisions of this Opinion, in combination with implementation of PACFISH, should provide reasonable certainty that site-specific actions will not result in jeopardy to listed salmon or adverse modification of critical habitat.

- The **Biological Opinion for the *Effects to Bull Trout from Continued Implementation of Land and Resource Management Plans and Resource Management Plans as Amended by the Interim Strategy for Managing Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, Western Montana, and Portions of Nevada (INFISH), and the Interim Strategy for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH*)** from National Marine Fisheries Service, dated August 14, 1998. This BO addresses the effects of continued implementation of LRMPs as amended by PACFISH standards and guidelines where listed distinct population segments of bull trout occur in Idaho, Montana, Oregon, and Washington.

- The **Biological Opinion - *Land and Resource Management Plans for National Forests and Bureau of Land and Management Resource Areas in the Upper Columbia River Basin and Snake River Basin Evolutionarily Significant Units*** by National Marine Fisheries Service dated June 22, 1998. This BO addresses the effects of continued implementation of the 18 LRMPs as amended by PACFISH standards and guidelines on Snake River salmon and steelhead.

- Ruediger, et al. 2000, ***Canada* Lynx *Conservation Assessment and Strategy (*LCAS**) as amended. Direction for use of the Lynx. Science Report and LCAS to promote lynx conservation and its habitat on federal lands administered by the USDA Forest Service and USDI Fish and Wildlife Service is found in the February 2000 Canada Lynx Conservation Agreement extended to December 31, 2005.

- ***Tucannon Ecosystem Analysis,*** Umatilla National Forest, August 2002. A watershed-level ecosystem analysis of current and reference conditions along with recommendations for restoration.

- ***Environmental Assessment for the Management of Noxious Weeds***, Umatilla National Forest, May 1995. Implements a long-term integrated weed management program on 773 specific noxious weed management projects beginning in 1995.

- ***USDA Forest Service Guide to Noxious Weed Prevention Practices*** Version 1.0, July 5, 2001. A comprehensive directory of weed prevention practices for use in Forest Service planning and wildland resource management activities and operations. Identified weed prevention practices that mitigate identified risks of weed introduction and spread for a project or program.

- ***The Pomeroy Ranger District Motorized Access and Travel Management Plan,*** Pomeroy Ranger District, July 1993. A comprehensive program resulting in a transportation system which provides for a broad mix of both motorized and non-motorized recreation opportunities while moving toward Forest Plan desired future conditions.

- ***Analysis of Umatilla National Forest Road System,*** completed January 2003. Forest-scale analysis in determining the minimum road system needed to meet resource and other management objectives.

- The ***Integrated Scientific Assessment for Ecosystem Management in the Interior Columbia Basin*** released 1996. Links landscape, aquatic, terrestrial, social, and economic characterizations to described biophysical and social systems.

- ***Salmonid Project Design Criteria Compliance Worksheet – Blue Mountain Provincial Expedited Process*** July, 2004. Expedited consultation process for mid-Columbia River Steelhead and Columbia River Bull Trout.

Project Record

This DEIS hereby incorporates by reference the project record (hereafter, referred to as the analysis file) [40 CFR 1502.21]. The analysis file contains resource specialist reports and other technical documentation used to support the analysis and conclusions in this DEIS. Specialists reports are included for the following: soil, water quality, fish, vegetation, Historic Range of Variability (HRV), noxious weeds, visuals, fire and fuels, air quality, roads analysis, heritage, economics, terrestrial wildlife species and habitats, management indicator species, Biological Evaluations for TE&S aquatic, terrestrial, and plant species, and deadwood habitat (DecAID analysis). Other sources of information, documents, published studies, and books referred to in the analysis file and this document are also included.

Relying on specialists reports and analysis file helps implement the CEQ regulations' provision that agencies should reduce NEPA paperwork (40 CFR 1500.4), that environmental documents shall be analytic rather than encyclopedic, and that EISs/EAs shall be kept concise and no longer than absolutely necessary (40 CFR 1502.2). The objective is to furnish enough site-specific information to demonstrate a reasoned consideration of the environmental impacts of the alternatives and how these impacts can be mitigated, without repeating detailed analysis and background information available elsewhere. Additional documentation and more detailed analyses of project area resources are located in the School Fire Salvage Recovery project analysis file located at the Pomeroy Ranger District, Pomeroy, Washington.

TREATY RIGHTS

The Forest Service, through the Secretary of Agriculture, is vested with statutory authority and responsibility for managing resources of the National Forests. No sharing of administrative or management decision-making power is held with any other entity. However, commensurate with the authority and responsibility to manage is the obligation to consult, cooperate, and coordinate with Indian Tribes in developing and planning management decisions regarding resources on National Forest system land that may affect tribal rights.

Locally, School Fire Salvage Recovery project area lies within the area ceded to the United States government by the Nez Perce Indians, and partially within the area ceded to the Unites States by the Confederated Tribes of the Umatilla Indians (CTUIR) as a result of the Treaties of 1855. Both Tribes were contacted during the scoping phase of the project. Elements of respective Indian cultures, such as tribal welfare, land, and resources were entrusted to the United States government as a result of the treaties. Trust responsibilities resulting from the treaties dictate, in part, that the United States government facilitate the execution of treaty rights and traditional cultural practices of the CTUIR and Nez Perce Indians by working with them on a government to government basis in a manner that attempts a reasonable accommodation of their needs, without compromising the legal positions of the respective tribes or the federal government.

Specific treaty rights applicable to that land base managed by the Umatilla National Forest area generally articulated in Article I of the CTUIR Treaty of 1855 and Article III of the 1855 Nez Perce Treaty, include:

"The exclusive right of taking fish in all the streams where running through or bordering said reservation is further secured to said Indians; as also the right of taking fish at all usual and accustomed places in common with citizens of the Territory; and of erecting temporary buildings for curing, together with the privilege of hunting, gathering roots and berries, and pasturing their horses and cattle upon open and unclaimed land."

Although the 1855 Treaties do not specifically mandate the federal government to manage habitats, there is an implied assumption that an adequate reserve of water be available for executing treaty related hunting and fishing activities.

Comments received from the tribes reflect the following concerns:

- Potential effects to archeological and traditional properties
- Potential effects to water quality
- Potential effects to fish habitat, including salmonid species federally listed as threatened or endangered under ESA.
- Potential effects to economic recovery

Because tribal trust activities often occur in common with the public, Umatilla National Forest will strive to manage tribal ceded land to enable the execution of tribal rights, as far as practicable, while still providing goods and services to all people.

DECISION FRAMEWORK

The scope of the project and decision to be made are limited to: commercial salvage and potential danger tree removal along open forest routes, haul routes, developed recreation sites, and administrative sites; two Forest Plan amendments; and mitigation and monitoring within the project area. Chapter 2 details the designs of these actions. This project is limited to National Forest System lands. Connected actions include reforestation of harvest units and temporary road development and decommissioning of temporary roads. This decision is limited to National Forest System (NFS) lands.

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 to the issues disclosed by each alternative. The Responsible Official can decide to:

- ♦ Select the proposed action, or
- ♦ Select an action alternative that has been considered in detail, or
- ♦ Modify an action alternative, or

- Select the no-action alternative
- Identify what mitigation measures and monitoring will apply, and
- Amend the Umatilla National Forest LRMP to incorporate management direction for Canada lynx and reallocation of four C1-Dedicated Old Growth management areas.

Chapter 2

Alternatives

School Fire

Salvage Recovery Project

Chapter 2

Alternatives

INTRODUCTION

Chapter 2 discusses tribal and public involvement, issues and other concerns with the proposed action, and how issues were addressed. Three alternatives are described in detail including mitigation measures and monitoring associated with the alternatives. Maps showing alternatives considered in detail are located in Appendix A. Also described are eleven alternatives that were considered but not analyzed in detail. The chapter ends with a comparative synopsis of alternatives based on the environmental consequences disclosed in Chapter 3.

TRIBAL and PUBLIC INVOLVEMENT

The scoping process required by NEPA (40 CFR 1501.7) to have an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action was followed. Umatilla Forest invited participation from Federal and State agencies, local Tribes, environmental groups and individuals interested in, or affected by, the proposed action.

Tribal contact:

- September 28, 2005 - Information sharing with Cultural Resource Department of Confederated Tribes of the Umatilla Indian Reservation (CTUIR) and Forest Zone Archeologist on School Fire Salvage Recovery.
- October 4, 2005 - Meeting with Cultural Resource Department of CTUIR to review project area with maps provided.
- October 7, 2005 – Letters sent to Tribes informing them of field trips (October 18th and October 20th) to tour the School Fire Salvage Recovery project area.
- November 15, 2005 – Field trip tour with Watershed Assessment representatives of Nez Perce Tribe (Ira Jones, Emmitt Taylor, and Paul Kraynak).

Public contact:

- October 7, 2005 – Approximately 230 letters were sent to individuals, State, Federal and local agencies and organizations, informing them of field trips (October 18th and October 20th) to tour the School Fire Salvage Recovery project area.
- Listing of proposed project in several editions of the Umatilla National Forest's quarterly publications of the Schedule of Proposed Actions (SOPA) beginning with the 2005 fall edition.
- October 18, 2005 – Field trip tour of School Fire Salvage Recovery project area -12 interested parties attended.
- October 25, Field trip tour of School Fire Salvage Recovery project area – 25 interested parties attended.

- October 26, 2005 - Notice of Intent published in the Federal Register (Vol. 70 No. 206).
- October 27, 2005 - Scoping letter and maps mailed to approximately 230 interested and affected parties. The letter described the proposed project and invited the public to comment on project activities.
- October 29, 2005 – Field trip tour of School Fire Salvage Recovery project area – 10 interested parties attended.
- November 1, 2005 – Field trip tour of School Fire Salvage Recovery project area for Pomeroy High School Agricultural Business Class to discuss social, political, economic, and environmental issues associated with the School Fire and proposed project. – 20 interested parties attended.
- November 8, 2005 – Open House at Pomeroy Ranger District to share information on proposed School Fire Salvage Recovery – 9 interested participants.
- November 8, 2005 – Field trip tour with Judi Olsen, aide to Patti Murray, U. S. Senator from Washington State.
- November 10, 2005 – Field trip tour with environmental reporter and photographer from Tri-City Herald newspaper.
- November 15, 2005 – Interview with Eric Barker of Lewiston Morning Tribune newspaper to discuss School Fire, and proposed School Fire Salvage Recovery.
- January 10, 2006 – Presentation by Chris Shulte to Lewiston Lions Club discussing School Fire spread, suppression efforts – initial and extended attack, and proposed salvage harvest.
- January 18, 2006 – Presentation by D. Groat to Asotin County Sportsman's Club, Clarkston, WA on proposed School Fire Salvage Recovery Project (10-15 individuals in attendance).
- February 6, 2006 – Presentation by D. Groat at the request of Washington State University Cooperative Extension Office in Garfield County, WA on the proposed School Fire Salvage Recovery Project (50-75 individuals in attendance).
- February 8, 2006 – Presentation by D. Groat to Native Plants Society, Whitman College, Walla Walla, WA (15-20 individuals in attendance).

Coordination has occurred with other federal, state, and local government agencies. U.S. Fish and Wildlife Service (USFWS) have been informed of proposed activities. Numerous meetings have taken place throughout project planning, with Washington Department of Fish and Wildlife (WDFW) and Pomeroy Ranger District staff. WDFW has also informed Pomeroy District personnel of rehabilitation and salvage projects occurring and planned on state land, which is located adjacent to School Fire Salvage Recovery project area and within the School Fire perimeter.

Twenty-four responses were received from public scoping. All comments were reviewed by the Responsible Official and ID team.

ISSUE IDENTIFICATION

Tribes, federal and state agencies, individuals, and organized groups raised concerns during the scoping process about potential environmental impacts of the proposed action. Based on public input the ID team recommended and the Responsible Official approved the issue topics listed below for detailed study. Each topic is briefly described in this section and presented again in detail in the affected environment and environmental consequences (Chapter 3). Significant issues are discussed at the end of this section.

- **Soil Resources** – Loss of ground cover and surface organics following School Fire may have elevated the sensitivity of soils to additional effects from proposed activities. Proposed activities may change soil productivity as measured by changes in the amounts of detrimental soil disturbance caused by increased soil compaction, etc. On some areas, past activities may have already negatively affected soil productivity.

- **Water Quality/Fish Habitat –** Areas burned in the School Fire are especially susceptible to accelerated runoff, erosion, and sedimentation. Salvage harvest, road use, and prescribed burning may affect water quality, quantity, and time of flows through alteration of soil, site characteristics, and other conditions. The primary physical stream and riparian characteristics and fish habitat properties that may be affected by salvage harvest are streamside vegetation and water temperature; sediment and turbidity; and stream geomorphology featuring instream woody material and streambank stability.

- **Forest Vegetation –** School Fire killed trees within the fire perimeter causing changes in forest composition, structure, and density. Tree planting activities, consistent with the Forest Plan, will change the forested composition, structure, and density compared to areas reforested using natural regeneration.

- **Fuels –** School Fire altered the type, pattern, configuration, and availability of fuels. Post fire salvage harvest will add activity fuels (slash from limbs and tree tops) impacting short-term fire hazards.

- **Noxious Weeds –** School Fire altered the vegetation creating conditions conducive to the spread of noxious weeds. Proposed activities have the potential to introduce or spread existing populations of noxious weeds.

- **Proposed and Listed Threatened, Endangered, and Sensitive (TE&S) Species –** Aquatic, terrestrial, and plant TE&S species and their habitats could be affected by proposed management activities.

- **Wildlife Habitat -Old Growth -Snags–**School Fire burned approximately 1,600 acres of dedicated old growth within four designated areas (Management Area C1). The Cummings Creek area was completely burned over with 100 percent mortality and the other areas received varying amounts of mortality. Salvage harvest would affect the number of snags and down wood in the project area

- **Wildlife Habitat - Management Indicator Species - Neo-tropical Migratory Birds–** Proposed salvage harvest and road use could affect habitat characteristics for management indicator species and neo-tropical birds present within the project area.

- **Heritage Resources –** Project activities could affect heritage sites. Heritage resources are non-renewable resources that can be destroyed or damaged by ground disturbing activity.

- **Range –** The Pomeroy Cattle & Horse Allotment is within the School Fire Salvage Recovery project area. Grazing operations could be impacted by timber falling, yarding, and hauling.

- **Visuals/Scenery–** School Fire changed the scenery within the fire perimeter. Activities that include salvage harvest will further change the visual characteristics and scenery of the area.

- **Air Quality** – Post fire salvage harvest activities such as jackpot and broadcast burning may impact air quality of communities down wind. Dust created during timber haul can also affect air quality. Impacts to air quality must be consistent with the Clean Air Act.

- **Recreation** –A wide variety of recreational activities occurred in the area before the fire including dispersed camping, hunting, hiking and recreational site-seeing. All of these activities occurred both on and off roads. Proposed salvage activities such as timber falling, yarning, hauling, and road use restrictions could affect public safety, recreation use, and access to authorized forest roads

- **Economic and Social Analysis –** The economic returns from the proposed project will affect local and regional economies. Economic benefits and the financial efficiency to be derived from the proposed harvest will be evaluated.

- **Inventoried Roadless Areas (IRAs) -** Willow Springs IRA is within School Fire Salvage Recovery project area and Meadow Creek IRA is adjacent to the project area. No activities are proposed within either IRA, but proposed activities adjacent to them could impact the opportunity for solitude in both IRAs.

- **Undeveloped Character -** The undeveloped character within the School Fire perimeter could be impacted by salvage harvest and associated activities. Natural integrity characteristics such as scenic condition, fish and wildlife habitat, etc. as well as changes in the degree of solitude and primitive experience may be impacted.

Significant issues describe a dispute or present an unresolved conflict associated with potential environmental effects of the proposed action. Based on public input the ID team recommended and the Responsible Official approved the significant issues listed below for detailed study. Each significant issue described below includes a narrative statement with criteria or methods to measure change (effects).

No Harvest/Natural Reforestation

Some environmental groups and individuals who commented during the scoping period believe recovering economic value from dead trees is an inappropriate objective, particularly for public lands such as national forests. They believe the values associated with dead trees, such as snags and down wood are more important than potential revenues and related socioeconomic benefits (employment, income) derived from selling the salvaged timber. In addition, they also suggested there is no need for active reforestation and the best approach is to allow disturbance and successional processes to proceed unimpeded without human intervention. They offered the following publications in support of their position; American Lands Alliance (2005), Beschta et al. 1995, 2004, DellaSala et al. 2006, Donato et al. 2006, Karr et al. 2004, Lindenmayer et al. 2004, McIver and Starr (2000, 2001), and others. Some suggested the Forest Service end all commercial logging (green and salvage) on National Forests because the damage that could occur outweighs the potential economic benefits of commercial salvage logging.

Indicators:

- Acres harvested
- Socioeconomic indicators such as potential revenues
- Quality and quantity of available habitat for dependent wildlife

Harvesting Dying Trees

A number of respondents, who commented during the scoping period, expressed concern the proposed action will harvest trees that may have lived. The controversy centers on what constitutes a dead tree in a post-fire context and how that determination is made. They believe trees that currently have green needles should not be logged so they may contribute to future snags and provide habitat for wildlife and fish species. Only trees obviously dead (crowns totally consumed or scorched) should be considered for harvest.

Indicators:

- Acres of salvage harvest of predominantly dead trees.
- Acres of salvage harvest of predominantly dying trees.
- Quality and quantity of available habitat for dependent wildlife.

ALTERNATIVE DEVELOPMENT PROCESS

Based on public input, the ID team recommended and the Responsible Official approved two action alternatives in addition to the required no action alternative. Both significant issues described above were used to drive the development of alternatives to the proposed action. The alternatives sharply define the significant issues.

ALTERNATIVES CONSIDERED IN DETAIL

Alternative A – No Action

Purpose and Design:

- Alternative A responds to the significant issues of no harvest and natural reforestation and harvesting of dying trees.
- Provides a comparison between natural reforestation and effects associated with commercial harvest and reforestation using tree planting.
- Alternative A responds to the requirement to consider a no action alternative and serves as a baseline to compare effects.

Description:

In this document the No-Action alternative means that all activities identified in the proposed action would not be approved or occur in the School Fire Salvage Recovery project area. Salvage harvest of fire-killed and damaged trees and tree planting in harvested units would not be authorized. There would be no construction of temporary roads or use of previously closed, decommissioned, and unauthorized roads in support of salvage harvest. No monitoring will be required in Alternative A.

Previously approved (ongoing) activities such as fire protection, monitoring, road maintenance, and including recommended BAER projects would continue as authorized and would proceed. Current biological and ecosystem functions would continue at their present rates. Removal of danger trees along open forest travel routes, developed recreation sites, and administrative sites and other tree planning to reforest the area would be analyzed in a separate NEPA document.

Alternative B – Proposed Action (Preferred Alternative)

Purpose and Design:

- Alternative B was designed to respond to the agency's purpose of and need for action.

- Salvage harvest to recover the maximum economic value of a portion of dead and dying trees consistent with the Forest Plan.
- Improve public safety by removing danger trees along open forest travel routes (including haul routes used for timber sale activity), developed recreation sites, and administrative sites.
- Alternative B is the proposed action and preferred alternative.

Description:

Salvage Harvest – An estimated 9,432 acres would be commercially harvested. Only dead and dying trees would be removed. Mortality determination would be based on the Blue Mountain National Forest's standard protocol to evaluate fire-injured trees when determining the probability of their survival for up to one year after a fire (up to five years for mature, large-diameter ponderosa pine) would be used. This protocol is known as the "Scott Guidelines" (Scott et al. 2002, 2003). The specific measurement criteria the District proposed to use to implement the protocol was reviewed by Don Scott, the primary author of the Guidelines and he concurred with them (Scott 2005). The protocol is also compatible with Pacific Northwest Region direction regarding conifer mortality determination (Goodman 2005, Schmitt and Filip 2005).

This alternative would salvage harvest clearly dead trees, trees rated by Scott Guidelines with a low probability to survive, and trees with a moderate probability to survive having dead cambium on three or more quadrants (see Appendix B – Implementation/Marking Guide for additional information).

Salvage harvest would begin in 2006. An estimated 85 million board feet (MMBF) of wood fiber would be recovered. No commercial treatments are planned within any PACFISH riparian habitat conservation areas (RHCAs), inventoried roadless areas, or research natural areas. Harvest of dead trees over 21 inches in diameter would occur where consistent with the Forest Plan (see Appendix C for Consistency with Eastside Screens).

Harvest Methods – Ground-based harvesting by forwarder would occur on approximately 2,624 acres in areas with a sustained slope less than 35 percent. Forwarder yarding utilizes two or more pieces of equipment. The trees are felled by either a track based feller/buncher or a processor. Hand felling is also an option with this system. Trees are then processed in the unit with branches and tops (slash) placed on the trail. Yarding of logs is accomplished with a forwarder. A forwarder is a wheeled piece of equipment that transports logs fully suspend from the ground. Since the trees are processed in the unit very little landing area is needed. Where available, most of the equipment operates on a slash mat. Operating on a slash mat, along with smaller landings, results in less soil disturbance than conventional ground based systems.

Skyline logging would occur on approximately 4,137 acres in areas where road systems are generally in place and topography is suited for this type of logging. Helicopter logging would occur on approximately 2,671 acres in areas where other systems of logging are not suitable. Timber would be felled by hand (chainsaws in skyline and helicopter units) and by either hand or feller buncher in forwarder units.

Both skyline and helicopter systems utilize hand felling. In a skyline system, logs are yarded up the hill by a system of cables, and logs are either partially of fully suspended to reduce soil disturbance. In a helicopter system, logs are flown fully suspended from the unit to the landing. Skyline yarding landings are slightly smaller than conventional ground-based systems. Helicopter landings are larger than conventional ground based systems, but fewer landings are required than conventional ground-based systems. Both systems result in less ground disturbance than conventional ground based systems.

Reforestation – Reforestation by hand planting of trees would occur on an estimated 9,432 acres (salvage units). Approximately 1,483 acres of the salvaged area would be treated for site preparation and long-term site protection. Treatment would include cutting of small unmerchantable dead trees followed by broadcast burning.

Tree planting in salvage units would meet the following minimum tree stocking guides and species recommendations listed in the tables below.

Table 2-1 Minimum Tree Stocking Standards

Average Stand Diameter After Harvest (Inches)	Minimum Acceptable Stocking: Live Trees Per Acre
<5"	100-200[1]
6"	100
8"	80
10"	65
12"	45
14"	30
16"	25
18"	20
20"	15
21+"	12

[1] Stocking standards for small diameters (<5") are taken from the Forest Plan (item 3 on FP page 4-70) (USDA Forest Service 1990a): ponderosa pine and lodgepole pine working groups – 100 trees per acre; south associated working group – 150 trees per acre; and north associated working group – 200 trees per acre. Stocking standards for larger size classes (average stand diameters greater than 5") are adapted from Kline (1995).

Table 2-2 Tree Planting Recommendations

PLANT ASSOCIATION GROUP	Seedling Density[1]		Species Composition of Planting Mix (Percent)[2]							
	TPA	Spacing	PP	WL	LP	DF	WP	GF	ES	SF
Hot dry upland forestland	134	18 feet	NR							
Warm dry upland forestland	151	17 feet	80%	NR		20%		NR		
Cool moist upland forestland	222	14 feet	25%	40%	NR	20%	10%	NR	5%	NR
Cool very moist upland forestland	222	14 feet		20%	NR	30%	10%	NR	40%	
Cool wet upland forestland	222	14 feet	NR	20%		30%	10%	NR	40%	
Warm moist upland forestland	194	15 feet	60%	NR		40%				
Warm very moist upland forestland	194	15 feet	20%	30%		40%	10%	NR	NR	

[1] Seedling density recommendations are expressed as both a trees per acre (TPA) figure and its corresponding square-spacing value, in feet. They are based on the authors' judgment and on table 2-1.

[2] Species composition of planting mix recommendations are based on Cole (1993), Powell (1997) and tables F-2 and F-4 in appendix F and consultation with Marjorie Allmaras, silviculturist, Pomeroy Ranger District. Column heading codes are: PP: ponderosa pine; WL: western larch; LP: lodgepole pine; DF: Douglas-fir; WP: western white pine; GF: grand fir; ES: Engelmann spruce; SF: subalpine fir. NR = Natural Regeneration, showing tree species expected to establish without planting, were not included in the planting mix but they could be used if seed sources for the recommended species are in short supply. The potential vegetation type composition for each plant association group is provided in Appendix E Table E-3.

Activity Fuels Treatments – Treat activity fuels created by salvage harvest (approximately 9,432 acres) by lopping and scattering on an estimated 7,579 acres. This treatment includes cutting limbs and tops removed from the main stem of the tree (bole) and scattering them (downed wood and slash that is dropped in the trail in front of the processor, and driven over by the forwarder, distributes the weight of the machinery and reduces soil compaction levels). The remaining 1,853 acres would have trees yarded with tops attached. Of the estimated 9,432 acres treated for activity fuels, approximately 3,132 acres would be jackpot burned to further reduce activity fuels.

Road Management – Approximately 45 miles of open system roads, and 26 miles of closed system roads would be used for hauling. Approximately 15 miles of previously decommissioned and unauthorized roads would be temporarily used. Approximately 6 miles of new temporary road would be constructed. System roads would remain the same after the project is completed (open roads would remain opened and closed roads would continue to be closed). Public access would be restricted in some areas during active haul for public and operational safety.

All new temporary roads constructed and those used in a temporary manner would be decommissioned after project activity use. Decommissioning would occur in the following manner:

- New temporary road construction**:** Any newly constructed temporary road would be decommissioned and recontoured back to its original state (as reasonably possible) upon completion of use by the timber sale purchaser. Any disturbed ground would be seeded with native grass seed. If another resource area (fuels, planting, etc.) needs to use the road for post-sale activities, they would be responsible to decommission, recontour, and seed either through their appropriated funding or sale collections. Delayed decommissioning can occur because of limited windows of opportunity, due to weather conditions, to burn or plant.

- Unauthorized existing temporary roads**:** Any unauthorized existing temporary roads used by the timber sale purchaser would be decommissioned by the purchaser. Stabilization work could consist of scarification, native grass seeding, blocking access, or whatever work may be required (as reasonably possible and allowable under the timber sale contract) to reduce soil movement as a result of contract activities. If another resource area needs to use the roads for post-sale activities, they would be responsible to decommission and stabilize either through their appropriated funding or sale collections. As a special consideration, if there are existing culverts in these unauthorized existing temporary roads, they would be removed by the purchaser or other resource area utilizing them after post sale activities are completed.

- Previously decommissioned roads**:** Any previously decommissioned roads used by the timber sale purchaser would be re-decommissioned back to their original state (as reasonably as possible). Any disturbed ground would be seeded with native grass seed. If another resource area needs to use the roads for post-sale activities, they would be responsible to re-decommission and seed either through their appropriated funding or sale collections. As a special consideration, if there were culverts existing in these previously decommissioned roads, they would be replaced prior to use at a size agreed upon by the timber sale administrator, forest engineer, and purchaser. Upon completion of use, installed culverts would be removed by the purchaser or other resource area utilizing them, after post sale activities are completed.

Danger Tree Removal **-** Danger trees would be removed 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 removed 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 considered to be any tree that has 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, and developed recreation or administrative sites. 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).

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.*

Snag Retention – Within each unit/stand proposed for salvage harvest, a minimum of 3 snags/acre ≥ 21 inches in diameter at breast height (dbh), if available, would be retained after treatments. If snags ≥21 inches in diameter are not available the next largest snags would be substituted. Hard snags would be selected for retention, with a preference for ponderosa pine and Douglas-fir. Soft snags are not considered merchantable, and therefore would not be removed from the unit. Snags would be distributed as individuals, scattered across the unit and in groups (3-5 snags). Generally, non-merchantable snags, < 10 inches) would be maintained within the unit, however, harvest activities may knockdown and/or breakup a portion of these snags. In addition, all salvage harvest units greater than 15 acres in size would retain clumps of snags no smaller than one acre in size and no larger than 3 acres. A clump would occur on every 15 acres in the unit. All snags, regardless of diameter would be retained within the clump. All snags in designated riparian corridors, within the harvest unit, would also be retained. In addition, all snags within RHCAs, inventoried roadless areas, ephemeral buffers, and untreated areas would be left across the landscape (see Appendix B-Implementation /Marking Guide).

Forest Plan Amendments – the following amendments are proposed for this alternative.

- ► The Umatilla National Forest Land and Resource Management Plan would be amended to incorporate objectives, standards, and guidelines for Canada lynx. Objectives would be incorporated into the Forest Plan on page 4-29, below Table 4-10 and above the paragraph starting with "Biological evaluation…" Standards and guidelines would be incorporated into the Forest Plan on page 4-91; bottom of the page, following Peregrine Falcon Habitat, with a heading for Canada lynx. The amendment would apply only for the duration of, and to those actions proposed in lynx habitat for the site-specific project called School Fire Salvage Recovery. Appendix J provides a description of the objectives, standards, and guidelines to be incorporated in the Forest Plan for this site-specific project).

- ► Amend the Forest Plan to re-locate four C1- Dedicated Old Growth management areas to new locations. Appendix A contains a map displaying the changes in land allocation. Appendix J includes two tables that display the changes by acres and land allocation.

Design Features and Management Requirements –The design features identified in the following table serve to minimize the effects of management activities. Effectiveness of implementing these measures is considered to be high for this project because they have been used successfully for projects on the Umatilla National Forest. Forest monitoring and evaluation reports document the effectiveness of these measures.

Table 2-3 Design Features and Management Requirements

Objective	Task	Timeline
HYDROLOGY/WATER QUALITY		
PACFISH Buffer Standards	Stream and riparian protection for the School Fire Salvage is based on the Forest Plan as amended by PACFISH. No harvest would take place in the RHCAs which are described below. Category 1 - **Fish-bearing streams**: RHCAs consist of the stream and the area on either side of the stream extending 300 feet slope distance from the edges of the active stream channel. Category 2 - **Perennial non-fish-bearing streams**: RHCAs consist of the stream and the area on either side of the stream extending 150 feet slope distance from the edges of the active stream channel. Category 3 - **Ponds, lakes, reservoirs, and wetlands greater than 1 acre**: RHCAs consist of the body of water or wetland and the area extending 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. Category 4 - **Seasonally flowing or intermittent streams, wetlands less than 1 acre, landslides, and landslide-prone areas:** This category includes features with high variability in size and site-specific characteristics, and assumes listed stock. At a minimum the RHCAs must include: the area from the edges of the stream channel, wetland, landslide, or land-slide prone area to a distance equal to 100 feet.	Prior to activity
PACFISH standards and guidelines	TM-1 – Prohibit timber harvest, including firewood cutting in Riparian Habitat Conservation Areas (RHCAs). RF-2 – For each existing or planned road, meet Riparian Management Objectives (RMOs) and avoid adverse effects on listed anadromous fish by initiating development and implementation of a Road Management Plan or a Transportation Management Plan. RF-3 – Determine the influence of each road on the RMOs. Meet RMOs and avoid adverse effects on listed anadromous fish. RF-5 – Provide and maintain fish passage at all road crossings of existing and potential fishbearing streams. TM-2a Per PACFISH TM-2a the following measures would be followed: construction of landing in RHCAs would be minimized; wherever possible, helicopter log landings will be located outside the RHCA. Along the Tucannon River helicopter log landings within the RHCA may be necessary. They will be limited to previously disturbed sites and on the opposite side of the Tucannon Road from the river. Only minor construction work will be allowed within the RHCA. RA-2 – Trees may be felled in RHCAs when they pose a safety risk. Keep felled trees on site when needed to meet woody debris objectives.	Prior to, and during activity

Objective	Task	Timeline
PACFISH standards and guidelines	RA-4 – Prohibit storage of fuel and toxicants within RHCAs. Prohibit refueling within RHCAs unless there are no other alternatives. Refueling sites within a RHCA must be approved by the Forest Service and have an approved spill containment plan. Per RA-4, helicopter service landings locations will be located outside the Tucannon River RHCA. Service landings may be necessary in other RHCAs on a limited basis if no other alternatives are available, after consultation with appropriate specialists. Helicopter landing (both log and service) within Forest Service jurisdiction will be rehabilitated as described under Soil Protection/Erosion Control design section of this table. Landings on other agency land will be rehabilitated as agreed with the controlling agency. FM-1 - Design fuel treatments and fire suppression strategies, practices and actions so as to not prevent attainment of RMOs, and to minimize disturbance of riparian ground cover and vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression or fuel management actions could perpetuate or be damaging to long-term ecosystem function, listed anadromous fish, or designated critical habitat. FM-4 – Design prescribed burn projects and prescriptions to contribute to the attainment of the RMOs. Snowplowing may occur in RHCAs. Snow removal equipment will be of the size and type commonly used. Snow removal equipment will be equipped with shoes or runners. Snowplowing will leave a layer of snow one to two inches thick on the roadway. RF-2f - Sidecasting of snow and soil will be prohibited within or abutting RHCAs (in watersheds where Critical Habitat has been designated for listed fish).	
Protect water quality (Clean Water Act)	Implement Best Management Practices (See Appendix G for listing of BMPs selected for project implementation along with effectiveness rating). Cable yarding systems - Full suspension will be required across all RHCAs and where possible within 100 feet (each side) of ephemeral draws. This will prevent ground disturbance near channels. Ground based yarding systems- RHCAs will not be crossed with ground based equipment (PACFISH Category 1, 2, and 4 streams). Ephemeral draws – In helicopter and skyline units, dissected ephemeral draws will have 25 foot buffers (no harvest areas). Ground based equipment will cross ephemeral draws and channels at pre-approved sites, and crossings will be minimized. • Harvest systems will be designed to minimize crossing ephemeral draws. Ephemeral draws will not be crossed where equipment will cause bank breakdown. • In ephemeral draws without buffers, all embedded and pre-fire downed wood will be retained.	Prior to, during, and post activity

Objective	Task	Timeline
Protect water quality (Clean Water Act)	Ephemeral stream channels will have protections to minimize equipment disturbance of remaining duff and ground cover, as well as soil. They will not be used as forwarder trails, landing sites, or as road locations. Commercial use of National Forest roads shall be suspended when commercial contract or permit operations create a continuous discharge of sediment into live streams that result in an increase on turbidity. This may be from pumping of saturated fines creating sediment-laden water on and/or from the road surface. Visual evidence of this may be identified by the increase in turbidity in live running streams evident at points downstream from the outflows of culverts, ditchlines, or fords. When operating in wet weather or outside normal operating season, the sale administration team will work with the District Ranger and resource specialists to ensure unacceptable effects do not occur. Timber sale purchaser will prepare a spill containment plan that would ensure that spilled fuel would not leave the site. Fuel will not be stored within any RHCA.	
AIR QUALITY		
Protect air quality (Clean Air Act)	Washington State Smoke Management Plan regulations will be followed to protect air quality and avoid smoke intrusion into sensitive areas.	Prior to, and during activity
SOILS		
Protect soil during burning **Protect soil during burning**	Burning will be done when the duff layer will be left intact or reduced minimally. Fuel moisture will be at least 15% on one-thousand-hour fuel (logs > 24 inches diameter). (See Best Management Practices (BMPs) in Appendix G) Prescribed fire will not be ignited in Riparian Habitat Conservation Areas, however, fire will be allowed to back into them and exposure of mineral soil will not exceed 10 percent.	During, and post activity
Control erosion on fire lines	Hand fireline construction will only occur where necessary. Any fireline constructed will be to minimal standard. Locations will be evaluated post-harvest. Hand fireline will be waterbarred and seeded at project completion, as needed.	Prior to, and during activity
Maintain road drainage to minimize erosion and protect road surfaces	Maximize opportunities to improve drainage from existing roads by outsloping or insloping, and cross draining of water onto areas most capable of spreading and infiltrating runoff (see BMPs in Appendix G).	During activity
Soil protection/erosion control	Forwarder trails will generally be located 50 feet apart, except where converging. All forwarder trails will be approved prior to use. No ground-based equipment will operate on sustained slopes greater than 35%, in order to reduce the potential for soil movement.	During and Post activity

Objective	Task	Timeline
Soil protection/erosion control	Skyline corridors will generally be located approximately 150 feet apart, except where converging. Landings will be designed and to minimize size and constructed to minimize effects and provide for safe operations. During and upon completion of harvest activities erosion control measures will occur on skyline corridors, forwarder trails, and landings. Post-activity exposed mineral soil will be treated as necessary to reduce soil erosion and compaction. This may include seeding, waterbarring, or subsoiling. Where possible, forwarder trails will be subsoiled or have logging slash and large wood left. After completion of harvest, where feasible, landing piles will be removed. If not removed they will be burned. Landings will be stabilized by planting with native seed. On helicopter landings, fuel containment structures will be leveled. Waterbars will be used to stabilize temporary roads during and immediately after use. Temporary roads that are designated to be used post-sale to allow access for planting or fuels treatment will be stabilized by waterbars, seeding with native grass seed, or by having slash placed on them. These roads will be closed to public use and entrances blocked with logging debris or earth berms and “road closed” signs. These roads will be permanently decommissioned as soon as all post-sale work is completed by the project requiring their use. Where there is no post-sale access needed, the timber sale will recontour and seed newly constructed temporary roads. On existing templates used as temporary roads, the timber sale will pull and recontour drainage structures and revegetate the roadbed, except where full sidecast pullback is required. Where soil productivity requires full sidecast pullback, other sources of funding will be sought to supplement timber sale funds that may be collected to accomplish this work.	
NOXIOUS WEEDS		
Control and prevention of invasive plants (noxious weeds)	District noxious weed crews will place a special emphasis on aggressive control of known weed populations within the School Fire footprint early in the growing season to prevent seed set later in the summer. NEPA-cleared sites will be treated according to the method assessed in the 1995 Weed EA. All gravel, fill, sand stockpiles, quarry sites, and borrow material will be inspected for the presence of invasive plants before use and transport. Use only gravel, fill, sand, and rock that are judged to be weed seed free by District or Forest weed specialist. Road blading, brushing and ditch cleaning in areas with high concentrations of invasive plants will be conducted in consultation with District or Forest-level invasive plant specialists. Invasive plant treatment and prevention practices will be incorporated as appropriate. This may include minimizing soil disturbance, but would not preclude it.	Prior to, during, and post activity

Objective	Task	Timeline
Control and prevention of invasive plants (noxious weeds)	Project or contract maps will show currently inventoried high priority noxious weed infestations as a means of aiding in avoidance and/or monitoring. Prior to moving onto the forest, reasonable measures will be taken to insure that all off-road equipment is free of soil, seeds, vegetative matter, or other debris that could contain or hold seeds. In addition, prior to moving off-road equipment from a cutting unit known to be infested with invasive species to any other unit that is believed to be free of noxious weeds, reasonable measures will again be taken to make sure equipment is free of soil, seeds, vegetative matter, or other debris that could contain or hold seeds (timber sale contract provision B/BT 6.35 or equivalent provision). All soils disturbed by project activities will be revegetated with certified "weed free" native seed. Logging system design will consider the objectives of maintaining ground cover and minimizing ground disturbance. Forest Plan standards and guidelines for ground and soil disturbance will be followed.	
CULTURAL RESOURCE		
Preserve and protect archaeological sites	Cultural resource surveys had been conducted within the project area before the School Fire (2005). These surveys are no longer considered adequate since ground conditions have changed significantly as a result from the fire. The project area will be re-surveyed before project implementation. All previously recorded and newly recorded sites will be protected from all activities associated with this project.	Prior to, and during activity
WILDLIFE		
Maintain dead wood habitat	All sale activities will maintain downed logs, snags, and green tree replacement trees at levels identified in the marking guide (see Appendix B-Implementation/Marking Guide). If designated snags and clumps are removed for safety or other operational considerations, the sale administrator will work with the contractor to maintain prescribed snag retention levels (as identified above) and clumps within harvest units.	Prior to, during, and post activity
Unique wildlife habitat	Unique wildlife habitat such as, seeps, springs, bogs, wallows, cliffs, talus, ad caves will be protected by minimizing ground disturbance one and one half tree lengths from the area.	Prior to, during, and post activity
Meet ESA requirements	If any federally listed species such as, but not limited to gray wolf, bald eagle, Canada lynx are found in the project area, the appropriate resource specialist will be contacted immediately. The Contracting Officer will take appropriate action to insure species are protected. Provisions BT6.24 would apply. Protection measure for known federally listed species will be listed in CT6.24.	Prior to, and during activity

Objective	Task	Timeline
Goshawk habitat	There are no known nesting territories in the project area. If a nest site is found it will be protected as directed in Forest Plan Amendment #11 (*Interim Management Direction Establishing Riparian, Ecosystem, and Wildlife Standards for Timber Sales- "The Screens.")* Appropriate provisions will be included in the timber sale contract.	Prior to, during, and post activity
Raptor nests	Protect known or discovered raptor nest sites from management disturbance until fledging has completed. Level of protection will vary by species and will be recommended by the district biologist.	Prior to, during, and post activity
Big game winter range	Management activities will not take place from December 1 – March 30 in Management Area C3 (west side of Tucannon River) to minimize disturbance to wintering big game.	During activity
RECREATION		
Protect recreational access	Primary access routes (Mountain Road 40, Iron Springs Road 42, and Tucannon River Road 47) may remain open to through traffic during logging operations, but may be subject to short delays for public safety. All other roads within the project area will be closed on a case-by-case basis while logging operations are ongoing. Current road closure information will be available at all portal kiosks and at local Forest Service District office.	During activity
Transportation management	During project activity alternative snowmobile routes will be designated in order to avoid conflict between winter logging operations and snowmobile activity.	During activity
PUBLIC SAFETY		
During project implementation	Warning or informational signs will be placed along major travel routes during project operations (timber, fire, engineering, restoration projects, etc) to alert and inform the public. Current information will be posted on portal entry kiosks. Public access may be restricted in some areas during active haul of merchantable material for public and operational safety.	During activity

Monitoring - Forest Service personnel will conduct monitoring for this proposed project prior to project activity, during project activity, and post project activity as described in the monitoring items below. Anticipated effectiveness of each monitoring element for School Fire Salvage Recovery project area is considered high.

- Timber sale preparation monitoring will be conducted before the award of the timber sale. This includes field checking of timber harvest unit layout and marking by timber management staff, hydrologist, wildlife biologist, archeologist, and silviculturist prior to implementation to assure the intent of the timber sale design and designated riparian buffers are realized.

- Timber sale contract activities will be monitored throughout the timber sale process to ensure compliance with the timber sale contract, Forest Plan standards and guidelines, existing laws and regulations, and identified design features. Timber management staff will conduct monitoring assisted by wildlife biologist, hydrologist, archeologist, and soil scientist.

- Forest soils scientist and/or timber management staff will monitor during and after timber sale activity, and will conduct post-project activity monitoring using soil disturbance transect information and walk-through surveys.

- Monitor sites of soil disturbance (landings, skyline corridors, skid trails, bladed constructed, re-constructed, and obliterated road segments) for 3 years to provide for early detection and treatment of any weed infestations that may result from project activities.

- Monitoring of needs and results of fuel hazard reduction, fuel consumption, and site preparation for burning projects. Walk-through surveys will be conducted. Plot information and data may be collected on a sample basis. Some projects may be intensively monitored following the Pomeroy Ranger District Prescribed Fire Program Monitoring Plan, dated 2/27/98. Fuels management staff will conduct the monitoring.

- Silviculture staff will monitor reforestation success.

- Number, size, distribution, and quality of snags and down logs will be field checked by wildlife staff on a sample of harvest units to determine if dead wood habitat objectives are being met.

Alternative C

Purpose and Design:

- Alternative C responds to the significant issues - harvesting of dying trees and no harvest and natural reforestation.
- Harvests primarily dead trees where fire effects were obviously severe enough (100 percent crown consumption or scorch) to kill at least 90 percent of trees. Trees with visible green needles would comprise 10 percent or less within a given unit.
- It responds to concerns about the values associated with dead trees, such as snags and down wood, Alternative C prohibits salvage harvest in the four former C1-Dedicated Old Growth management areas and prohibits harvest of trees over 21 inches in diameter.
- Improves public safety by removing danger trees (not removed during fire suppression) along open forest travel routes, developed recreation sites, and administrative sites.

Description:

Salvage Harvest – An estimated 4,188 acres would be commercially harvested. Obviously dead trees (100 percent crown consumption or scorch) would be removed. Trees with visible green needles would comprise 10 percent or less within a given unit. Scott Guidelines would be used to determine mortality on incidental trees with green needles within these units.

There would be no salvage harvest in any of the four former C1-Dedicated Old Growth management areas reallocated to new management area designations.

Salvage harvest would begin in 2006. This alternative would recover an estimated 39 MMBF of wood fiber. There would be no harvest of trees over 21 inches in diameter. No commercial treatments are planned within any PACFISH riparian habitat conservation areas (RHCAs), inventoried roadless areas, or research natural areas.

Harvest Methods. Ground-based harvesting by forwarder would occur on approximately 951 acres in areas with a sustained slope less than 35 percent. Skyline logging would occur on approximately 1,626 acres in areas where road systems are generally in place and topography is suited for this type of logging. Helicopter logging would occur on approximately 1,611 acres in areas where other systems of logging are not suitable. Timber would be felled by hand (chainsaws in skyline and helicopter units) and by either hand or feller buncher in forwarder units.

Reforestation –Reforestation by hand planting would occur on an estimated 4,188 acres in areas affected by salvage harvest. Of these acres, approximately 925 acres would be treated for site preparation and long-term site protection. Treatment would include cutting of small unmerchantable dead trees followed by broadcast burning.

Tree planting objectives and planting recommendations are the same as Alternative B.

Fuels Treatment – Treat activity fuels created by salvage harvest (approximately 4,188 acres) by lopping and scattering on an estimated 3,687 acres. This treatment includes cutting limbs and tops removed from the main stem of the tree (bole) and scattering them to reduce fuel concentration and to provide for soil stability. The remaining 501 acres would have trees yarded with tops attached. Of the estimated 4,188 acres treated for activity fuels, approximately 760 acres would be jackpot burned to further reduce activity fuels.

Road Management – Approximately 45 miles of open system roads, and 18 miles of closed system road would be used for hauling merchantable material. Less than 10 miles of previously decommissioned would be used in a temporary manner. Approximately 3 miles of new temporary road would be constructed. All new temporary roads constructed and those used in a temporary manner would be decommissioned after use for project activities. System road use would remain the same after the project is completed (open roads would remain opened and closed roads would continue to be closed). Public access will be restricted in some areas during active haul of merchantable material.

Decommissioning would be the same as described in Alternative B.

Danger Tree Removal – This alternative would use the same criteria for identifying danger trees as described in Alternative B. For this alternative, danger trees would be removed from an estimated 63 miles of road.

Snag Retention – Same as Alternative B.

Forest Plan Amendments – Same as Alternative B.

Design Features and Management Requirements **–** Same as Alternative B.

Monitoring – Same as Alternative B.

SALE AREA IMPROVEMENTS

Sale area improvements include activities which follow timber harvest and are intended to improve resources within the project area. They may be funded with Knudsen-Vandenburg (KV) funds, which are generated from the sale of timber.

KV/SAI projects associated with the proposed action and analyzed for environmental effects in Chapter 3 of this document are listed below:

- Reforestation – Plant areas (associated with harvest) where there is insufficient seed source to insure reforestation by natural means. (9,435 acres Alternative B – 4,185 acres Alternative C).
- Site Preparation – Slash and burn to provide long-term fire resistance of reforestation sites. (1,483 acres Alternative B – 925 acres Alternative C).
- Road Decommissioning – Decommission new temporary roads and previously decommissioned and unauthorized roads used for project activities. Decommissioning would be to a higher standard than what is required in a timber sale contract. (Approximately 15 miles Alternative B – 10 miles Alternative C).
- Noxious Weeds – Monitor and treat noxious weeds associated with haul routes and harvest units.

KV/SAI projects not associated with the proposed action are listed below. They are eligible for KV funding, if funds are available. Environmental analysis would be completed in separate NEPA documentation and decisions.

- Reforestation – Plant areas (not associated with harvest) where there is insufficient seed source to insure reforestation by natural means.
- Road Decommissioning – Decommission existing unauthorized roads not used for project activities.
- Culvert replacement and drainage stabilization
- Noxious weeds – monitor and treat weeds outside of the project area but within the School Fire perimeter.
- Site restoration – rip/decompact old landings to restore site productivity.
- Spring and guzzler construction
- Fencing and corral construction
- Recreation and interpretive signage

ALTERNATIVES CONSIDERED, BUT ELIMINATED FROM DETAILED STUDY

The following alternatives were considered and eliminated from detailed study by the Responsible Official for reasons identified below:

1. **Do Not Use Temporary or Decommissioned Roads**
   An alternative was proposed by the public with the intent to reduce soil movement and disturbance. This alternative would prohibit new temporary roads or use of sensitive closed or decommissioned roads in a temporary manner. Changes in harvest systems (i.e. tractor to forwarder; skyline to helicopter) would occur. All effects disclosed for both action alternatives are expected to be

consistent with the Forest Plan; therefore, long-term soil productivity of the land is expected to be maintained. Additional requirements above that provided by the Forest Plan and design criteria already incorporated into the proposed action would not be needed to protect soil productivity and would unnecessarily increase operating costs which in turn would reduce economic benefits (purpose and need). In addition, the relative difference in developing and analyzing such an alternative to meet the above criteria would not result in significantly different effects of those anticipated with Alternative C. Based on this information this alternative was considered but not analyzed in detail.

2. **Do Not Sell Danger Trees**
Individuals and environmental groups suggested hazards to public safety along roads could be reduced by simply falling the danger trees and leaving them in place. They believe the hazard could be reduced without commercial harvest. The Forest Service agrees the hazard would be reduced however this alternative would not address other aspects of the purpose and need. Alternative A will disclose the effects of not selling any trees. Based on this information this alternative was considered but not analyzed in detail

3. **Enter Inventoried Roadless Areas**
Timber industry respondents suggested the Forest Service enter Inventoried Roadless Areas to increase economic benefits as stated in the purpose and need. The Forest Service agrees entering IRAs could increase economic benefits. Experience indicated entering inventoried roadless areas to harvest and build roads is controversial and tends to lengthen the decision making and implementation process. Analysis of wood deterioration and the corresponding reduction in value indicates the need for haste. Given this situation the Responsible Official decided to forgo potential economic benefits that may lengthen the decision making process and focus on economic benefits achievable before the wood looses commercial value. Based on this information this alternative was considered but not analyzed in detail

4. **Incorporate all Canada Lynx Conservation Assessment Strategy (LCAS) Recommendations**
This alternative would incorporate all of the recommendations listed in Chapter 7 of the LCAS into the Forest Plan to conserve Canada lynx for this site-specific project was considered. The Forest Service chose to incorporate only those standards and guidelines that were relevant to the purpose and need and alternatives for School Fire Salvage Recovery project. Incorporating management direction irrelevant to the project and scope of the decision to be made could have added unnecessary analyses and be confusing during project implementation.

5. **Incorporate all LCAS Recommendations – forest wide**
In response to public input, the Forest Service considered an alternative that incorporates, forest-wide, all of the recommendations listed in Chapter 7 of the LCAS, as amended into the Forest Plan to conserve Canada lynx and its habitat. It would have amended the plan forest-wide and remained in effect until the Forest Plan was revised. This alternative may have addressed the project-specific purpose and need to provide management direction specific to Canada lynx, however, doing so would have required additional analysis of programmatic effects that are outside the scope of the purpose and need and decision. In addition, the Umatilla Forest Plan is currently being revised and expected to be approved by the end of 2007. New information about lynx and any resulting changes in management direction to conserve Canada lynx would be considered and blended within the context of the Forest Plan revision process. There is no need to duplicate the effort of the revision process in this site-specific analysis. For these reasons this alternative was considered but eliminated from detailed study.

6. **Incorporate Lynx Management Direction that Differs from the LCAS**
In response to public comment the Forest Service considered incorporating management direction for Canada lynx that differs from the conservation recommendations located in Chapter 7 of the LCAS. The LCAS (Ruediger et al. 2000), as amended, includes a set of conservation recommendations that are based on the best currently available scientific information (Ruggiero et al. 2000) about lynx, risks to the species and/or individuals posed by management activities; habitat conditions; and measures that are likely needed to conserve the species and. The LCAS assessment and strategy were authored by specialists representing four federal agencies including the USDI Fish and Wildlife Service. The LCAS has been reviewed and modified by the science team since it was published in 2000 considering relevant new information and conflicting science.

These publications along with subsequent updates and recommendations from the Lynx Steering Committee represents the most credible and applicable synthesis of science, including various view points concerning the ecology, management, and conservation of lynx and lynx habitat in the contiguous United States. New information about lynx and any resulting changes in management direction to conserve Canada lynx would be considered and blended within the context of the Forest Plan revision process. There is no need to duplicate the effort of the revision process in this site-specific analysis. For these reasons alternative strategies to the LCAS were considered but not analyzed in detail.

7. **Exclude Logging in Undeveloped Areas**
One respondent suggested the Forest Service exclude logging in unroaded or undeveloped areas. Avoiding salvage harvest in undeveloped areas is possible. Doing so would not be consistent with the purpose and need of this project. The Umatilla Forest Plan considered and anticipated the need for salvage harvest following catastrophic wildfire consistent with the desired future conditions of the land allocations and the standards and guidelines to protect the environment. All salvage harvest proposed will be consistent with the decisions made in the Forest Plan. Alternative A will disclose the effects of not logging, including not logging in undeveloped areas. Impacts to undeveloped areas are disclosed in Chapter 3. Based on this information this alternative was considered but not analyzed in detail.

8. **Helicopter Harvest Only**
An alternative was proposed by the public with the intent to reduce impacts to soils. This alternative would yard all salvage units with a helicopter and not use any skyline or ground based, forwarder yarding. The Forest Service agrees this alternative would reduce impacts to soils. Helicopter yarding is incorporated into the proposed action when there was no available or easily constructed road access or where resource protection warranted its use. Helicopter yarding is almost twice as expensive compared to skyline or ground based methods. All effects disclosed for both action alternatives are expected to be consistent with the Forest Plan therefore; long-term soil productivity of the land is expected to be maintained. Additional requirements above that provided by the Forest Plan and design criteria already incorporated into the proposed action would not be needed to protect soil productivity and would unnecessarily increase operating costs which in turn would reduce economic benefits (purpose and need). Based on this information this alternative was considered but not analyzed in detail.

9. **Non-Commercial Restoration Only**
A non-commercial restoration alternative – modeled on recommendation of Beschta reports was suggested by some respondents. This alternative would utilize a passive management approach for fire area recovery without a commercial salvage component modeled in Beschta et al. (2004) and Beschta et al. (1995). This approach is very similar in nature to the burned area emergency response

(BAER) actions that have already been and would continue to be implemented, as funding allows, within the project area. While restoration is not a purpose and need for this project, Alternative A - No Action, along with actions already completed would reflect a restoration-only alternative. Alternative A describes some of the components of this approach and the effects analysis for Alternative A (by resource) provides an analysis of expected results if the current proposal or alternative is not implemented. The range of activities included in the fully developed action alternatives, combined with the consideration of the effects of the No Action alternative, offer a sufficient display of trade-offs and variation of effects to explore the issue of recovery through active management versus recovery through a limited passive approach. Based on this information this alternative was considered but not analyzed in detail.

10. **Delay Treatment**
This alternative would consist of treating small-diameter fuels now and treating large-diameter fallen snags in the future and when they become a real fire risk. This approach primarily addresses future fuel reductions by postponing management activities until fuels exceed desired levels, because of fallen snags and downed wood. This approach is inconsistent with the purpose and need of this project which addresses economic recovery of dead and fire-damaged trees. This alternative is more representative of Alternative A–No Action. In specific areas proposed for salvage treatment, economic utilization of commercially valuable timber resource can serve to offset costs related to fuels reduction. The economic viability of this project's fire killed and fire-damaged timber resource is limited and to delay treatment would result in no economic recovery and actions such as fuels reduction and reforestation would need to come from appropriated funding. Based on this information this alternative was considered but not analyzed in detail.

11. **No Road Construction and Minimize Reconstruction**
This alternative would include no additional road construction and minimize road reconstruction of existing roads. This alternative is similar to the helicopter-only alternative. It was eliminated from detailed study for the same reasons. As issues have developed and polygons identified for potential salvage, it is not anticipated that there would be any new specified system road construction. Our proposed action does include new construction of temporary roads, but they would be decommissioned upon completion of use. Based on this information this alternative was considered but not analyzed in detail.

COMPARISON OF ALTERNATIVES

The following tables compare the alternatives by activity, specific features, issue topics, and significant issues and compares how they respond to the purpose and needs identified for the project.

Table 2-4 Comparison of Alternatives by Activity

Activity	Unit Of Measure	Alternative A	Alternative B	Alternative C
Harvest				
Salvage harvest	Acres % of area	0 0	9,432 (34% of 28,000 acres)	4,188 15% of 28,000 acres)
Estimated volume of timber removed	million board feet (MMBF)	0	85	39
Logging System				
Forwarder Skyline Helicopter	acres acres acres	0 0 0	2,624 4,137 2,671	951 1,626 1,611
Fuels Treatment (Activity Fuels)				
Lop and Scatter	acres	0	7,579	3,687
Tops yarded	acres	0	1,853	501
Jackpot Burn	acres	0	3,132	760
Reforestation				
Plant	acres	0	9,432	4,188
Site Prep (Slash and Broadcast Burn)	acres	0	1,483	925
Roads				
New temporary construction	miles	0	6	3
Unauthorized or previously decommissioned roads used in a temporary manner	miles	0	15	10
Open roads used for haul	miles	0	45	45
Closed roads used for haul	miles	0	26	18
Danger Tree Removal	miles	0	71	63
Forest Plan Amendments **(1) Incorporate management direction for lynx** **(2) Reallocated C1-Dedicated Old Growth units and replace with new C1 units**	Yes/No	No No	Yes Yes	Yes Yes

Table 2-5 Comparison of Effects by Issue and Alternative

ISSUE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
SOILS			
Detrimental Soil Condition (Acres)	657 acres (out of 9,432)	726 acres (out of 9,432) (increase of 69 acres)	
	366 acres (out of 4,188)		292 acres (out of 4,188 (decrease of 74 acres)
Effective Ground Cover	Recover at current rate	No unit would have effective ground cover below Forest Plan standards and guidelines because of implementation of operational design criteria, choice of operation systems, use of BMPs, and contractual control. Both alternatives would meet Forest Plan standards and guidelines. Effects would be short-term.	
Woody Debris	Wood levels would not be changed in any area.	All units would retain sufficient organic matter to maintain long-term soil and site productivity.	
HYDROLOGY/WATER QUALITY			
Riparian Condition and Function	No difference in the quality or timeframe of the recovery of riparian condition or function would be seen between Alternative A – No Action and Alternatives B and C.		
Road Density (during project activity)	No change	0.1 to 0.4 increase by subwatershed	0.1 to 0.2 increase by subwatershed
Road Density – net reduction (post-project activity)	0 miles	6miles - unauthorized roads decommissioned	4 miles – unauthorized roads decommissioned
Miles of Road in RHCAs	No change between Alternative A – No Action, and Alternatives B and C		
Wood Recruitment Potential	No change between Alternative A – No Action, and Alternatives B and C		
Water Temperature	There would be no difference between Alternative A and Alternatives B and C in the recovery of water temperature that is related to shade.		
Sediment (modeled tons)	Year 3 – 24,026 tons Year 4 – 24,026 tons Year 5 – 24,026 tons	Year 3- 25,052 tons Year 4 – 24,271 tons Year 5 – 23,996 tons	Year 3 – 24,741 tons Year 4 – 24,229 tons Year 5 – 24,007 tons
FISH			
Temperature	Increase likely due to loss of shade until shade restored to pre-fire levels	Slightly accelerated (5 years) shade development with riparian replanting within 5 years.	Same as Alternative B

ISSUE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Substrate Conditions (cobble embeddedness, percent fine sediment)	First 5 years: Increase through natural processes likely first 2 years post-fire. Decrease with time thereafter to natural levels. Long-term: (5 years plus). Chronic inputs at pre-fire levels	First 5 years: Potential increase relative to Alternative A (< 3% total over 2 years). Decline with time to levels comparable to Alternative A. Long-term (5 years plus). Chronic levels reduced slightly relative to Alternative A	First 5 years: Potential increase relative to Alternative A (<2 percent total over 2 years). Decline with time to levels Comparable to Alternative A. Long-term (5 years plus). Chronic levels reduced more than with Alternative A, less than with Alternative B.
Large Wood	Increase through natural processes over next 5-15 years	Same as Alternative A	Same as Alternative A
Pools	Naturally variable through natural post-fire processes; long-term increase likely on NFS lands, associated with increases in Large Wood	Same as Alternative A, except pool frequencies slightly lower due to management-induced 2-year pulse of additional sediment (<3 percent) may fill some pools.	Same as Alternative B, except <2 percent additional sediment relative to Alternative A.
Fish Passage	Fish passage at 3 culverts may be intermittently affected by bedload movement in unstable channels.	Long-term improvement with culvert upgrades within 5 years.	Same as Alternative B.
VEGETATION			
Species Composition (Year 2015) Nonstocked (Percent of acres)	64%	56%	56%
Forest Structure (Year 2055) Stand Initiation Old Forest (Percent of acres)	46% 15%	21% 18%	21% 18%
Tree Density (Year 2055) Low density (Percent of acres)	73%	56%	56%

ISSUE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
FUELS			
Fuel Loading (CWD) Above historic and acceptable range in year 2035 (acres and percent of area)	16,238 acres (79% of Area)	8,153 acres (40% of Area)	11,825 acres (58% of Area)
Resistance-to-Control Extreme rating in year 2035 (acres and percent of area)	7,004 acres (34% of Area)	3,468 acres (17% of Area)	4,618 acres (22% of Area)
NOXIOUS WEEDS			
Acres at High Risk to infestations	3,510 acres	4,490 acres	Subset of Alt. B (exact acres at high risk not modeled)
TE&S PLANTS			
Effects Determination Threatened & Endangered Sensitive	No Effect No Impact	No Effect No Impact	No Effect No Impact
WILDLIFE			
Effects to Threatened, Endangered, and Sensitive Wildlife Species	No impacts or effects to TES species.	Calif. Wolverine (S) - No Impact Gray Wolf (E) – No Effect Canada Lynx (T) and Bald Eagle (T) - May affect, but will not likely adversely affect Canada lynx and bald eagle.	Same as Alternative B.
Dedicated Old Growth (C-1) and late old structure stands.	Replacements would not be designated to compensate for the burned Dedicated Old Growth.	Consistent with the Forest Plan, replacement C1 Dedicated Old Growth areas would be designated.	Same as Alternative B.
	Burned C1 would remain classified as Dedicated Old Growth until the Forest Plan is revised.	Consistent with Forest Plan, C1 units would be allocated to a new management area.	Same as Alternative B.
	No harvest would occur in burned Dedicated Old Growth (C1) or in other late old stand structure.	Harvest would occur consistent with new land allocation.	No harvest would occur in management areas previously allocated to C1.

ISSUE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Elk (MIS). Cover, forage, roads	A gradual increase in cover and decrease in forage would occur.	No areas currently classified as satisfactory or marginal cover would be changed to a forage condition. Conifer tree planting establishes forest cover sooner as compared to natural plant succession.	Same as Alternative B Open road densities would not change.
	Open road densities would not change.	Same as Alternative A	Same as Alternative A
Martin, Pileated woodpecker' and cavity excavators (MIS): affected habitat and snag density.	Habitat for some MIS species would not be affected.	Activities would not occur in existing marten or pileated woodpecker habitat.	Same as Alternative B.
	Snag densities for primary cavity excavators exceed Forest Plan standards.	Same As Alternative A	Same as Alternative A
Percent of habitat ≥ 50 percent tolerance interval in School Fire Salvage Recovery analysis area			
Lewis's woodpecker (≥ 10")	79%	46%	64%
Lewis's woodpecker (≥ 20")	59%	34%	59%
White-headed woodpecker	70%	37%	55%
Three-toed woodpecker	77%	63%	68%
Black-backed woodpecker	46%	25%	35%
Level of assurance for selected primary cavity excavators in the Tucannon-Asotin analysis area			
Lewis woodpecker (≥ 10")	Moderate to High	Moderate	Moderate to High
Lewis's woodpecker (≥ 20")	Moderate	Low to Moderate	Moderate
White-headed woodpecker	Moderate	Low to Moderate	Moderate
Three-toed woodpecker	Moderate	Moderate	Moderate
Black-backed woodpecker	Moderate	Low	Low to Moderate
HERITAGE			
Disturbance to sites	None	None	None

ISSUE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
RANGE			
Forage Response	In the short-term forage response would increase, but in the long-term forage availability would decrease because of an abundance of dead and down material which would reduce the capability of new forage growth.	Forage would be readily available over a longer period of time due to removal of dead and dying trees and less accumulation of material on the ground.	Same as Alternative B
Permittee Access	No effect to current access	Same as Alternative A	Same as Alternative A
Livestock Distribution	Over time as snags fall and material accumulates on the ground livestock distribution and grazing patterns would be disrupted.	Removal of dead and dying trees would reduce livestock distribution and grazing patterns.	Same as Alternative B
VISUAL/SCENERY			
Visual Quality Objective (VQO)	Does not meet	Does not meet VQO, but fits exception	Does not meet VQO, but fits exception
Rehabilitation	No rehabilitation	Rehabilitation of 9,432 acres	Rehabilitation of 4,188 acres
AIR QUALITY			
Air quality conditions	No Effect	Over the long-term future prescribed fire entries and wildfires would have lower smoke emissions than Alternative C because more acres (9,432 acres) have large woody debris reduced by treatments	Over the long-term future prescribed fire entries and wildfires would have more smoke emissions than Alternative B because less acres (4, 188 acres) have large woody debris reduced by treatments

ISSUE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
RECREATION			
Recreational Use	Any reduction in use would be because of fire effects such as, loss of wildlife and habitat, short-term loss of visual quality, and opportunities for personal use forest products. No major reduction in recreational use is anticipated.	In addition to any reduction in use because of the effects of the fire there would be some short-term public safety restrictions in use during harvesting activities. Temporary closing of roads and delays on arterial roads during project activity are expected. Upon completion of project activities recreational use would return to similar to pre-School Fire levels.	Same as Alternative B
Public Safety	All snags would be retained, except for those identified as unsafe. Threat to public safety remains.	Danger trees would be removed along approximately 71 miles of designated Class 3, 4, and 5 Forest roads, along haul routes for timber sale activities (regardless of Class), in developed recreation sites , and administrative sites. Threat to public safety reduced.	Same as Alternative B, except danger trees would be removed along approximately 63 miles of road. Threat to public safety reduced.
SOCIAL AND ECONOMIC ANALYSIS			
Gross Spending - Garfield County	$0	$1,042,305	$427,384
Vicinity Direct Income Increase	$0	$2,512,290	$1,075,250
Employment (local and non-local) number of jobs	0	133.8	57.3
Project Costs	$0	$4,765,307	$2,175,503
INVENTORIED ROADLESS AREAS			
Natural Integrity	No Effect	No Effect	No Effect
Opportunity for Solitude	No Effect	Short-term audio and visual effects from salvage harvest activities near the area. Short-term presence of smoke during fire treatments	Same as Alternative B
Appearance and Attractions	No Effect	No Effect	No Effect

ISSUE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
UNDEVELOPED CHARACTER			
Natural Integrity	No Effect	Short-term visual and audio effects from salvage harvest activities and fire treatments. Short-term presence of smoke during fire treatments Beneficial long-term effect of decommissioning unauthorized temporary roads in the area.	Same as Alternative B
Opportunity for Solitude	Activities on adjacent state and private land would continue	Short-term visual and audio effects from salvage harvest activities and fire treatments. Short-term presence of smoke during fire treatments Activities on adjacent private and state land would continue.	Same as Alternative B
Appearance and Attractions	No Effect	No Effect	No Effect
NO HARVEST/NATURAL REFORESTATION			
Acres Harvested	0	9,432	4,188
Potential Revenues	$0	$11,597,258	$5,223,133
Quality and Quantity of available habitat for dependent wildlife	See Wildlife section	See Wildlife section Some dead and dying trees 21 inch or greater dbh would be harvested.	See Wildlife section No dead trees 21 inch or greater dbh would be harvested.
HARVESTING DYING TREES			
Acres of predominantly dead trees salvage harvested	0	4,188	4,188
Acres of predominantly dying trees salvage harvested	0	5,244	0
Quality and Quantity of available habitat for dependent wildlife	Same as above.		

Table 2-6 Comparison of How Each Alternative Responds to the Purpose and Need

PURPOSE AND NEED	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Need to salvage harvest as rapidly as practicable before decay and other wood deterioration occurs to maximize potential economic benefits.			
% Volume Lost by Year Year 1 Year 2 Year 3 Year 4 Year 5	No salvage harvest	-8.7% -44.2% -75.1% -94.0% -100.0%	-8.2% -42.9% -73% -92.5% -100.0%
% Value Lost by Year Year 1 Year 2 Year 3 Year 4 Year 5	No salvage harvest	-12.2% -48.1% -77.5% -94.7% -100%	-11.7% -47.1% -75.8% -93.5% -100.0%
Need to improve public safety by removing danger trees along open forest travel routes, haul routes used for timber sale activity, developed recreation sites, and administrative sites.			
Public Safety	See effects under Recreation in table above.		
Need to amend the Forest Plan to incorporate management direction for Canada lynx			
Forest Plan Amendment included	No	Yes	Yes
Need to amend the Forest Plan to allocate new C1 Dedicated Old Growth management areas to replace those changed by the fire			
Forest Plan Amendment included	No	Yes	Yes

Chapter 3

Affected Environment And Environmental Consequences

School Fire

Salvage Recovery Project

Chapter 3

Affected Environment

and

Environmental Consequences

INTRODUCTION

This chapter describes both affected environment of area resources and environmental consequences that would affect those resources based on alternatives analyzed in detail as described in Chapter 2. Relevant direction from Umatilla National Forest Land and Resource Management Plan (Forest Plan), and applicable laws/regulations are also discussed in this chapter.

LOCATION

School Fire Salvage Recovery project area is located within the burned area perimeter of School Fire. This project specifically considers that portion of School Fire on National Forest System land (approximately 28,000 acres). It is located on Pomeroy Ranger District in Columbia and Garfield Counties, Washington in T. 9 N., R. 40 E., Sections 13, 24, and 25; T. 9 N., R. 41 E., Sections 1-4, and 8-36; and T. 9 N., R. 42 E., Sections 1-12, 14-23, and 29-32 (see maps in Appendix A).

The project area is within Upper Touchet River Watershed (North Patit Creek subwatershed); Upper Tucannon River Watershed (Little Tucannon River, Cummings Creek, Tumalum Creek, Headwaters of Tucannon River subwatersheds), and Pataha Creek Watershed (Headwaters Pataha Creek subwatershed). It contains habitat for federally listed Snake River/Columbia Basin anadromous fish and resident fish species, and bull trout. Willow Springs inventoried roadless area (IRA) is also included in the project area.

A portion of Washington Department of Fish and Wildlife (WDFW) land lies within School Fire Salvage Recovery project area, the remainder lies immediately north of the project area. WDFW operates Tucannon Fish Hatchery, W. T. Wooten Wildlife Area station and residence, and Camp Wooten, an Environmental Learning Center which is leased to Washington State Parks and Recreation.

Tucannon Hatchery was constructed in 1949 by Washington Department of Game, which is now WDFW, to produce rainbow trout to support a popular sport fishery. In 1984 this hatchery was purchased and refurbished by U.S. Army Corps of Engineers to act as a satellite station to Lyons Ferry Hatchery, which was built on the Snake River and became operational in 1983. Both of these hatcheries are used in combination to mitigate for fish and fishing losses caused by the four lower Snake River dams. A goal of wild fish restoration was added to this hatchery mitigation program because of Federal ESA listings and declining populations of wild salmonids in Snake River basin.

Camp William T. Wooten State Park covers 40 acres and 4,100 feet of freshwater shoreline. Facilities include Environmental Learning Center buildings, an archery range, campfire circle, interpretive trail, indoor swimming pool, man-made lake, two outdoor interpretive shelters, and a multi-purpose field and athletic court. Youth groups, schools, and private groups use the park year round.

CLIMATE

Analysis area watersheds are in the far northern-most portion of the Blue Mountains section in the Maritime-Influenced Zone and Mesic Forest Zone subsections. The influence of marine air flowing through the Columbia River Gorge is particularly strong in this area leading to relatively higher precipitation than is general in the Blue Mountains, and to a higher susceptibility to rain-on-snow events. This was demonstrated during the 1996 regional rain-on-snow events, when weather systems traveling down the Columbia River Gorge strongly affected the northern Blue Mountains and did not affect the southern Blue Mountains. The generally northern aspect of the drainage system likely favors moisture retention in the watershed as a whole. Annual precipitation is strongly influenced by elevation and ranges from 20 inches in the lower elevations to 70 inches at the highest elevations (Oregon Butte, 6,387 feet). Most precipitation (over 70 percent) accumulates from November through April, and much occurs as snow especially in higher elevations. Maximum daily air temperatures average in the mid 80's (ºF) in the summer and in the mid 30's (ºF) in the winter. Elevations in the project area range from 2,280 feet on the Tucannon near the lower Forest boundary and 5,200 feet at Willow Spring on the east rim of the Tucannon canyon (Umatilla National Forest, August 2002).

PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS

The temporal and spatial scale of analysis is variable depending on the resource concern being evaluated, particularly when considering the effects of past, present, and reasonably foreseeable actions. During the interdisciplinary process, the following summary of past, present, and reasonably foreseeable actions within School Fire Salvage Recovery project planning area was developed. These projects are considered, where relevant, when addressing the cumulative effects for various resources. The effects are disclosed in this chapter.

<u>SUMMARY OF PAST ACTIONS:</u>

- **Fire Suppression Activities –** These actions occurred during fire suppression. (Additional descriptions of each activity can be found in the "Biological Assessment of T&E fish and Wildlife Species" School Fire, January 11, 2006).
    - Water Use - Utilization of nearly 100,000 gallons daily from local waters sources with tankers, tenders, engines and helicopters.
    - Retardant - aerial application of retardant occurred each day from August 5th through August 16th.
    - Construction of 33 miles of dozer line (21 miles on NFS land) with safety zones. Lines averaged nearly 18 feet in width and safety zones were nearly 50 feet wide. Berms were pulled back post-use, and disturbed soil was harrowed with native grass seed applications.

- Construction of nearly 8 miles of hand fireline with about 6 miles located on NFS land. Lines were pulled in and revegetated post-fire use.
- Snag Felling – danger tree removal was conducted on all arterial roads within the fire perimeter. "Brush out" was completed on several miles of road that was used as fireline. Trees and shrubs were limbed (4 -5 feet) nearly 50 feet in width along the fire perimeter.

- **Burned Area Emergency Response (BAER) Activities –** Numerous actions were identified as part of the BAER process. Following an analysis by resource specialists these actions were identified as emergency actions necessary to reduce fire and fire suppression effects to water quality and to protect soils from erosion. Actions were also identified to prevent the spread of noxious weeds. The following actions were implemented:
  - Native seed application on an estimated 1,700 acres. Idaho fescue, mountain brome, blue wild rye and blue bunch wheat grass seed were applied through aerial seeding, hydro seeding, and wheat straw mulch.
  - Four plastic culvert pipes on Forest road 4700 were replaced with metal pipes.
  - Rolling dips and driveable waterbars were constructed between culvert locations on forest roads 47, 4700020, 4016, and 4200040.
  - Riparian planting of 120 acres (approximately 5,000 native shrub/tree rooted stock) in Cummings Creek
  - Cleaning two catch basins
  - Hand pulling approximately 25 acres of knapweed in areas adjacent to burned areas along forest road 4700
  - Stabilization of 1.5 miles of forest road 4700020 in Cummings Creek from FS boundary upstream
  - Large wood recruitment – Forty large trees (green snags) were felled cross channel of Cummings Creek to replace large woody debris (LWD) that was lost, and to provide structure to hold substrate during debris flows

- **Timber Harvest by decade**:

Table 3-1 Timber Harvest by Decade in School Fire Salvage Recovery Area

Years	Acres	Method	Silviculture Prescriptions in the Area
1950-1959	2,257	Tractor	Regeneration harvest – partial removal
1960-1969	4,506 407	Tractor Cable	Regeneration harvest – partial removal and Regen harvest – clearcutting,
1970-1979	1,827 4,420 410	Tractor Cable Skyline	Regeneration harvest – partial removal; Regen harvest – clearcutting, Thinning; Shelterwood (seed cut and preparation cut)
1980-1989	581 1,413 451	Tractor Cable Skyline	Regeneration harvest – partial removal; Regen harvest – clearcutting, thinning; shelterwood (seed cut and preparation cut)
1990-1999	341 78 207 391 647	Tractor Cable Skyline Helicopter Cut-to-length	Regeneration harvest – partial removal; Regen harvest – clearcutting, Regen harvest individual tree; thinning; shelterwood (seed cut and preparation cut)
2000-2010	73 6	Tractor Cable	Regeneration harvest, selection, individual tree, thinning; shelterwood; sanitation

- **Fuels Treatment by decade:**

Table 3-2 Fuel Treatments by Decade in School Fire Salvage Recovery Area

Years	Acres	Treatment
1960-1969	253	Broadcast and Pile burning
1970-1979	265	Broadcast and Pile burning
1980-1989	618	Broadcast and Pile burning
1990-1999	1,750	Broadcast and Pile burning
2000-2010	352	Broadcast and Pile burning

- **Wildfire:**
  One lightning storm in 1960 resulted in 22,021 acres burned on or adjacent to Pomeroy Ranger District. There were three big fires resulting from this event: Cummings Creek (approximately 8,890 acres located due north of the District boundary from Arbothknott Creek on the east to Cummings Creek on the west); Wenatchee Creek and Crooked Creek (it was centered on the Garfield/Wallowa county line, with much of this fire in the Wilderness). This lightning bust started at least 38 individual fires, with some of the other larger ones being Patterson Ridge (200+ acres); Godman (300+ acres counting spots); Willow Spring (300+ acres); Mt Misery (350 acres); and West Tucannon (300+ acres).

  There was also a fire near Tucannon River road (west side of river) in 1984 (due west of Camp Wooten); another near the east side of the river road in 1961 (near Big Four/Curl lake); and a larger fire (est. 300+ acres) in 1961 at the head of Waterman Gulch and due south of Jumpoff Joe.

- **Grazing – Pomeroy Allotment**
  Grazing has occurred at various levels beginning in 1860, from 9000 ewes in 1905 to 83 cow/calf pairs at present. Range improvements include 22 ponds, 14 spring developments, 20 miles of fence, 8 wildlife guzzlers, and 2 corrals located within this allotment.

- **Aquatic Habitat**
  In the mid 1960s Tucannon River channel near present day Tucannon Hatchery up to Little Tucannon River was dredged by the State using bulldozers to create a more stable channel and prevent any future flooding.

  In the late 1990's construction of stream structures of large wood and rock were placed in an attempt to return the stream channel to more natural conditions. Meander reconstruction and side channel habitats have been restored to proper functioning condition. This project work was supplemented with numerous native grass, shrub and tree planting projects.

- **Roads**
  In the last 10 years, approximately 22 miles of road have been decommissioned.

SUMMARY OF PRESENT ACTIONS:

- **Recreation –** Ongoing use of dispersed camping, hunting, sightseeing, etc. occurs year-round. Public firewood gathering and snowmobile use will continue to occur

- **Grazing – Pomeroy Allotment -**Currently one permittee runs 83 cow/calf pairs on an annual basis from June 10 to October 10 on three pastures Abels, Lower Pataha, and Upper Pataha. The allotment will not be grazed in the 2006 season to allow for forage and soil recovery. Observation survey plots taken will be taken in summer 2006 to determine vegetation recovery. Information from these plots will be used to determine how long the allotment pastures will be rested.

- **Noxious Weed Control –** Annual ongoing treatment of noxious weeds using herbicide and manual methods in areas of infestation and monitoring of noxious weeds.

- **Timber Salvage Harvest (State and Private)**

  Wooten Wildlife Area - Washington Department of Fish and Wildlife (WDFW) is salvage harvesting fire killed timber on about 2,636 acres of the Wooten Wildlife Area (WDFW and DNR lands). In addition to salvage logging, approximately 147 acres will be commercially thinned in an unburned area near Camp Wooten. The planned activities meet or exceed Forest Practices Rules (http://apps.leg.wa.gov/rcw/default.aspx?cite=76.09). Helicopters will be used for all salvage, with the possible exception of work inside the boundaries of Camp Wooten. Trees will be removed along the main Tucannon corridor, in the Tumalum drainage, and in the Cummings Creek drainage.

  No-harvest Riparian Management Zones (RMZ) will generally be 200-feet wide on each side of perennial fish bearing streams, Tucannon River, and Cummings Creek. Tumalum Creek, a seasonally dry fish bearing stream, will have a 100-foot no-harvest Riparian Management Zone (RMZ) on each side. Perennial non-fish bearing streams will have a 50-foot no-harvest RMZ on each side. Where safety regulations require felling danger trees inside of the RMZ, some trees or the butt end log of some trees will be removed as part of the commercial timber sale. Five or six trees representative of the stands will be left per acre for wildlife.

  Road use will be confined to conditions that meet State forest practice standards and Umatilla National Forest road rules; both require that road use stop when sediment from roads enters streams.

  Wildlife browse species will be planted at 150 per acre in locations that supported them previously, about 1500 acres. Conifers, ponderosa pine, Douglas-fir, and western larch, will be planted at 150 per acre on all harvested acres (personal communication Doug Kuehn, WDFW Forester).

  Fire Salvage on private land - Applications filed with Washington DNR to log fire salvage were reviewed. Eight applications are in the Pataha or Dry Pataha drainage covering 1,730 acres, one is in the Tucannon drainage for 35 acres, and one is in Patit Creek, 13 acres. Acres listed on permits often include whole ownerships and harvesting may occur on fewer acres. These applications were approved with conditions to meet the State Forest Practices Rules. More permits could be filed, but it is likely that most have already been received.

  Tractor skidding or other ground based equipment would be used on most of these areas. Ground based skidding would be limited to 35 or 40 percent slope, low pressure systems would be allowed up to 50 percent slope. Crossings of seasonally dry streams (type 5) would be limited to one crossing per 250 feet and an equipment limitation zone of 30 feet would call for minimizing equipment entry. Perennial non-fish bearing streams (type 4) would receive 50 foot RMZs where basal area requirements limit harvest and equipment limitations would be in effect. Landings would be located at least 75 feet from them. Perennial fish bearing streams in the Pataha and Dry

Pataha are in the bull trout overlay and shade trees within 75 feet of the bankful width would be left. Pataha Creek, a perennial fish bearing stream would have a 75 foot RMZ under one permit. On Pataha and Dry Pataha Creeks a skyline system will be used across a 90 foot RMZ in another permit that covers about 400 acres. There are no fish bearing or perennial streams in the areas with approved permits in Tucannon and Patit Creek.

Erosion control measures include location of landings at increasing distances from streams as fish use increases. Mulching of disturbed areas with slash or hay and seeding is required. Outsloping or waterbars are required for all roads and skid trails. Full bench construction with DNR site approval is required when building new roads/trails/or landings on slopes over 40 percent (personal communication Jesse Calkins, Forest Practices Forester).

SUMMARY OF REASONABLY FORESEEABLE ACTIONS:

- Stevens Ridge ATV Complex Project (Decision Notice signed 4/18/05) – Project is located in T9N., R42 E., Sections3, 4, 9, and 10. It consists of a looping ATV (all terrain vehicle) trail complex, approximately 24 miles long and encompasses an area of about 1,600 acres. It utilizes roads built and used during past logging operations on Stevens Ridge.
- North South OHV Trail – Project would construct 29 miles of OHV (off-highway vehicle) trail from Forest boundary on Forest road 40 to Forest boundary on Forest road 4304. Located in T9N., R42E., Sections 4,9, 16, 17, 20, and 32; T8N., R42E., Sections 5,8,9, 15, 22, 23, 25, and 36; and T8N., R43E., Section 29, 32, 34, and 36 and T7N., R44E., Sections 2-6.
- Reforestation/rehabilitation of nearly 500-1,000 acres of riparian habitat with mixed native shrubs and conifers in Grub, Hixon, Tumalum and Cummings Creeks. Estimated 35,000 stems and rooted stock.
- Two cross draining culverts are scheduled for removal from Grub Creek.
- Hixon Creek culvert removal.
- Reforestation – Plant trees in areas where there is an insufficient seed source to insure reforestation by natural means. These areas are not associated with salvage harvest and have a suitable management area allocation. Approximately 4,125 acres would be planted if Alternative B is implemented and approximately 9,375 acres if Alternative C is implemented.
- Road Decommissioning – Decommission existing unauthorized roads not used for the timber sale activities. Approximately 13 miles if Alternative B is implemented, and approximately 16 miles if Alternative C is implemented.
- Spring and guzzler construction.
- Fencing and corral construction.
- Placement of recreation interpretive signs.
- Site restoration – rip/decompact old landings and restore site productivity.
- West Patit Prescribed Fire Project – Located in Patit Subwatershed of the Touchet Watershed in T9N, R41 E, Sections 4-9 and 17-18. A landscape prescribed fire treatment on approximately 1600 acres is proposed to reduce ground fuels and improve forage and reduce wildfire hazards. Burning would occur in late fall or late winter/early spring. Existing roads would be used. There would be no ignition in RHCAs, but fire would be allowed to back downhill into these areas.
- Pacific Primitive Rendezvous – a week long organized camping event near Sunflower Flat.
- Gathering of mushroom in burned areas.

SOILS

SCALE OF ANALYSIS

The scale of analysis for soil resources (the activity area as described in Forest Plan standards and guidelines) is the harvest unit. Associated system roads and temporary roads are included in assessments. Introductory setting and characterization is described for the fire area as a whole. Most information is limited to the National Forest system land portion of the fire.

Standards and Guidelines - A minimum of 80 percent of an activity area is to be maintained in a condition of acceptable productivity potential. Acceptable productivity potential is defined as a less than 20 percent increase in bulk density in volcanic-ash derived soils and a less than 15 percent increase in bulk density in other forest soils (a measure of soil compaction); soil displacement of less than 50 percent of the topsoil or humus enriched A1 and/or AC horizons from an area of 100 square feet or more which is at least 5 feet in width; molding of soil in vehicle tracks and rutting of less than a 6 inch depth; or soils that are not burned severely due to prescribed fire. Further detail, clarification and policy guidance is provided in Forest Service Manual (FSM) 2520.3, R6 Supplement 50, 6/87. This supplement has been updated in R6 Supplement 2500-98-1. Soil conditions exceeding these levels (thresholds) of acceptable productivity potential are considered in a detrimental soil condition (DSC).

Measures for Acceptable Soil Productivity:

- **Detrimental Soil Condition** (DSC) as a percentage of the area of each harvest unit (activity area), expressed in acres for comparison of the Alternative. Permanent roads and temporary roads associated with harvest are included. As described above, soil conditions exceeding the thresholds for compaction, displacement, puddling, and severe burning are considered in a detrimental soil condition.
- **Effective Ground Cover**- as a percentage of the area of each harvest unit. Effective ground cover is defined as: all living or dead herbaceous or woody materials and rock fragments, greater than three-fourths of an inch in diameter, in contact with the ground surface. Includes tree or shrub seedlings, grass, forbs, litter, chips, and so forth.

  Management activities shall be designed and implemented to retain sufficient ground vegetation and organic matter to maintain long-term soil and site productivity (FP p. 4-80).

Coarse and fine woody debris (also referred to as woody debris or small and large woody fuels) expressed in tons per acre. Coarse woody debris is typically defined as dead standing and downed pieces larger than 3 inches in diameter (Harmon and others 1986) and fine woody debris as smaller than 3 inches.

Assessment Methodology for Detrimental Soil Conditions (DSC)

Effects due to salvage and associated operations were assessed on a unit basis. Direct effects estimates included observations from previous monitoring of both green and fire salvage (primarily Tower and Bull Springs, Wheeler Point, and Willow Springs which is adjacent to the School Fire) operations on the Forest. Estimate of DSC increases from activity were increased 1 to 2 percent to account for lack of surface cover and anticipated higher rates of compaction effects without the down wood component typical of green operations. Operational rehabilitation mitigation/design criteria were factored into overall DSC estimates expected at the end of operations (Table H-5, Appendix H). Units with previous higher (10 percent or more) existing (detrimental) soil conditions would be expected to have less increases from proposed actions due to reuse of trails and landings. This was not factored into overall estimates but would tend to reduce cumulative effects of additional soil disturbance.

New temporary roads were factored by the unit(s) that they are accessing. They would be obliterated as part of the project design and placed back into productive capacity in the long-term, but were factored in the detrimental soil condition tabulation for immediate post-project conditions. Calculated in acres, most are quite small (less than 1 acre) with little to no effect on overall unit percentages in most units. Use of existing unclassified/unauthorized roads would facilitate rehabilitation on those sites, improving the productive capacity from present condition. In total (about 25 acres), they represent restoration efforts to improve heavily disturbed sites and increase productivity in the area. Additional rehabilitation efforts under consideration for the area (see Reasonably Foreseeable Actions) will further improve on current conditions as they occur.

It was evident during field assessments that some of the existing condition estimates will overstate the existing DSC in some cases. In some cases this is due to an existing access (non-system) road or skid trail in a small unit, thus increasing the percentage of the area impacted. In other cases, small areas of large units had high disturbance levels that were (then) assigned to the unit as a whole due to placing in the percentage groupings, which will tend to indicate larger acreages of DSC than actually occur in those units. A primary intent of Forest Plan standard and guidelines for the DSC is to inform managers of areas with potential and need for rehabilitation, so while overestimating in these cases, the relatively higher numbers (percentage or acres) indicate areas where rehabilitation opportunity exists.

AFFECTED ENVIRONMENT

Soils are dominantly volcanic ash parent materials overlying basalt and andesite residual soils in varying depths. Some of the more stable soils in this area have a thin subsurface layer of loess on top of the (basalt/andesite) bedrock. Even the shallowest soils in nonforest positions have considerable volcanic ash mixing in the surface, and (therefore) exhibit some characteristics of deeper ash soils, notably dustiness.

Volcanic ash soils are low-strength with little to no coarse fragments and are therefore susceptible to compaction from machinery. All soils in the area have shallow topsoil layers, with the grassland and shrubland soils having somewhat thicker surface horizons. These shallow surface layers are susceptible to displacement from machinery, either directly through scraping or via erosion losses when dry by ‘dusting out’. Water infiltration rates are high, especially if the soil surface is undisturbed. Water erosion is a risk if the surface cover of forest duff and vegetation is removed, particularly on of steep slopes, whether due to fire or mechanical means.

Within units, soil type is quite variable, with the primary difference the depth of volcanic ash on the surface. This directly influences the plant communities that can grow there with the deeper ash soils supporting greater density of trees and moisture-demanding varieties. Ash soils are typically more susceptible to compaction and displacement impacts when dry. Shallower soils in the area are more susceptible to puddling and displacement impacts, especially when wet.

Soil Inventory

The Land Type Association (LTA) descriptions (see Appendix H) include primary and secondary soil types (named series) derived from the Terrestrial Ecological Unit Inventory (TEUI) in process on the Blue Mountain National Forests. The LTA is a coarse-scale inventory suitable (1:100,000 map scale) for large area planning purposes such as Forest Plans. The TEUI is more detailed survey (1:24,000 scale) equivalent to the land-type scale in the Ecological Hierarchy used by the Forest Service (ECOMAP

1993). The TEUI is a correlated survey, part of the National Cooperative Soil Survey (NCSS), and therefore includes soil types at the soil series level in the taxonomic classification which provides names for the soils series. For added descriptive characterization, the dominant representative soil series typical of the LTAs in the School Fire area are listed and described in the Appendix, along with discussion on Geology, Landslides, and the subsection (Blue Mountains Ecoregion, Tollgate Plateau subsection) this area fits into in the Ecological Hierarchy.

This (School Fire) area is not yet mapped in the Blue Mountains TEUI so the Umatilla National Forest Soil Resource Inventory (SRI) is used for soil type identification, and field verified by the Forest Soil Scientist for harvest units visited. Soil types are inventoried (mapped), described, and documented in the Umatilla National Forest Soil Resource Inventory (SRI) (USDA Forest Service 1977). Soils are not named because the SRI is not a National Cooperative Soil Survey (NCSS) correlated survey. The SRI is intended for mid-scale planning purposes. Soil characteristics were field verified by the Forest Soil Scientist at the harvest unit scale. The map unit codes represent soils to the family level in the Soil Taxonomic system (USDA 1975).

Table H-3 in Appendix H provides a compilation of the primary SRI map units for activity units described in the Proposed Action (Alternative B). The key management interpretations for hazards (ratings) due to machine activity are listed in the four columns on the right. Listed is a hazard rating for compaction, displacement, puddling, and erosion. Ash soil depth is shown as a primary characteristic due to its importance for site properties and response to management activity. Interpretations for compaction, displacement, puddling, and erosion hazard are listed for dominant soils. A Soil Resource Inventory (SRI) Map for the proposed action can be found in Appendix A.

Detrimental Soil Condition (DSC)

Forest Plan standards and guidelines for management induced soil disturbance are described in terms of the amount of area of an activity unit (for example, a harvest unit) exceeding certain levels of soil impacts in degree and extent. Impacts that are considered include compaction, displacement, rutting (puddling), and severe burning from prescribed fire. Impacts from compaction, displacement and puddling, in particular, tend to be persistent and last many years in this area. A study in central Idaho indicates that natural recovery of the soil may take 40 to 70 years (Froehlich et al. 1983). The persistence of compacted soil over time, for example, determines its affect on stand response and the long-term effect on forest productivity. How long soils remain compacted is determined by natural recovery rates or tillage operations or both (McNabb and Froehlich 1983). As such, these impacts from previous soil disturbing actions are still observable. Not all soil disturbance is detrimental. Exceedance of certain threshold values trigger characterization of that disturbance as detrimental. For example, compaction is considered detrimental if bulk density is increased more than 20 percent for ash soils.

Guidance for methodology includes: Protocol for Assessment and Management of Soil Quality Conditions, Umatilla National Forest, 2002; Guidelines for Sampling Some Physical Conditions of Surface Soils, Howes, Hazard and Geist, US Forest Service Pacific Northwest Region, 1983.

Units for School Fire Salvage Recovery project were assessed for the extent and degree of previously impacted soil using field observation starting in the fall of 2005, the soil inventory (SRI) with field verification by the Forest Soil Scientist, prior history of activity (including harvest entries), and prior knowledge of the sites from previous assessment by both district and Forest staff (Table H-4, Appendix H). Observations and ratings were done by field layout crews that had previous experience and training.

Units were grouped into three ranges (0-10; 10-20; >20) of existing detrimental soil condition as a percentage of area based on those field assessments. Additionally, units with prior harvest history and the likelihood for greater existing impacts were evaluated by the Forest Soil Scientist for quantitative assessment relative to Forest Plan standards and guidelines for detrimental soil condition.

The fire made evaluation of existing soil conditions much easier by removing vegetation and ground cover. Old skid trails, rutting and compaction from machinery is more obvious without the covering effect of forest litter (duff) and ground vegetation. The units with a history of multiple entries were evaluated more closely by the soil specialist to determine the existing detrimental soil condition (DSC). An estimate of DSC as a percentage of the areas, converted into acres, and assigned for each activity unit to provide a consistent tracking measure.

The following table is a summary of the units displayed in Table H-4, Appendix H. It summarizes the individual unit's percentage into the 3 group ranges and lists the acres for each category. The mid-point of the range (e.g. 5 percent for the 0-10 percent group) was used to calculate acres in DSC and for establishing a percentage by unit for use in effects changes. This (use of midpoint for calculating) will tend to overestimate acres in DSC, especially in units with little to no existing DSC, but is useful for comparing relative starting points and effects of actions for cumulative effects assessment. Four units in Alternative B are currently exceeding Plan standards for DSC, with one unit exceeding in Alternative C.

Table 3-3 Summary of Existing Detrimental Soil Conditions (DSC) of Proposed Harvest Units

ALTERNATIVE	**HARVEST AREA DETRIMENTAL SOIL CONDITION (DSC)**			
	0 to 10%	**10 to 20%**	**>20%**	**Total Units/Acres**
Alternative B # of Proposed Units Acres and percent of DSC out of 9,432 acres	175 399 (4%)	47 230 (2%)	4 28.4 (<1%)	226 657 (7% of 9,436)
Alternative C #of Proposed Units Acres and percent of DSC out of 4, 188 acres	109 239 (6%)	24 104.6 (3%)	1 22.2 (<1%)	139 366 (9% of 4,188)
While detrimental soil condition area (acres) is tracked on an activity area basis (salvage unit), totals for the entire area of affected area is included in order to use as a basis for comparison of alternatives in the Environmental Consequences section.				

While previous entries is an indicator of silvicultural activity it is not necessarily a strong indicator of current soil detrimental conditions as the reasons for entries (treatments) and impacts from them vary considerably. Historical entry data includes low disturbance thinning (often hand completed) to higher disturbance activity such as tractor skidding, but under a variety of conditions producing highly variable effects. Natural recovery from these activities also varies considerably depending on soil type, location, weather and other factors.

Effective Ground Cover

Forest Plan standards and guidelines describe minimum effective ground cover percentages after soil disturbing activity based on soil erosion hazard classes. Effective ground cover typically recovers quickly and is not a long-lasting condition. Effects to effective ground cover from proposed actions will be discussed in the Environmental Consequences section, and is used as an erosion and sedimentation factor in the Hydrology/Water Quality section of this document where erosion is discussed and modeled. Affected environment for effective ground cover describes conditions as a result of the fire.

Fire Suppression Effects

Fire suppression activities like fireline construction can be sources of erosion and sedimentation after fires are controlled. A fire suppression rehabilitation plan was developed for School Fire. It was implemented in September 2005, following the fire. Nearly 33 miles of mechanically constructed fireline and safety zones were constructed, about 21 miles of line on NFS lands. Handlines were scattered throughout the fire area and were estimated to cover another 8 miles. Most of the direct (at fire's edge) dozer line was constructed outside NFS lands on State and private ownerships. In general, School Fire was contained by existing roads (Groat 2005).

Restoration and rehabilitation of suppression firelines on NFS lands was completed September 17, 2005. Restoration work included a combination of full bench restoration and water-barring. Berms were pulled back into the firelines when possible. Woody material was dragged back into firelines to direct water off handlines. Dozer and handlines were seeded with a native seed mix from the Pomeroy Ranger District. Seeding of those lines was completed September 25, 2005 with an average of 15 pounds/acre mix of mountain brome, blue wild rye, and Idaho fescue. (Groat, 2005)

Burned Area Emergency Response (Baer) Assessment

Fire affects soil properties in a special way, with reduced infiltration and increase in water repellency especially important to watershed function. Erosion is the most visible and dramatic impact of fire apart from the consumption of vegetation (USDA Forest Service 2005). Fire may affect the maintenance of site productivity but the magnitude of its potential effect depends on the 1) ecosystem (including inherent soil properties) 2) the intensity of fire and 3) the frequency of the fire (USDA Forest Service 1980).

Terms such as fire and burn intensity, and burn and fire severity are sometimes used interchangeably though they are indicators of different effects. Fire or burn intensity relates to the amount and rate of surface fuel consumption. It is not a good indicator of the degree of chemical, physical and biological changes to the soil or other resources. The use of fire or burn severity provides a more accurate method to assess the effects of fire to the soil resources and ecosystems in general. Fire or burn severity reflects the amount of heat that is released by a fire and how it affects other resources. It is dependant on the type of fuels and the behavior of the fuels when they are burned. The Forest Service Burned Area Emergency Response (BAER) program has agreed to use (Fire or) Burn Severity (Debano et. al. 1998) as a standard for burned area assessments, with burn severity the preferred term.

The BAER process is intended to provide for a rapid assessment of threat to life, property and natural resources resulting from wildfire watershed impacts. As the fire was being contained, a BAER assessment was conducted for the School Fire and provides for further characterization of the fire's effects on soils by mapping the burn severity. Burn severity distribution (low, moderate, high) is displayed in Table 3-4 below along with acreages. Changes in water repellency due to the fire was not observed as naturally occurring water repellency is common in the area and commonly occurs in unburned ash-cap soils when very dry heating during a fire intensifies initial or inherent water repellency (Debano et al. 1998).

Table 3-4 Burn Severity – Acres and Percentage of Fire Area (all ownerships)

Burn Severity	Acres	Percentage of Fire area
Low/Unburned	19,870	38%
Moderate	25,620	50%
High	6,433	12%

Additionally the loss of the surface duff material (forest floor), which acts as a mulch, exposes the mineral soil to rapid drying. The loss of the duff also reduces water storage capacity on site. Therefore, the areas mapped with moderate and high burn severity can be expected to cause increased runoff and erosion if short-duration, high intensity rainfall events occur, particularly during the summer of 2006. Erosion risk can be expected to drop considerably after the first growing season as vegetation (especially grasses, forbs and mosses) reestablishes (Johnson 1998; Forest monitoring Tower Fire). Susceptibility to erosion has already been reduced by the increase in effective ground cover due to extensive needle-cast in areas where the tree crowns (needles) were not consumed. Extensive discussion of fire effects on soil and water can be found in numerous publications including Boyer and Dell 1980, Debano et al. 1998, and Neary et al. 2005.

The Burned Area Emergency Response (BAER) assessment team evaluated fire related erosion and runoff risk to life, property, and resources and made recommendations for emergency stabilization and weed spread reduction measures. Recommendations were based on results from burn severity mapping, evaluation of resource values at risk, and analysis of the cost-effectiveness of mitigation treatments. Treatments were targeted at high priority areas including: Pataha Creek, upper Tumalum, and Cummings Creek due to concerns for weed spread and high-value fisheries. In an unnamed tributary to Camp Wooten, mulching treatments occurred in the headwaters to increase infiltration and reduce the threat to Camp Wooten from potential storm runoff.

Recommendations for NFS lands included: seeding on approximately 1,760 acres of moderate and high severity burn areas with native species to reduce erosion and weed invasion and spread potential from adjacent private and state lands; three mulch treatments (hydro-mulch, wheat straw and wood-straw) on approximately 150 acres in the headwaters above Camp Wooten to improve infiltration and reduce runoff directed at Camp Wooten. Monitoring sites have been installed to evaluate treatment implementation and effectiveness for the three mulch treatment types. Hardwood planting along about two miles of Cummings Creek has begun and will continue through spring 2006. Weed pulling occurred along sections of the Tucannon River road (School Fire BAER evaluation and implementation documents, 2005).

Roads in the fire area were evaluated both as structures at risk and as potential sources of erosion and sedimentation. Additional drainage structures (drain dips) were added to FR 4016 and 4200040 in the Pataha drainage. Along the mainstem of the Tucannon River damaged drainage structures (culverts) were replaced on FR 4700 and ditch maintenance occurred. Along Cummings Creek, NFS portions of 4700020 were stabilized and seeded. Drainage structures at risk on an abandoned road in Grub Canyon are identified for removal.

Further discussion of erosion and runoff processes including erosion estimates using the WEPP model is discussed in the Hydrology/Water Quality section of this document.

The Burn Severity Map (Appendix A) displays the location of burn severity areas in graphic form. High and moderate burn severity areas are predominantly in the Tucannon, Cummings, and Tumalum drainages in the heavily timbered stands that had high fuel loads. In many cases these are also areas with

High erosion hazard and are susceptible to erosion due to the fire as discussed here and in the Hydrology section. The Vegetation and Fuels section of this document also discuss tree mortality which tends to correlates with burn severity, but there is not a direct correlation.

Coarse and Fine Woody Debris

Maintaining soil productivity over the long-term generally requires presence of soil organic material and fire effects characteristic of the natural fire regime. Most fires characteristic of the historic fire regime or moderate severity prescribed fires are likely to enhance soil development and fertility over the long term by periodic release of nutrients. However, extremely severe fires or large severely burned areas within fires, brought on by either rare natural events or humans, are likely to be highly detrimental to forest soils (Harvey et al. 1989). Graham et al. (1994) developed conservative recommendations for leaving coarse woody debris (CWD) after timber harvesting to ensure enough organic matter was left to maintain long-term forest productivity, amounts adjusted based on the vegetation types. These vegetation types are a primary component of classification of forests into fire regimes (Agee 1993, Brown 1995).

Fuel loadings were reduced during the School Fire by varying amounts depending on the burn severity experienced by the stand. These reductions are generally summarized by severity rating as discussed in the Fuels section of this document. More detailed discussion of woody material may be found in the Fuels, Wildlife, and Hydrology/Water Quality sections of this document. The following tables and narrative about fuel loadings is taken from the Fuels section of this document.

Table 3-5 below displays the pre-fire, current, and maximum desired small diameter (less than 3 inch diameter) fuel loading by fire regime.

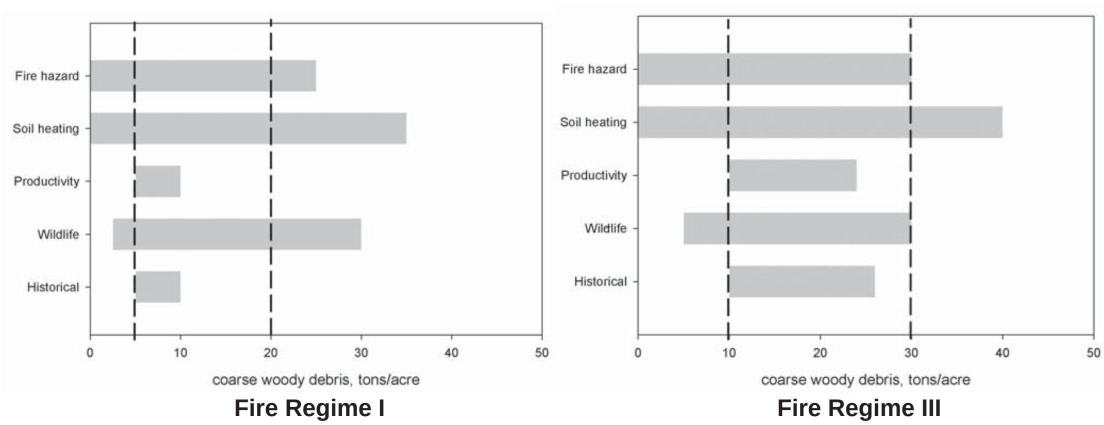
Table 3-5 Estimated Average Pre-Fire, Current, and Desired Maximum Small Woody Fuel Loadings

Historical Fire Regime	**Pre-fire <3 inch fuels (Tons/Acre)**	**Current <3 inch fuels (Tons/Acre)**	**Maximum Desired <3 inch fuels (Tons/Acre)**
Low Severity (Fire Regime I)	6.2	1.7	3
Mixed Severity (Fire Regime III)	6.2	4.3	5

Sources/Notes: Pre-fire and current fuel loadings were determined using FVS-FFE. Original fuel load inputs into FVS were based on estimations using the Photo Series for Quantifying Natural Forest Residues in Common Vegetation Types of the Pacific Northwest (Maxwell and Ward 1980). Desired loadings are based on predictions of ground fuel loadings that may have occurred under the natural fire regime.

Brown (2003) integrated the various sources of information to identify an optimum range of CWD that provides an acceptable risk of fire hazard while providing benefits to soil and wildlife (see Figure 3-1). These ranges can be used to illustrate the effects of various management alternatives on CWD over long periods and can assist in attaining historical stand structures and large fuel accumulations using potential reburn severity as a basis for identifying optimum quantities of CWD.

Figure 3-1 Optimum ranges of coarse woody debris for providing acceptable risks of fire hazard and fire severity while providing desirable quantities for soil productivity, soil protection, and wildlife needs for Fire Regime I and Fire Regime III forest types. Dotted lines show a range that seems to best meet most resource needs: 5 to 20 tons per acre for the warm dry types and 10 to 30 tons per acre for other types.



Sources/Notes : Figure from Brown 2003 (see Brown's Figure 2)

The acceptable and historic ranges of CWD quantities were used to assign CWD classifications to all forested stands in the School Fire Salvage Recovery project area. Stands were classified as Below (below acceptable range), Historic (within acceptable range and historic range), High (within acceptable range but higher than historic range), and Above (above acceptable and historic range). Table 3-6 identifies pre-fire and current post-fire CWD classifications of all forested stands in the project area.

Table 3-6. Pre-Fire and Current CWD Classifications of All Forested Stands in School Fire Salvage Recovery Area

CWD Class	Pre-fire Acres	% Area	Post-fire Acres	% Area
Above	685	3%	0	0%
High	1,575	8%	335	2%
Historic	15,751	77%	9,385	46%
Below	2,467	12%	10,758	53%
Total	20,478	100%	20,478	100%

Source/Notes: Summarized from the School Recovery vegetation database as developed using FVS-FFE model Forest Vegetation Simulation with Fire and Fuels Extension, (USDA FS 2004h); acres and percents include National Forest System forested lands only.

The concern for woody debris levels is one of balancing retention of sufficient quantities of woody debris for organic matter retention & soil surface stabilization needs versus (too) large quantities such that a reburn in future years would create undue severity to the soil. The amount of coarse woody debris (CWD) that provides desirable biological benefits, without creating an unacceptable fire hazard or potential for high fire severity reburn, is an optimum quantity that can be useful for guiding management actions (Brown et al. 2003).

ENVIRONMENTAL CONSEQUENCES

Most concerns to the soil resource due to salvage activity center on the perceived increase in sensitivity of the soils due to the fire, especially erosion potential, and issues of further removal of woody material in a fire area with much reduced organic matter levels. The potential for re-burn is also raised as an issue if large amounts of dead wood are not reduced and subsequent future fires produce high severity fires due to the high fuel loads. Discussion of these issues, in general, is well covered in McIver and Starr (2000).

Effects of School Fire Salvage Recovery proposed activities concentrate on effects relative to soil disturbance exceeding criteria for detrimental soil condition as described in the Forest Plan, and effects to effective ground cover as compared to Forest Plan guidelines. Other relevant soils issues are briefly discussed, with reference made to other sections of the EIS where these issues are further addressed. Analysis of effects of proposed actions relies heavily on local experience of both fire salvage and green tree harvest activities and comparison with those of the soil characteristics of the units in this area.

Alternative A - No Action

Direct/Indirect Effects – Alternative A:

Detrimental Soil Condition (DSC)

This alternative would produce no increase or reduction in detrimental soil disturbance (detrimental soil condition) from proposed salvage logging operations and associated activities. No rehabilitation and native seeding of existing landings, skid trails, or unauthorized roads would occur. Four units (as they are configured in this proposed action) are estimated to be over Forest Plan standards for detrimental soil condition on a percentage-of-area basis (28 acres total), and one unit as included in Alternative C (22 acres).

Effective Ground Cover

Effective ground cover would recover on all acres at current rate with no temporary reductions due to surface disturbance and yarding of salvage logs or burning of slash. Increases of effective ground cover from sub-merchantable tree material left from felling and bucking of salvage trees would not occur. Because prescribed burning of logging slash would not occur, the potential for high burn severity sites from this activity would not be realized.

Coarse and Fine Woody Debris

Dead wood amounts would remain at current levels. Total dead wood amounts would be above the range recommended (Brown et al. 2003) on units that would otherwise be treated in Alternatives B and C to be within recommended ranges. This would increase the risk of high intensity reburn and associated adverse soil effects as described in several publications, notably Agee and Skinner (2005) and Brown and others (2003). The positive effects of higher wood amounts over the long-term as dead trees fall (McIver and Starr 2000, Brown et al. 2003, Beschta 2004) would be increased realized on units that would have salvage logs removed in the action alternatives. See the Fuels section for specific discussion of dead and down wood levels.

There are a few units where management objectives have reduced downed wood levels at or below the lower range for the site, for example Unit 26 on the Forest boundary along Road 40. This unit is in an area treated for fuel reduction objectives, and existing and projected dead wood levels are estimated to be just below the suggested range, based on Brown and others (2003).

<u>Cumulative Effects – Alternative A:</u>

Detrimental Soil Condition (DSC)

There are no cumulative effects to detrimental soil condition (DSC) for this alternative. There are no land disturbing activities.

Effective Ground Cover

Effects from the fire to watershed conditions has been discussed earlier and in the Hydrology/Water Quality (and other) sections. Mulching treatments prescribed in the BAER evaluation were limited to the headwaters of Hixon Creek and the tributary that runs by Camp Wooten, which is not in the proposed salvage area.

Coarse and Fine Woody Debris

Wood levels would not be changed in any area with this alternative. The positive effects to soil productivity from the higher organic matter levels, and potential negative effects from potential reburn, are discussed elsewhere in this section and in the Fuels section.

Effects Common to Action Alternatives (B and C)

<u>Direct/Indirect Effects – Alternatives B and C:</u>

Detrimental Soil Conditions

Salvage logging activities would create direct effects to soils due to disturbance from harvest and yarding machinery driving over the soil and dragging of logs. The effects are primarily in the form of soil compaction, displacement of topsoil, puddling (rutting in wet soil). Prescribed burning following harvest activities would create some high burn severity where fuels levels are concentrated and burn for a long time (residence time). An indirect effect is the exposure of mineral soil due to machine traffic and dragging of logs (primarily with skyline systems), creating an erosion risk that may or may not be realized.

The intent of Forest Plan standards and guidelines for detrimental soil impacts is to minimize the extent (area) of detrimental levels of soil disturbance. Specifically, the total area in an activity area (e.g. harvest unit) should be 20 percent or less in area exceeding criteria for detrimental disturbance. The different types of impacts are combined together to produce detrimental soil condition (DSC).

Not all soil disturbances are detrimental to ecological processes, productivity, or creates an erosion hazard. Thresholds for detrimental thresholds for compaction, displacement, puddling, and severe burning are described in the Forest Plan or Forest Service Manual, Pacific Northwest Region Supplement 2500.98-1. Compaction is typically measured using bulk density changes, with a 20 percent or greater increase in ash soils, common in this area, considered exceeding detrimental thresholds. Displacement, puddling, and severe burn impacts have separate criteria for detrimental thresholds.

The Forest Soil Scientist, among others, was directly involved with the selection of harvest systems and operational design with the objective of reducing the extent and degree of potential soil impacts. See Table 2-3 Design Features and Management Requirements in Chapter 2. Contemporary harvest systems proposed for this project are capable of extracting timber with minimal area effects on soil resources. This requires careful operational control, but it is common for operations on the Umatilla NF to impact less than 8 percent with, ground-based systems, of an activity area. Skyline and helicopter systems are even lower, typically under 5 percent.

The cut-to-length system (forwarder) typically produces little to no exposed mineral soil surfaces as there is no dragging of trees overland. The bulk of the soil effect is from compaction from the machinery driving over the areas being harvested. Trails are typically 40 to 60 feet apart with average-sized systems in this area. The area within the trails that is detrimentally disturbed is highly variable but if often less than half of the trail area. Downed wood and slash that is dropped in the trail in front of the processor, and also driven over by the forwarder, distributes the weight of the machinery and reduces compaction levels. Displacement of volcanic ash soils can occur when skidding operations occur during the driest parts of year. The use of the cut-to-length forward/processor system essentially eliminates this concern also.

Of concern in fire salvage areas is the question of how much downed wood remains and how much slash is available in burned trees to cushion the compaction effects. In the high, and some moderate, severity fire areas, much of the downed wood was consumed in the fire, with needles and small branches typically burned in the standing timber as well. This has reduced the amount of downed wood and slash that can be expected to be available for machinery to drive on. This was another consideration in logging system(s) selection. This has been considered and factored into impact estimates by increasing the potential detrimental soil effects estimates from a 3 to 6 percent range to 4 to 8 percent for high and moderate severity on ground-based system units. Skyline systems have potential DSC range increased from 1 to 3, to 1 to 4 on high and moderate severity units. With less downed wood on site (than in a green operation) to cushion, a slight increase in added soil displacement from log dragging is anticipated in high and moderate burn severity areas.

In addition to avoiding adding excessive detrimental soil effects by operational design, mitigation in the form of subsoiling treatment of areas of highest compaction (landings, high-use skid trails) and revegetating with native species (grasses and trees), serves to reduce the total area of soils that would otherwise be in a detrimentally compacted condition. Areas of previously compacted or puddled soil that are reused in this salvage operation will also receive treatment, thereby reducing a portion of the existing detrimentally disturbed soil.

Table 3-7 summarizes the number of units and acres in each DSC group by Alternative. Alternative B increases the total acres of detrimental soil condition by 69 acres. Alternative C shows a net decrease of 74 acres in total detrimental soil condition. This is a result of the smaller total number of acres in the alternative and resulting greater (percentage) effect on the total of the rehabilitation work on existing roads, landings and trails. The totals in both alternatives would be higher without the mitigation and rehabilitation treatments provided in the operational guidelines. Table H-5 in Appendix H provides a detailed list by harvest unit of estimated cumulative DSC.

Table 3-7 Summary of Cumulative Detrimental Soil Condition (DSC) by Alternative

ALTERNATIVE	ACTIVITY AREA DETRIMENTAL SOIL CONDITION			
	0 to 10%	**10 to 20%**	**>20%**	**Total Units/Acres**
Existing Condition (see Table 3-3) (Alt B acres DSC) (Alt C acres DSC)	 399 239	 230 105	 28 22	 657 acres 366 acres
Alt B - number of units Total acres DSC	175 488	51 238	0 0	226 units 726 acres (8% of 9,436)
Alt C - number of units Total acres DSC	109 208	30 84	0 0	139 units 292 acres (7% of 4,188)

Effective Ground Cover

School Fire removed ground cover and created conditions that elevated surface erosion rates; this is especially true in steep, severely burned areas. Surface erosion from rainfall begins immediately following a fire and decreases dramatically as vegetation reestablishes itself in 3-4 years (Emerson 2003 and Elliot et al. 2001). Vegetation acts as a barrier and shields to the soil from the impact of raindrops. In fact, any material on the surface helps protect the soil from the impacts of raindrops that displace the soil. Effective ground cover includes limbs, tree boles, vegetation or other material protecting soil from erosion.

Increased effective ground cover from logging litter can reduce soil loss in post-fire watersheds. Logging slash created from harvest operations would [in most cases] increase the amount of effective ground cover [in the short-term] by adding unmerchantable tree parts (slash) to the forest floor. Long-term, boles removed from the site in salvage operations would not be available for long-term down wood. This would have little effect on erosion hazard, absent another high severity fire, as vegetative growth and duff layers will have been recovered.

Discussion of erosion and sedimentation may be found in the Hydrology/Water Quality section that includes modeling of erosion rates using the WEPP model (Elliot and Hall 1997).

A primary concern of salvage logging operations is the risk of increased erosion within an already highly erodible environment (Beschta et al. 2004; public comments). There is an increased likelihood of overland flow in high severity burned areas (Neary et al. 2005) that could flow to (re)disturbed areas - forwarder trails, skyline corridors, landings- from yarding operations. Surface soils will have stabilized and infiltration improved considerably by the time of first operations one year after the fire (Robichaud 2000; Forest monitoring), reducing the likelihood of undisturbed areas within units producing overland flow that would run onto freshly exposed areas. Grasses and forbs in the lower elevations, and mosses in the higher elevations, were observed to have become established within the first full year after the Tower Fire on the North Fork John Day Ranger District of the Umatilla NF in 1996.

Operational design systems, BMPs, and particularly use of cut-to-length harvest systems reduce or eliminate the potential for erosion on the salvage units. Cut-to-length harvesting systems are full suspension systems such that logs are not dragged along the ground. This essentially eliminates continuous areas of bare soil that creates erosion hazard in most situations. Skyline systems affects very little ground but can create long, continuous areas of bare soil where logs (one end) are dragged uphill, in skyline corridors. The continuity of these corridors is often broken by downed wood, slash dropping onto the corridor soil surface, and ground irregularities. High and moderate burn severity areas would tend to have less downed wood on the ground, so there is likely to be somewhat less available to break the skyline corridor bare soil. Effective ground cover, and erosion hazard, would not be substantially increased. Keeping erosion control measures (water bars, slash, etc.) current during and after operations is very effective in minimizing erosion hazard.

No combination of harvest operation system and site treatment or fuels treatment (which also would be in subsequent years) in any one unit would produce levels of bare ground (lack of effective ground cover) anywhere near standards/guidelines or otherwise level of concern. Tree planting would not measurably decrease effective ground cover.

Post-fire logging followed by broadcast burning affects future stand structure and succession (Grifantini and others, 1991). Burning can aid the establishment of planted conifers by reducing competing vegetation. Burning can also favor fire resistant plants such as grasses and some pioneering plants such as *Ceanothus* species, which add nutrients to the soil (Sexton 1994). Indirect effects of underburning slash and ground cover is proportional to underburn treatment acres.

Operational design criteria, choice of operation systems, use of BMPs, and contractual control is such that no unit would have effective ground cover levels below standards and guidelines. No units would be expected to have effective ground cover reduced below 90 percent of expected levels for the soil and vegetation types (see Table H-7, Appendix H for example of calculations included to determine effective ground cover).

Coarse and Fine Woody Debris

Soil productivity is irreplaceable in human timescales and should be protected (Beschta et al. 1995). Organic matter in the soil surface horizon plays a role in the regulation of water availability, movement and storage, soil structure and soil stability. Site productivity and recovery is often dependent on the amount of surface organic matter remaining in post-fire watersheds (Jurgensen et al. 1997).

Oliver and Larson (1996) have documented that disturbances such as fire and harvest can release nitrogen into the soil. Immediate increases in readily available soil nitrogen can be attributed to the release of simple organic compounds from heat-disrupted soil organic matter and heat-killed microbial tissues (Choromanska and DeLuca 2001). Long-term consequences of nutrient losses on soil productivity are relational to how often and how severely the soil is burned. Soil productivity may actually increase where fire burns with low severity, as the available nutrients that were tied up in understory vegetation and forest floor organic matter are released to the surviving forest vegetation. However, management practices that remove remaining organic matter from low productivity sites after a wildfire may decrease soil productivity.

Dead wood amounts in salvage units would be guided by recommendations in Brown and others (2003). Remaining wood is expected to be sufficient to continue ecological processes; excessive materials in untreated areas allow for risk of high severity fire in any re-burn scenarios in the mid to long-term.

In general, the amount of fuel does not affect the probability of reburn or wildland fire ignitions. The meteorological and physical processes that generate lightning, and human behavior that leads to human-caused fires, determine when and where a fire ignition occurs. The real question is not whether there is a greater probability for reburn, but when reburn occur would they be of greater intensity and more destructive to natural resources (Everett 1995). Professional experience has shown that increased fuel loads can result in increased fire intensity and severity. In other words, given the same weather and topographic conditions, areas with higher fuel loads would burn hotter, have longer flame lengths, have greater potential to convert to crown fires, be more difficult to contain, pose greater risks to firefighters, kill more vegetation, and damage soils more severely than areas with lower fuel loads. The literature shows that when dead and live tree biomass increase, so does flame length and fireline intensity (Rothermal 1983) and while Large woody fuels have little influence on the spread of the initiating fire, they can contribute to development of large fires and high fire intensity and severity (Brown et al. 2001), especially where fuel loads are continuous.

Slash burning has the potential to cause nutrient loss to the extent that post-fire needle cast and recovering vegetation is consumed. This effect would be greater where the post harvest underburn treatments area proposed.

Coarse woody debris (CWD) enhances microsite conditions and habitat, but is not in itself a great source of nutrients. Nutrients captured in coarse wood are brought to CWD habitat by animals and recycled by decomposers such as fungi. The environmental effects of log removal are primarily through wildlife habitat alterations.

Compared to Alternative A – No Action, the direct effects of proposed salvage logging would reduce levels of snag and coarse wood in harvest units. In terms of both short and long-term soil productivity, the tree harvest represents some fundamental trade-offs to the nutrient cycle that organic matter fosters:

Tree bole removal would remove a long-term source of organic matter, while reducing the risk of severe fire effects in the future by reducing fuel loading;

Harvest activities would increase ground cover immediately by placing logging slash on the ground, but would reduce the localized benefits of logs in proportion to the amount of coarse wood removed.

Cumulative Effects – Alternatives B and C:

Detrimental Soil Condition (DSC)

Proposed actions are designed with a considered balance between potential site impacts and the feasibility of operations. Previous management activities disturbed soils to varying degrees and extent, with some impacts still exceeding levels considered detrimental as described in the Forest Plan and Regional Guides.

Existing soil disturbance is scattered across the proposed salvage areas, concentrated on more level ground that is readily accessed. It is primarily in the form of old skid trails and access roads that were sufficiently disturbed at the time of their use. They remain in exceedance of criteria for detrimental disturbance levels. This existing detrimental soil condition is often referred to as legacy disturbance, and is factored into assessments of cumulative effects for new management actions.

A certain amount of overlap occurs when logging activity happens on units with existing detrimental soil condition as machinery reuses some trails and landing sites. This tends to reduce the amount of added, new detrimental soil impacts. However, this was not used to reduce the estimated increase percentage in DSC in the assessment due to uncertainty on the extent of this effect on a specific unit. This would likely lead to some overestimation of total potential DSC in units with existing soil disturbance from previous activity.

The tabulation for Alternative C is essentially the same as Table H-5 except acreages (and subsequent percentage values) were adjusted for units where they changed from the Proposed Action, Alternative B. This has the effect of changing the percentage of DSC for those units where portions are not included in Alternative C. For example, unit 145 has an upper (gently sloping) portion which includes an existing unclassified/unauthorized road. This road and multiple (ground-based) entries combine to indicate higher residual detrimental soil condition. The portion included in Alternative C is the steeper portion with little to no detrimental condition. In either action alternative, the existing road (and new temporary road) would be rehabilitated resulting in a net improvement of productive area.

Tree planting activities would not contribute measurably to detrimental soil condition.

Table 3-8 below displays by alternative cumulative effects to detrimental soil disturbance in a different format. The affected environment analysis area is different for Alternative B and C since the units and associated acres are different, with Alternative C units a subset of Alternative B. Again, total increases in DSC that otherwise would occur, are reduced in Alternative B

Table 3-8 DSC Soil Effects by Alternative

	Alternative A	Alternative B	Alternative C
Detrimental Soil Condition – Acres	657	726	583
Units Exceeding Plan DSC Standards & Guidelines	4	0	0

Reasonably Foreseeable Actions - Additional road decommissioning of existing unauthorized roads and major skid trails would add to the acreage with improved productivity. Salvage receipts generated could be matched with other funding sources for this work. This work is most likely to occur on the Stevens Ridge area. This is in addition road decommissioning associated with the project.

Effective Ground Cover

With the exception of road surfaces, effective ground cover is essentially recovered within 1 to 5 years after cessation of disturbing activities and revegetation activities. Therefore, effects within harvest units are assessed as short-term, direct and indirect effects.

Coarse and Fine Woody Debris

Coarse and fine woody debris is discussed under Affected Environment and Direct and Indirect Effects.

Alternative B- Proposed Action

Direct/Indirect Effects – Alternative B:

Differences in the two action alternatives for salvage and associated activities were discussed above. The primary difference between the two alternatives, other than total units and differences in affected acres, is the miles/acre of new temporary road construction and existing unauthorized use and road rehabilitation.

Prescribed burning (gross) acres are greater for Alternative B, at a total of 4,615 acres for fuels treatment and reforestation site preparation. Unit specific effects are included in the tabulations above.

Cumulative Effects – Alternative B:
Discussed in effects common to action alternatives.

Alternative C

Direct/Indirect Effects – Alternative C:
Differences in the two action alternatives for salvage and associated activities were discussed above. The primary difference between the two alternatives, other than total units and differences in affected acres are the miles/acres of new temporary road construction and existing unauthorized use and road rehabilitation.

Prescribed burning (gross) acres are greater for Alternative C, at a total of 1,685 acres for fuels treatment and reforestation site preparation. Unit specific effects are included in the tabulations above.

Cumulative Effects – Alternative C:
Discussed in effects common to action alternatives.

Finding of Consistency:
All alternatives would be consistent with Forest Plan standards and guidelines for achieving soil quality maintenance objectives. Action alternatives have been designed to achieve project objectives with minimal soil disturbance of any kind especially that which would create added erosion hazard, while balancing operational feasibility considerations. Existing areas of detrimental soil disturbance (detrimental soil condition or DSC) that would be reused (e.g. old landings), and additional DSC from proposed activity, would be mitigated with decompaction treatments and native seeding, thereby reducing the existing detrimentally disturbed area. In addition, some existing unauthorized roads and trails would be rehabilitated. This would improve their existing productive capacity, and moving those particular units, and the project area as a whole, on an improving trend. This (also) meets guidance included in the Forest Service Manual, Pacific Northwest Region 6 Supplement 2500.98-1.

HYDROLOGY/WATER QUALITY

SCALE OF ANALYSIS

The hydrologic system and the hydrologic effects of proposed actions will be analyzed for National Forest System (NFS) lands by Hydrologic Unit Code (HUC) 6 Subwatershed (SWS). Water Erosion Prediction Project (WEPP) sediment modeling on NFS lands will be reported for the project area. Cumulative effect indicators including Equivalent Treatment Acres (ETA) are reported by HUC 6 SWS and cumulated by the HUC 5 Watershed.

HUC is a national level interagency map of the hydrologic system from regional scale drainage (e.g. Columbia Basin) to subwatershed level (40,000-100,000 acre) drainage.

Treatment alternatives will be evaluated based on their effect to hydrologic function and condition, water quality, and water yield. Indicators used to analyze effects of proposed actions are as follows:

- Hydrologic Function and Condition:
    - riparian condition and function
    - road density, miles of road in RHCA, wood recruitment potential
- Water Quality:
    - water temperature,
    - sediment (WEPP model)
- Water Yield:
    - ETA

Several recent documents have assessed the condition of the Tucannon River drainage. These documents provide background for this report and have a broader content and geographical setting.

- WRIA 35, Middle Snake River Watershed, Level 1 Assessment Report, January 2005
- Snake River Salmon Recovery Board, Oct. 2005, Snake River Salmon Recovery Plan for SE Washington
- Umatilla National Forest Pomeroy Ranger District, August 2002, Tucannon Ecosystem Analysis
- Tucannon Subbasin Summary, August 2001

AFFECTED ENVIRONMENT

Hydrologic Function and Condition

The project area contains portions of subwatersheds listed in Table 3-9. Nearly all of the project area is located in the center of the Lower Snake-Tucannon subbasin (HUC 4) with NFS lands upstream and private land downstream and is drained by the Tucannon River and Pataha Creek. Tucannon River flows into the Snake River at road mile (RM) 62.2. Pataha Creek flows into the Tucannon River at RM 11.2. There are many draws and tributaries that drain to the Tucannon River within the analysis area. Tributaries draining the east aspect have intermittent or ephemeral flows, with a few small perennial springs while those draining the west aspect are generally perennial. Headwater portions of Tumalum Creek and Cummings Creek are on NFS lands though their confluence with Tucannon River is below the Forest boundary. A relatively small area in North Patit SWS (Walla Walla subbasin) is also included in the project area.

Topography of the area is characterized by uplifted basalt plateaus and deeply dissected canyons with moderate to steep sideslopes. Alluvial fans are common at the mouths of side canyons, indicating that debris flows are a basic land forming/disturbance process in this area. Most of the Tucannon River corridor within the project area is State land managed by the WDFW. The stair step boundary, between WDFW land and NFS land, gives the Forest Service small corners of management in the corridor. This corridor is included in the area calculations for the hydrologic analysis.

School Fire occurred in August 2005. It burned in ten HUC 6 SWS located in five HUC 5 Watersheds, primarily in the Upper Tucannon (26.7 percent of acres) and the Pataha (11.3 percent of acres) Watersheds. Analysis will focus on four subwatersheds (HUC 6) in Upper Tucannon and Pataha Watersheds that had significant proportions of moderate and high burn severity. These areas are especially susceptible to accelerated runoff and erosion. Two SWS, Headwaters Tucannon and North Patit Creek, included in the project area, had few acres in the fire and relatively low fire severities.

Burn severity refers to the effects of soil heating on soil structure, infiltration capacity, and biotic components. It is used to indicate runoff and erosion potential due to a fire. It is not the same as fire intensity or tree mortality. The Burn Severity Map (Appendix A) for School Fire was developed from Landsat satellite imagery as interpreted by the Remote Sensing Application Center (RSAC). It was ground and air verified by the Burned Area Emergency Response (BAER) team. Differences in surface organics and duff cover are used to define severity categories. They are as follows:

- Low severity - litter scorch or consumption with duff largely intact.
- Moderate severity - litter consumption with deeply charred or consumed duff, no visible alteration of mineral soil surface.
- High severity - complete consumption of duff and mineral soil surface visibly reddish or orange color.

(Debano et al.1998)

Distribution of burn severity across the landscape is shown in Table 3-9.

Table 3-9 Burn severity by Subwatersheds

Subwatershed Number HUC 6	6 HUC Name	6 HUC Acres	Acres in Fire	Percent HUC in Fire	Percent Moderate and High
5 HUC #1706010705 Pataha Watershed		118,339	13,408	11.3	
170601070501	Headwaters Pataha Creek	18,281	13,408	73.3	42.0
5 HUC # 1706010706 Upper Tucannon Watershed		140,709	37,534	26.7	
170601070601	Headwaters Tucannon River	24,271	77	0.3	0
170601070603	Little Tucannon	22,182	16,097	72.6	49.0
170601070604	Cummings Creek	12,695	12,016	94.7	58.5
170601070605	Tumalum Creek	10,266	7,813	76.1	45.9
170601070606	Lower Upper Tucannon	12,741	1,531	12	6.8
5 HUC # 1707010203 Upper Touchet River		146,018	702	0.4	
170701020306	North Patit Creek	11,988	702	5.9	2.9

Burn severity varies across the landscape with some catchments almost completely burned at moderate and high severity and other having only small areas affected (Table 3-9 and Burn Severity Map – Appendix A). The extent and location of burn severity directly relates to watershed response. Catchments with extensive areas in moderate and high severity, on steep slopes and in valley bottoms, are most likely to be affected by subsequent precipitation and runoff events. In general, these areas include headwater areas of Tumalum drainage, Cummings Creek, and many small tributaries to the Tucannon River between the Little Tucannon and Tumalum Creek (Clifton 2005).

Riparian Condition and Function:

Burn severity along stream channels was calculated by Rosgen stream class and shown in Table 3-10. This coarse Rosgen classification shows the steep topography of the area, with the vast majority of stream miles in Rosgen A class (over 4 percent gradient). Between 33 and 40 percent of stream miles (perennial and intermittent) on NFS lands in Cummings Creek, Tumalum Creek, and Little Tucannon subwatersheds burned with moderate or high severity. About 20 percent of stream miles in Pataha burned at these severities. Large scale mortality of stream-side conifers will change the timing and abundance of large wood recruitment far into the future. Short-term increases in recruitment are expected as dead trees fall. Future recruitment will be reduced while new stands establish and grow to maturity (Hasson et al. 2006).

Table 3-10 Stream Burn Severity by Rosgen Class on NFS Lands

Subwatershed	Rosgen Stream Class	Total Miles of Stream in Rosgen Class	Miles of Moderate and High Severity	Percent Burned with Moderate and High Severity
170601070604 Cummings Creek	A	84.2	33.5	39.8
	B	5.9	2.4	40.0
	B/C	0.4	0.1	33.3
	C	0.1	0.0	0.0
	Total	**91**	**36**	**40**
170601070603 Little Tucannon River	A	142.7	63.8	44.7
	B	4.9	1.2	24.8
	B/C	3.3	0.6	18.7
	C	5.3	1.4	26.8
	C/E	0.9	0.3	34.5
	Total	**157**	**67.3**	**43**
170601070605 Tumalum Creek	A	19.6	6.4	32.6
	B	0.8	0.4	50.0
	B/C	0.0	0.0	50.0
	Total	**20.4**	**6.8**	**33**
170601070501 Headwaters Pataha Creek	A	41.1	9.2	22.4
	B	3.8	0.1	3.4
	B/C	0.6	0.1	9.1
	C	0.87	0.15	17.2
	Total	**46.4**	**9.6**	**21**

Roads

Slope position of roads is a critical factor in the interaction between roads and streams. Valley bottom roads have the most direct effect on streams and riparian areas, including accelerated erosion, loss of streamside shade, and increased number of road stream crossings. Mid-slope roads can intercept subsurface flow, extend channel networks, and accelerate erosion. Ridge-top roads can influence watershed hydrology by channeling flow into small headwater swales, accelerating channel development. Because roads increase the efficiency of watershed runoff, the timing of stream flow can be affected.

Road density and miles of road inside Riparian Habitat Conservation Areas (RHCAs) are used as indicators of the potential for roads to affect peak flows and water quality. Due to the relatively flat topography of the plateaus and very steep dissection of drainages, road location near channels is low relative to channel length within these SWS.

Table 3-11 is calculated with open and closed roads. Road densities are low in the Headwaters Tucannon, Little Tucannon, and Cummings Subwatersheds, and high in Tumalum and Upper Pataha Subwatersheds. NFS ownership in Tumalum is minimal and is mostly in upland plateaus, the area with the highest concentration of roads.

Table 3-11 Road Density, RHCA Roads, and Stream Crossings on NFS Lands

Subwatershed Name	Subwatershed Number	Rd. Density (mi. per mi. sq.)	Fish RHCA Rd /Mile of Fish Steam	Total RHCA Rd /Total Mile Stream	NFS Total Existing Roads (mi.)	Percent Road Miles in Areas with Moderate and High Severity	Road Crossings Mapped Perennial/ Intermittent
Headwaters Tucannon River	170601070601	0.7	0.1	0.1	28	0.0%	N/A
Little Tucannon River	170601070603	1.3	0.5	0.1	39	11%	44
Cummings Creek	170601070604	2.0	0.4	0.1	27	31%	44
Tumalum Creek	170601070605	4.0	0.0	0.01	17	36%	11
Headwaters Pataha Creek	170601070501	3.9	1.1	0.2	54	31%	91

Road data is based on the Forest road layer and does not include unauthorized roads. Connectivity to the drainage network is underestimated since ephemeral draws are not generally mapped. School Fire exposed old roads that had been overgrown and known system roads that were overgrown and had been categorized as decommissioned.

Water Quality

Water Temperature

Prior to School Fire, water temperatures on NFS lands were generally low and met Washington State water quality standards for Class AA (extraordinary) waters. Maximum water temperatures on tributaries and at higher elevation stations were below 61º Fahrenheit (F) [16º Celsius (C)] during the warmest time of the year. One year of data for Tucannon River at the Forest boundary was recorded before the fire. The 7-day average was higher than standards and possibly reflects low elevation, low gradient, and the north/south orientation of the reach above the sample point. The seven day average maximum water temperatures at sampling sites in and just upstream of the analysis area from 1992 to 2004 are shown in the following table.

Table 3-12 Annual Maximum Water Temperatures in ºF - (7-day average of daily maximums)

Monitoring Site	Elevation (ft)	92	93	94	95	96	97	98	99	00	01	02	03	04
Cummings Cr Near Forest Boundary	2240		52	57	53									57
Hixon Creek	2900						54		58	57	57	55	57	58
Little Tucannon Cr @ mouth	2820	61	57	61	58		58	61	58	59	59	60	61	59
Tucannon River @ Panjab Cr / bridge	2970			67	57		56	59	56	58	58		60	58
Tucannon River @ Forest Boundary	2400													68
Pataha Cr @ FS Bdy	3800	63	58		58			62	60	60		62	61	

School Fire eliminated shade on large segments of perennial streams (Table 3-10) and water temperature increases can be expected. Data loggers in Cummings Creek and Tucannon at the Forest boundary provided a look at water temperature during the fire. Both of these sites burned with high severity. Aquatic animals died in Cummings Creek (D. Groat, personal communication). The fire burned at both sites on August 6, 2005. In Cummings Creek, water temperature increased 13°F in the hour between instrument readings; from 56°F at 1753, to 69°F at 1853. Data from the Tucannon at the Forest boundary is not distinct, probably due to much larger flow and instrument location in a deeper pool. Water temperatures will take decades to recover to pre-fire levels, though on the Tucannon River shade is less significant in controlling water temperature due to the width of the river and its north/south orientation.

Erosion and Sedimentation

Natural background erosion for forest and range lands in the Northern Blue Mountains, in the absence of disturbance, is generally low (< 4 tons/acre). Increases in erosion occur episodically, in response to disturbance. Floods and wildfire are the two primary disturbance processes that increase erosion rates and delivery of sediment to river systems. Increased erosion and sedimentation are well documented post fire effects (Helvey 1980; Robichaud et al. 2000; Wondzell et al. 2003; and Neary et al. 2005).

Vegetative canopy and ground surface cover were dramatically reduced by the fire and in some areas eliminated as indicated in Table 3-9. Loss of canopy and ground cover increases raindrop impact on exposed soil surfaces with various effects that increase risk of surface runoff and soil erosion. Effects of fire to soil and water are discussed extensively in the state of knowledge review "Wildland Fire in Ecosystems – Effects of Fire on Soil and Water" (eds. Neary, Ryan, and DeBano 2005). In the portion of School Fire comprising the analysis area, the percent of subwatersheds in moderate and high burn severity exceeds 40 percent for all ownerships (Table 3-9). Steep terrain and soil erodibility contribute to increased erosion potential. Precipitation patterns and intensity for several years following the fire will largely determine the magnitude of increased erosion and sedimentation. Recent studies have shown a wide range of erosion following fires. Erosion increases are generally highest in the first few years after a wildfire, and decline rapidly as watersheds revegetate (Robichaud and Brown 1999).

Accelerated surface erosion (sheetwash and gullying) is likely in moderate and high severity burn areas with steep slopes after the first significant rain events. Rain-on-snow events which include heavy winter snows, with freezing conditions, and warm "chinook" rains could also produce shallow landslides and debris flows in smaller drainages (Clifton 2005). Stream channel erosion is likely to increase in reaches with exposed soils on stream banks and floodplains, as well as due to higher water yields with potentially higher peak flows.

Eroded sediments on hillslopes may take years or decades to reach stream systems and much of the mobilized sediment will be deposited in headwater channels and smaller tributaries (Elliot 2005, personal communication). Stream and valley gradient and morphology are important factors influencing the fate of sediment delivered to channels. Instream storage, routing, and transport are controlled in part by high flows, instream wood, and riparian vegetation. In general, higher gradient channels lacking large wood will be zones of transport, compared to lower gradient channels with abundant instream wood, which will be sediment storage zones.

Suspended sediment and turbidity data have been collected on the Tucannon River at the Panjab Bridge and at the Forest boundary for over 15 years. Evaluation of instream sediment data collected at these sites shows the influence of channel and valley morphology on sediment transport and storage processes (McCown 2002). Sediment loads were higher seasonally, and year to year at the upper monitoring station, compared to the downstream Forest boundary. The Panjab bridge site is above the fire and the Forest boundary site is in the middle of the fire at the downstream boundary of the influence of NFS lands. Sampling will continue at both sites and will form the basis of comparing pre-fire/post-fire and above/below fire water quality over time.

Sediment Modeling using Forest Service WEPP interfaces

The Water Erosion Prediction Project (WEPP) model was used to estimate erosion and sediment yield for purposes of evaluating post-fire effects, comparing management activities, and evaluating cumulative effects (Elliot and Hall, 1997, Elliot et al. 2000). WEPP is a continuous simulation, process-based model that incorporates climate, soil, ground cover, and topographic conditions. WEPP interfaces (modules) were specifically designed for forest applications by the Rocky Mountain Research Station, and are increasingly in use for project-level analysis (http://forest.moscowfsl.wsu.edu/fswepp/, Neary et al. 2005).

Assumptions for model runs and applicability of results are documented in Appendix I of this document. Model results are estimates for purposes of comparing relative pre and post-fire conditions and effects of management scenarios, and are not absolute predictions. Because of natural variability in climate, soil types, cover, and other factors, and assumptions made to simplify modeling, results are at best plus or minus 50 percent (Neary et al. 2005, Elliot et al. 2000). Post-fire erosion rates are largely dependant on climatic conditions.

WEPP interfaces (Disturbed WEPP, Road WEPP, and FuME) were used to characterize the affected environment pre and post-fire. A range of representative hillslopes were first modeled to determine erosion rates for different slope and burn severity conditions. Total erosion and sediment production were then estimated at the subwatershed and project area scales. The model distinguishes road erosion from hillslope contribution so these sources were estimated separately, then combined. Results are averages, in tons/acre/year, and percent differences for comparing natural background conditions (hillslopes), existing disturbances (roads), and post-fire management effects on each of these sources. Activities and effects not accounted for in modeling include: grazing, and developed and dispersed recreation.

Natural background hillslope erosion rates in the analysis area are very low compared to rates after a wildfire. Erosion after wildfires is a major source of sediment; however, fires do not happen every year (Table 3-13). Fire disturbance is a relatively infrequent occurrence, and it can take years to decades for sediment mobilized from the fire to move out of the watershed. Based on the most recent large fire in the drainage, sediment modeling uses a fire return interval of 40 years. In comparison, erosion from roads is an annual source of sediment. Other activities (thinning, prescribed fire) occur periodically and are potential sources (Table 3-13). Pre and post-fire baseline erosion estimates from hillslopes and roads in the analysis area are described in Environmental Consequences under Alternative A (No Action).

Table 3-13 Comparison of Erosion Rates, Sediment Delivery, and Frequency Of Sources in School Fire Salvage Recovery Analysis Area (30-60% Slope)*

Source of sediment	"Average" annual hillslope erosion ($ton/mi^2/y$)	Sediment delivery in year of disturbance (ton/mi^2)	Return period of disturbance (y)
Undisturbed forest	6.4	0	1
Wildfire cycle	76.2	3046.4	40
Prescribed fire cycle	9.3	185.6	20
Commercial Thinning cycle	1.3	25.6	20
Low use roads	0.8-10.0	0.8-10.0	1
High use roads	1.5-10.0	1.5-10	1
*Note: results are for a single hillslope in the analysis area			

Water Yield

Increased water yield following fires is widely documented (Helvey 1980, and Stednick 1995). Water storage in the soil profile increases due to reduced use by live vegetation and a higher portion of the annual precipitation is available for runoff. Late summer fires like School occur at the end of the growing season when most of the annual reduction in soil water has taken place. Generally full effects of reduced evapotranspiration on soil-water content are not seen until the second year following a fire (Klock and Helvey 1976). Increased water yield is most likely to be seen during spring runoff and is directly related to precipitation inputs. Increased peakflow is possible; the magnitude of the increase will be dependent on many factors including the portion of annual precipitation that occurs as snow and snow melt rates which are annual weather occurrences (Helvey 1980). Increased water yield will decline over time as vegetation recovers, but may not reach pre-fire levels for decades, until conifer cover is reestablished.

The relationship between created openings, (reduced live conifer cover in the fire) and changes in water yield and peak flows has been documented by numerous studies. Recent reviews of literature demonstrate that the relationship is highly variable (Stednick 1995, and Scherer 2001). Generally effects are not seen below 15-20 percent equivalent clearcut or treatment acres (ECA or ETA) and in a local study effects were not seen below 50 percent ECA (Helvey 1995).

Equivalent Treatment Acre Model

Umatilla National Forest equivalent treatment acre (ETA) model (Ager and Clifton 2005) was used to evaluate the pre-fire conifer structure as a baseline indicator of water yield and peakflow. Post-fire estimates of conifer mortality were developed based on satellite imagery and data processing (Siviliculturist's Specialist Report). Post-fire estimates in Table 3-14 are simply acres of conifer mortality in the area of the fire as a percent of forested acres in each subwatershed.

Table 3-14 Pre-Fire ETA and Post-Fire Estimate on NFS Lands

Subwatershed Number	Subwatershed Name	Pre-fire ETA Percent	Post-fire Estimate Mortality Percent
170601070601	Headwaters Tucannon River	2.4	0.1
170601070603	Little Tucannon River	2.5	46
170601070604	Cummings Creek	5.2	73
170601070605	Tumalum Creek	6.8	68
170601070501	Headwaters Pataha Creek	6.7	45

For subwatersheds in the fire, the decrease in live conifer cover is substantial. This reflects reductions in canopy cover and evapotranspiration, processes which have important roles in the capture and storage of water.

Increases in peakflow are of concern due to their potential to erode and destabilized channels, affecting aquatic habitat and biota and human safety. They are a function of the area burned, watershed characteristics like topography and soils, and severity of the fire. Extreme rainfall events have produced the largest recorded increases in peakflows from fires (Neary et al. 2005*).* The upper subwatersheds draining to the mainstem Tucannon River at the Forest boundary were largely unaffected by the fire, and although most of the subwatershed including the Tucannon corridor was burned, only 20 percent of the total drainage area was in the fire. In smaller downstream tributaries fire affected a far larger portion of their drainage area (Table 3-9).

Increases in water yield are likely, but the magnitude of increase has a low predictability and will depend largely on the pattern of precipitation over the next few years. Peakflow increases are highly dependent on precipitation intensity and snow melt rate relative to infiltration capacity and with less predictability than water yield (MacDonald, 2000).

CLEAN WATER ACT

In Washington the Environmental Protection Agency has designated the State as having the responsibility to implement the Clean Water Act. The Clean Water Act requires that water quality standards protect beneficial uses. The Washington State Department of Ecology (DOE) has identified Use Designations to meet this requirement (WAC Chapter 173-201A, Table 602). The State has divided watersheds into Water Resource Inventory Areas (WRIA). The watersheds in the School Fire are included in WRIA 35, Middle Snake. For the streams on NFS lands in the School Fire (Tucannon River, Cummings Creek, Tumalum Creek, and Pataha Creek) the following beneficial uses have been identified:

- Aquatic Life Uses — Char (bull trout) spawning and rearing, core salmon and trout
- Recreation — Extraordinary Primary Contact
- Water Supply Uses — Domestic, Industrial, and Agricultural
- Miscellaneous Uses — Wildlife habitat, harvesting, commercial/navigation, and boating/aesthetics

(http://www.ecy.wa.gov/programs/wq/swqs/wac173201a-1997)

Water quality standards for AA Extraordinary Waters apply to all surface waters on the National Forest. Water temperature and turbidity standards are most likely to be of interest on the National Forest. These and other land management related pollutants are non-point sources and are addressed by project design and best management practices. Currently the State is using the 1997 Rule for temperature and turbidity and the 2003 rule for fecal coliform.

- Temperature shall not exceed 16°C (61°F). When natural conditions exceed 16°C, no temperature increases will be allowed which will raise water temperature by greater than 0.3°C.

- Turbidity shall not exceed 5 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.

- Fecal coliform organism levels shall both not exceed a geometric mean value of 50 colonies/100 mL and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 100 colonies/100 mL.

(DOE, 1997, 2003)
(http://www.ecy.wa.gov/programs/wq/swqs/index.html)

DOE prepared its most recent listing of impaired water bodies (303d list) in 2004. Listings of impairment for surface waters draining the area of the School Fire are as follows in Table 3-15.

Table 3-15 Impairments of Surface Water

Surface Water	NFS Land	Downstream of NFS
Tucannon River	Temperature	Turbidity, pH
Cummings Creek	Temperature	
Pataha Creek	Temperature	Fecal coliform, pH

(http://www.ecy.wa.gov/programs/wq/303d/2002/2004_documents)

The Forest Service's responsibilities under the Clean Water Act are defined in a November 2000 Memorandum of Understanding (MOU) between Washington State Department of Ecology and the Forest Service. The MOU designates the Forest Service as the management agency responsible for meeting the Clean Water Act on NFS lands and recognizes best management practices (BMPs) as the primary mechanism to control nonpoint source pollution on NFS lands. It further recognizes that they are developed by the Forest Service as part of the planning process. This means the Forest Service is responsible for defining and implementing appropriate BMPs for National Forest Lands to meet the Clean Water Act. BMPs that apply to this project are identified in Chapter 2 and in Appendix G.

DOE is in the early stages of developing Total Maximum Daily Loads (TMDL) for WRIA 35.

SAFE DRINKING WATER ACT

The 1996 amendments to the Safe Drinking Water Act require federal agencies that manage lands that serve as drinking water sources to protect these source water areas. Source Water Areas are the sources of drinking water delineated and mapped by States for each federally-regulated public water system The Washington State Department of Health has been delegated the responsibility to conduct source water assessments and develop a database of source areas for public water systems. Source water mapping has been completed in the State of Washington.

Source water areas for Boise Cascade's surface water supply on the Columbia River are mapped in the project boundary and Source Water protection has been incorporated into the design of the salvage project. A well which supplies Camp Wooten and is located at the camp has also been identified. Best management practices from EPA Region 10 Source Water Protection (in draft) have been incorporated as design criteria. Those and other BMPs identified for this project are listed in Appendix G of this document. The EPA document "*Incorporating Source Water Protection into the Planning Process*" has been addressed in the development of the project.

ENVIRONMENTAL CONSEQUENCES

Effects Common to All Alternatives, Including No Action

Hydrologic Function and Condition

Riparian Condition and Function

School Fire burned with moderate and high burn severity along major lengths of streams, see the table below.

Table 3-16 Percent Channel Length Burned with Moderate and High Severity by SWS

Subwatershed Name	SWS Number	Percent channel length
Little Tucannon River	170601070603	43
Cummings Creek	170601070604	40
Tumalum Creek	170601070605	33
Headwaters Pataha Creek	170601070501	21

Loss of ground cover and tree mortality were high in these severity ranges. The sediment-filtering capacity of near-channel vegetation and shade were reduced or eliminated. Increased risk of erosion and sedimentation from near channel locations will be of relatively short duration, less than 5 years. Ground cover, including pioneer mosses provides protection to the soil surface relatively quickly and accelerated erosion and sedimentation from these areas will decline to near back ground levels within 5 years. The filtering capability of these areas will also recover over this time frame.

The duration of effects from tree mortality will extend for decades. A short-term increase in large wood recruitment will occur as dead trees near channels fall. A gap in recruitment can be expected while new stands regenerate and grow, with recruitment of larger size classes farthest out in the future.

Channel changes could be seen in the short-term as a result of changed water yield and the increased potential for peak flows. Channel stability is at increased risk due to short term reductions in vegetative cover and the longer term decline of root strength in fire-killed trees. Increased water yield and sediment supply, and over time decreases in large wood structure could lead to changes in channel morphology. Stream bank stability is reduced in areas with moderate and high severity burn conditions and channel erosion potential is higher. Effects would be most likely within the first few years after the fire while the landscape is most vulnerable to erosive events.

Proposed action alternatives would include design criteria that meet interim PACFISH direction for Riparian Habitat Conservation Area (RHCA) width. No salvage or temporary road construction would take place inside these areas. Design of logging systems would protect these areas and would not slow their recovery.

School Fire changed the ability of near-channel riparian shrub and forb component to provide inputs to stream channels and to filter sediments and protect water quality. Recovery of these functions to their pre-fire conditions and the timeframe of the recovery will be determined by natural recovery rates, weather patterns, and natural disturbance processes. No difference in the quality or timeframe of the recovery of riparian condition or function would be seen between Alternative A -No Action and Alternatives B and C.

Water Quality

Water Temperature

School Fire reduced shade along stream channels as described in the water quality affected environment section and in Table 3-16 above. Shade is an important component in the regulation of water temperature. Stream width, stream orientation and the pattern of mortality relative to effective shade will determine increases in sun energy reaching surface waters. Water temperatures may be expected to increase in those channels that have stream flow during the summer months. In the vicinity of School Fire, summer maximum water temperatures typically occur in late July or early August. Recovery of shade to pre-fire conditions will require decades as stands develop and grow to those heights and densities.

Action alternatives (B and C) would include interim PACFISH RHCAs as design criteria and would protect existing shade and the recovery of shade at the same rate as Alternative A – No Action. There would be no difference between any of the alternatives in the recovery of water temperature that is related to shade.

Increased erosion and sedimentation are a likely consequence of the fire, and increased sediment loads have the potential to lead to widening of channels and reducing the width-depth ratio. This can be associated with increased water temperatures as streams widen and become shallower. Shading may not be as effective and shallower streams would be easier to heat. The degree to which this might occur will depend on weather patterns, e.g., intense rainfall, rapid snow melt, which could lead to surface runoff and the erosion it would cause. Delivery of eroded sediments to streams and routing of sediment through stream systems are highly complex, long-term, and episodic. The magnitude and duration of such effects have low predictability.

Water Yield

Water yield will almost certainly increase from the drainages in the School Fire Salvage Recovery project. The key variables determining the magnitude of increases in water yield and peakflow from wildfires are:

- Tree mortality; reduced evapotranspiration (plant use of water) leading to higher soil moisture levels and increased runoff, changed patterns of snow accumulation and melt rates
- Weather patterns; the amount, form and rates of precipitation and snowmelt. These variables and their interactions are complex.

Tree mortality from the fire is high in the subwatersheds within the project. Increases in water yield after fire are generally seen in the Pacific Northwest, where reductions in evapotranspiration exceed increased ground surface evaporation. Increases in peakflow are more variable since they are often a consequence of weather patterns; short, intense precipitation events (Neary et al. 2005). In a study of geomorphic response to peak flow increases, Grant (2000) concluded that peak flow increases can account for a portion of increased suspended and bedload transport, but that this effect is "dwarfed" by the changes in sediment supply from, in his study, pre-1966 harvest. While harvest standards have improved over the years, it is likely that his conclusions would apply to future sediment loads in the School Fire Salvage Recovery project area, where sediment supply has increased.

The duration of increased water yield will be related to the development of plant cover and its composition. Literature related to post-fire logging has rarely reported an effect on water yield or peakflow (Helvey 1980 and 1975; McIver and Starr 2000; Neary 2005). Increases in water yield are expected due to tree mortality which occurred in the fire and removal of these trees by the activities proposed in the action alternatives would not change the amount or timing of the increase.

Alternative A – No Action

Direct/Indirect Effects – Alternative A:

Hydrologic Function and Condition

Roads
No change would be seen in miles of road or their location. Connectivity of the road system with the drainage network would not increase or decrease. Some increase in recreational road use could occur on roads that had previously been overgrown. The potential for erosion from roads has increased over the short-term (1-3 years) due to the fire (see discussion under erosion and sedimentation below).

Water Quality

Erosion and Sedimentation
The ash/silt-loam soils of the project area have a natural water repellency that is overcome as the soil is wetted. These are relatively fine grained soils and fire related hydrophobicity was not was not observed during the BAER field review. The organic forest floor (duff) was consumed over large areas (Table 3-9), reducing water holding capacity. Surface runoff will largely be determined by the intensity of precipitation events and their duration. No surface runoff effects; including rilling and elevated turbidity measurements at water sample stations on the Tucannon River, were observed during the first fall after the fire (2005). Nearly normal and relatively gentle rainfall wetted the soils and was infiltrated.

WEPP Modeling Results
Overall, School wildfire has the greatest impact on rates of erosion and sedimentation in the analysis area. Fire effects would persist for several years, with the highest increases in the first year after the fire, decreasing rapidly as ground cover reestablishes.

No change in road use would occur including decommissioning treatment on unauthorized roads. Road related erosion rates would increase in the first two years (because of the loss of ground cover and increased hillslope erosion), and would return to pre-fire levels (approximately 507 tons/year) by Year 3 (Table 3-17).

At the analysis area scale, hillslope erosion would be greatest in Year 1, more than ten times pre-fire background rates. Hillslope erosion rates would remain elevated in Year 2, at four times the pre-fire level. Combined hillslope and road erosion would return to pre-fire levels by Year 3 (Table 3-17).

Table 3-17 Comparison of Total Erosion (tons) from Hillslopes and Roads Combined

Alternative		Pre-fire Baseline	Year 1[1](post fire pre activity)	Year 2	Year 3	Year 4	Year 5
Alt A	Roads	507	1824	710	507	507	507
	Hills	23,519	254,262	89,409	23,519	23,519	23,519
	Total	24,026	256,086	90,119	24,026	24,026	24,026
Alt B	Roads			1,340	1,298	752	477[2]
	Hills			88,112	23,754	23,519[3]	23,519[3]
	Total			89,452	25,052	24,271	23,996
	% Alt A			-0.7	+4.2	+1.0	ND[4]
Alt C	Roads			1,217	1,160	710	488[2]
	Hills			88,392	23,581	23,519[3]	23,519[3]
	Total			89,609	24,741	24,229	24,007
	% Alt A			-0.6	+3.0	+0.8	ND[4]

Notes:
1. Year 1= Aug ’05-Jul ’06; Year 2= Aug ’06-Jul 07, and so on.
2. Road activity modeled in Years 2-5, decommissioning effects under Alt B and C would extend beyond Year 5 at same (reduced) level.
3. Logging activity modeled in Years 2 & 3; so Hillslope erosion in Years 4 & 5 under Alt B and C would be the same as Alt A (No Activity).
4. ND= no difference (<0.1%)

Cumulative Effects – Alternative A:

Hydrologic Function and Condition

Riparian Condition and Function

Prior to the adoption of PACFISH in 1995 harvest activities on NFS lands sometimes entered near channel areas. The extent of these entries was estimated using harvest history going back to 1958 and stream maps. Riparian harvest information off of NFS lands is not available.

Table 3-18 Historical Harvest Entries inside RHCAs

Subwatershed	SWS #	Percent Stream Miles with Harvest Entry inside RHCA (NFS)
Little Tucannon River	170601070603	10
Cummings Creek	170601070604	30
Tumalum Creek	170601070605	14
Headwaters Pataha Creek	170601070501	47

These entries as well as channel clearing and straightening activities in the Tucannon River following the 1964 flood would have reduced large wood components of the streams involved. Substantial effect to channel morphology and routing and storage of sediments would have occurred. Recovery of more natural components of channel morphology in the Tucannon River were substantial following the 1996/97 floods (Del Groat, personal communication). Following these recent floods the Forest Service and Garfield and Columbia County Conservation Districts implemented restoration projects to plant riparian areas and add structure to channels.

Past grazing on NFS lands in the project area declined from the early 1900s to 83 cow/calf pairs since 1960. Water sources were developed to distribute grazing across the pastures. Soil disturbance, compaction, and reduced vegetative cover would have been concentrated at these locations. Where these sites were located near channels the reduction in ground cover would have reduced sediment filtering capacity and possibly a hardwood component that could have provided structure to channels.

Three pastures (Abels, Lower Pataha and Upper Pataha) of the Pomeroy C&H (cattle and horse) Allotment are to be rested for the first year following the fire (2006). Monitoring plots are to be established during the 2006 field season to assess vegetation recovery and soil condition. Information from these plots will be used to decide how long the allotment pastures will be rested.

Ongoing and future foreseeable harvest by State and Private in the School Fire would meet or exceed State Forest Practices Rule requirements (http://apps.leg.wa.gov/rcw/default.aspx?cite=76.09). On the Wooten Wildlife Refuge Cummings Creek, Tumalum Creek, and the Tucannon River would have no-harvest buffers that would generally protect future recruitment of wood and recovery at natural rates of near-channel ground cover and sediment filtering capacity. However, where roads are inside state riparian management zones (RMZs), danger trees within one and one-half tree lengths would be felled and some portion of those trees would be removed by the purchaser. Wood recruitment along the mainstem Tucannon River and Cummings Creek on State lands would be affected to some degree by this removal. On private lands some reduction in recruitable wood in the Pataha drainage is expected due to removal of trees. Limitations on stream crossings and soil disturbance within Riparian Management Zones would be required; however some impact to recovery of near-channel ground cover and filtering capacity would be expected.

Riparian condition and function on NFS lands in the School Fire Salvage Recovery project area would recover at natural rates.

Roads

Past road construction on NFS lands and their locations relative to channels is incorporated into the direct and indirect effects by the road density and RHCA road analysis (Table 3-11). In addition approximately 22 miles of road decommissioning has occurred over the last 10 years. Alternative A would not construct or decommission any roads. Ongoing fire salvage logging on State and private lands could require that roads be constructed. The extent of non-NFS road construction near channels is not known at this time. Over time restoration and partnership money could become available to fund road decommissioning and replacement of fish barrier culverts that have been identified on NFS lands. Road decommissioning would improve watershed function to the degree that the road system was disconnected from the stream network and that productivity was improved by recontour of road fill. Replacement of culverts that are currently barriers to fish passage with passable culverts or bridges would reduce the risk of culvert failure and improve channel morphology.

Water Quality

Water Temperature

The current effect on water temperature of past reductions in shade from near channel harvest or other actions that might have led to increases in water temperature, like post-1964 widening of the mainstem Tucannon, are incorporated in current water temperatures and described in the Affected Environment discussion. Shade has been reduced or eliminated in areas of moderate and high burn severity as previously discussed. Private land salvage of dead or dying trees near perennial, but not fishbearing, streams in the Pataha drainage could have a short term affect on shade. The shade capability of dead or dying trees would be short lived and no measurable effect to water temperature would be expected.

Erosion and Sedimentation

Past activities including road construction, landing construction, old skidding, grazing, recreation, and other disturbances have increased the background erosion. Modeling shows existing roads (the largest source of above background erosion) contributing about 2 percent above background, with other activities contributing to a lesser degree. Where these activities occurred near channels annual sedimentation would have been increased.

Suppression activities associated with School Fire exposed mineral soil in mechanically and hand constructed firelines and safety zones. Post-fire rehabilitation of these lines included installing drainage structures, pulling berms, and native seeding. Short-term accelerated erosion is expected, and where these disturbances occurred near the channel network sedimentation is expected. Monitoring drainage effectiveness and revegetation will occur.

BAER seeding on approximately 1,760 acres and mulching (limited to 150 acres) in severely burned areas will slightly reduce overall erosion rates, with the greatest reduction occurring in the second year after treatment. Approximately 5 percent of the analysis area was treated, with about a 60 percent erosion reduction expected on treated acres in the second year (Elliot et al. 2005). Recovery of ground cover is expected within 5 years.

Effects of past grazing are concentrated near water sources and in trails. These areas would have a higher likelihood of erosion post-fire. Erosion and sedimentation from the road system is discussed in the direct and indirect analysis.

Fire salvage activities on State and private lands include an unknown amount of road construction which could lead to increased erosion and sedimentation. Road construction and use is controlled by the State Forest Practice Rule which requires that roads be constructed and maintained so that sediment delivery would not prevent achieving desired fish habitat and water quality. Effects from these actions are downstream of NFS lands.

Ongoing state harvest on Wooten Wildlife Area is being done with helicopters which would minimize disturbance. Landings for this harvest are located to avoid sedimentation into surface waters. In the Pataha drainage, ground based salvage logging on private lands could lead to soil disturbance near channels. Equipment limitation zones and erosion control would control but not eliminate erosion and sedimentation.

Future foreseeable road decommissioning, fish passage barrier replacement on Hixon Creek, and road/stream crossing stabilization on Grub Creek, could occur over time as restoration and partnership money became available to fund the projects that have been identified on NFS lands. Culvert replacement projects would have short-term water quality effects. State standards would be met and mitigation and BMPs would minimize effects. Medium and long term effects would be to improve the function of the stream network and reduce the risk of stream crossing failure.

Implementation of the Steven's Ridge ATV Complex would encourage ATV users to be on an existing road system that has been designated for use. These are ridge top roads and there would be no erosion or sedimentation effects of implementation. Some improvement in the location of ATV use would be possible.

Prescribed burning in the North Patit subwatershed would have no effect to water quality. Design criteria and mitigation would minimize soil exposure to small areas and RHCAs would prevent movement of any sediment to surface waters.

Reforestation and riparian planting associated with BAER work would use hand planting and would not create more than small patches of open soil. There would be no risk of sedimentation into surface waters from these projects.

Accelerated erosion and sedimentation from the road system (NFS and other) and other past activities that have compacted or displaced soils are present and will persist into the future. Some additional effect over the short term (5 years) would be expected from ongoing and future actions including fire salvage on State and private lands. Effects of actions would be expected to decline as fire salvage activities are completed and as fire damage to ground cover recovers. Short-term effects from road decommissioning and culvert replacement would be controlled and minimized by mitigation actions, and offset by improved hydrologic function and reduced risk of stream crossing failure which would start or accrue as projects were completed.

WEPP Modeling Results

In the first several years after the fire, cumulative effects would be nearly the same as modeled under Direct/Indirect effects because additional effects on erosion rates would be small (increases or decreases in total erosion), indistinguishable from background, and within the range of model variability. Initial fire effects are far greater than any increase (or decrease) from additional activities. Over longer timeframes (> 5 years), other actions such as road decommissioning and prescribed burning would slightly alter background rates. Effects (increase or decrease in erosion rates) would depend on the extent and type of activity.

Water Yield

Equivalent Treatment Acres

The effect of past harvest activities on water yield for NFS lands has been incorporated into the Affected Environment analysis by the ETA model which uses harvest history as an input and by post-fire estimates of conifer mortality. Ongoing and future State and private fire salvage logging would remove dead and dying conifers. Fire caused mortality has reduced evapotranspiration which is likely to lead to higher soil moisture content and increased water yield. No effects to water yield or peakflows would occur due to the removal of these trees.

Alternative B – Proposed Action

Direct/Indirect Effects – Alternative B:

Hydrologic Function and Condition

Roads

About 41 miles of road would be reopened for use. These roads are currently categorized as closed, previously decommissioned, and/or unauthorized. Existing drainage structures and road templates have been identified as adequate to use, with road maintenance. Some decommissioned roads were closed by recontouring the first several hundred feet and in those segments cuts and fills would be recreated. About 6 miles of temporary roads would be constructed. Location of these roads would avoid crossing channels or entering RHCAs to the extent possible. Cut and fill construction would be limited.

All temporary road use categories would be decommissioned to the extent possible by the timber sale contract at the end of the project. If post-sale activities like planting or fuels treatment would require use of these roads, then that project would assume responsibility for decommissioning and the road would be closed until used and then decommissioned.

Decommissioning existing unauthorized roads would include removal of existing culverts and drainage crossings. Additional funding would be required to decommission these roads to the desired level, i.e. recontouring of cut/fill slopes that existed prior to the salvage sale. Road densities (calculations include all temporary use categories) would increase slightly during the project (see Table 3-19).

Table 3-19 Changes in Road Density During Project Activity by Alternative (miles/mile^2)

Subwatershed		Existing Road Density Alternative A	Road Density Alternative B	Road Density Alternative C
170601070603	Little Tucannon River	1.3	1.3	1.3
170601070604	Cummings Creek	2.0	2.1	2.1
170601070605	Tumalum Creek	4.0	4.4	4.1
170601070501	Headwaters Pataha Creek	3.9	4.1	4.1

There would be no new stream channel crossings though some new construction could cross the head of ephemeral swales. Installation of culverts in previously decommissioned roads could lead to a temporary increase in road connectivity with the stream system. There could be a short term expansion of the drainage network as a result of new culvert installation in previously decommissioned roads. There would be no new construction inside RHCAs relative to the existing condition/no action. Therefore, there would be no change in channel/floodplain connectivity.

Road use and temporary road construction would have a short-term small affect to hydrologic function and condition in this alternative. The project would use and then decommission 6 miles of existing unauthorized roads, including removal of existing culverts and drainage crossings which would result in a small net benefit to hydrologic function and condition relative to Alternative A- No Action following the project.

Water Quality

Erosion and Sedimentation

Design criteria for salvage harvest includes implementation of PACFISH/Forest Plan interim widths of no-harvest RHCAs as well as assignment of appropriate logging systems. In skyline and helicopter units twenty-five foot buffers would be left on dissected (V and U shaped) ephemeral draws. These buffers are in addition to those required by PACFISH and would act to store sediment in these draws. These design criteria would prevent damage that could contribute to erosion and sedimentation into channels and streams (Belt et al. 1992).

Helicopter systems would be used on 2,671 acres. Soil disturbance with this logging system would be minor, as logs would be lifted from the ground. Limbs and tops would remain on site and act as mulch. Skyline systems on 4,137 acres, would suspend at least one end of logs, and would have full suspension over RHCAs. Ground disturbance would be limited to corridors. Water bars on these corridors would prevent channelized surface runoff in corridors which could cause erosion. About 1,853 acres of skyline would be yarded with tops attached to reduce fuel loading. Limbs which broke out of tops would act as mulching, further reducing the risk of erosion.

Forwarder systems (low ground pressure) would be used on 2,624 acres with sustained slopes not exceeding 35 percent. Trails would be located with an average spacing of 50 feet and tops and limbs, as well as existing non-merchantable trees, would mulch the trails. Mulching would be much less on these acres than in a green sale where monitoring has consistently shown no erosion with these harvest systems. Trails would be water-barred as needed. Ephemeral draws would be crossed at designated locations and in areas that would not cause destabilization. There would be an increased potential for surface runoff and erosion on these trails. Existing disturbed landings and trails would be used when possible. Standard erosion control mitigations and BMPs, would be used where needed to prevent erosion in trails and skyline corridors.

Umatilla National Forest has a record of effective implementation of design criteria and BMPs. Systematic implementation monitoring of design criteria and BMPs was conducted on the Pomeroy and Walla Walla Ranger Districts during the 2001, 2002, and 2003 field seasons. Implementation of PACFISH RHCAs has been monitored prior to harvest (after marking) and after harvest. A high level of compliance has been documented which meets or exceeds PACFISH interim direction. Tractor and forwarder trails were monitored on ten units of two sales and found effective erosion control that prevented erosion on trails. (Umatilla National Forest, files 2001-2003).

In unburned landscapes, RHCA widths together with logging design and erosion control BMPs effectively prevent sediment from reaching surface waters. In the project area, although some vegetation remains, the filtering capacity of RHCAs has been reduced in areas of moderate and severe burn intensity (Table 3-16) and there would be an increased risk of sediment delivery through the RHCAs. The risk would be short-term, less than 5 years and would be associated with intense, localized, summer storms or with area- wide rain-on-snow events. These storms have a low probability for any given location or for any given year.

Hand work (lop and scatter) would reduce the depth of fuel on 7,579 acres. Some of these acres would then be prescribed burned. Jackpot burning, which targets concentrations of fuels, would occur on 3,132 acres and broadcast burning would occur on 1,483 acres. Broadcast burning would generally occur on helicopter yarded acres. Very little of adjacent RHCAs would burn in these activities because ignition would occur outside of RHCAs and fuel which might carry the burn was consumed in the fire.

Some studies of erosion and sedimentation have found increases after salvage logging. Other studies have found no increase post-activity. Steepness of slope, logging system, amount of logging residue left on site, variability between treatment units, and weather events account for much of the difference between studies (McIver and Starr, 2000).

Newly constructed temporary roads would have no direct connection with the stream network. Installation and removal of temporary culverts in previously decommissioned roads could lead to short-term increases in sediment delivery from these roads.

Forty-one miles of road would be reopened with this alternative. The running surface of these roads has revegetated and armored during non-use and would be reopened by blading and other maintenance. Increased erosion would occur from these road beds. Open system roads (45 miles) would receive maintenance prior to and after use. Newly constructed temporary, unauthorized and previously decommissioned roads would be decommissioned by the project to the extent possible under the timber sale contract.

Erosion and sedimentation effects of log haul on forest roads have been the subject of numerous studies. Log haul has been demonstrated to increase sedimentation from hydrologically connected roads during precipitation events, with the effect decreasing as traffic is reduced or ends (Reid 1984). Dry season use of roads or restricting logging traffic during surface runoff from roads can reduce this effect by interrupting or reducing the road-stream connectivity. Umatilla National Forest Commercial Road Use Rules would require log haul to stop when runoff from roads creates turbidity in streams. It states as follows:

> *Commercial use of National Forest roads shall be suspended when Commercial Contract or Permit operations create a continuous discharge of sediment into live streams that result in an increase in turbidity…Visual evidence of this may be identified by the increase in turbidity in live running streams evident at points downstream from the outflows of culverts, ditchlines, or fords. (Umatilla National Forest, 2001)*

In a study of sediment production from forest roads, newly cleaned ditches were found to have a sediment yield substantially more than blading of the road surface or traffic use (Luce and Black 2001). This is likely due to the disruption of armored or vegetated surfaces, leading to a larger supply of fine, erodible sediment in a feature that carries water during storms. Ditch clean out would be used only when ditch function was compromised and would minimize disturbance of existing vegetation and natural armoring, practices which are common on the Umatilla National Forest.

Road use restrictions and minimized ditch cleanout would reduce sediment production from road use to the extent possible. Haul routes would include open roads, FR 4016 along Pataha Creek, a gravel surfaced road and FR 4700 inside the RHCA of the Tucannon for portions of its length. Over half the haul length of this road is paved. Forest Road 4016035, a native surfaced road in the RHCA of Dry Pataha was previously decommissioned by installing closure berms.

Salvage logging, road use, and temporary road construction would alter natural erosion rates and increase the risk of sediment delivery to streams in the short term (3-5 years). The increase in risk is based on soil exposure from activities and the potential for sediment delivery during weather events. Weather events most likely to occur during the operating period are isolated thunderstorms. These types of events are generally localized in a drainage, but can be very intense. Soil exposure from logging activities would be limited in extent and separated from streams by buffers. Roads pose a greater risk because of their extent and connectivity with the stream network.

Implementation of project design criteria, mitigation, and best management practices would minimize storm effects but localized erosion and sedimentation effects would be expected as a result of storm events. Effects would be limited to the drainage affected, and unlikely to be distinguishable from background downstream.

WEPP Modeling Results

Increased traffic, road construction, and logging activities would increase road surface, cutslope, and fill slope erosion, and sediment delivery to ditches and drainages during the activity years. Road erosion would increase approximately 89 percent compared to Alternative A in Year 2 (Table 3-17). Total erosion would be greater in Year 2 because of combined road use and elevated background erosion rates. Compared To Alternatives A and C, rates would be highest under this alternative in Year 3 and 4, though total erosion rates would decline due to natural fire recovery. Erosion rates would remain elevated in Year 4 because of limited road use but road decommissioning would begin to contribute a slight reduction. By Year 5, erosion rates would be slightly (~6 percent) less than Alternative A because of decommissioning of 6 miles of unauthorized roads used by the logging activity.

At the hillslope scale, natural erosion rates would be slightly affected under different logging activities, depending on slope, burn severity, operations, and weather conditions. Lop and scatter would increase cover and slightly reduce erosion, compared to skyline yarding and broadcast burning, which have potential to decrease cover and slightly increase erosion. Changes in erosion rates would be small, localized, and short duration. Road use, including increased logging traffic, would increase road erosion rates and move sediment off roadways and into ditches. Effects would vary depending on road condition, traffic level, proximity to streams, and weather conditions.

At the analysis area scale, total hillslope erosion would be slightly (~1 percent) less in Year 2 compared to Alternative A, about the same as Alternative C, though differences would not be significant or ecologically important because of model and natural background variability. The slight reduction in hillslope erosion would be due to use of lop and scatter fuels treatment which would slightly increase cover. Total hillslope erosion would be nearly the same in Year 3 compared to Alternative A, and Alternative C. Small erosion increases would be due to broadcast burning treatment which would slightly reduce ground cover. The combined erosion levels from hillslopes and roads would be no different than background by Year 5 (Table 3-17).

Cumulative Effects – Alternative B:

Hydrologic Function and Condition

Riparian Condition and Function

As discussed above, there would be no affect to riparian condition or function from any alternative. Effects of past, ongoing, and future foreseeable actions on riparian condition and function their magnitude and duration are discussed in cumulative effects for Alternative A, and would be the same for Alternative B.

Roads

Past road construction on NFS lands and its location relative to channels is incorporated with proposed new temporary road construction in the direct and indirect effects for Alternative B by the road density and RHCA road analysis. Very small increases in road density due to new temporary road construction in the alternative are shown in Table 3-19. About 9 of the 22 miles of previously decommissioned roads would be used with this alternative. Road construction associated with fire salvage on state and private lands would be the same as discussed in cumulative effects under Alternative A. Short-term (about five years) increases in road connectivity to the drainage network could occur due to the installation of culverts in previously decommissioned roads. Decommissioning, following the project, of existing unauthorized roads (6 miles) would remove culverts and other drainage crossings and lead to a small reduction in road connectivity relative to Alternative A.

Water Quality

Water Temperature

Alternative B would have no effect on water temperature. Effects of past, ongoing, and future foreseeable actions on water temperature their magnitude and duration are discussed in the cumulative effects for Alternative A and would be the same for Alternative B.

Erosion and Sedimentation

Accelerated erosion and sedimentation effects from roads (NFS and other) and other past activities that have compacted or displaced soils are present and would persist into the future. Some additional effects over the short-term (5 years) would be expected by ongoing and future actions including fire salvage on state and private lands and NFS road use during the proposed salvage. Effects of actions would be expected to decline as fire salvage activities were completed and as fire damage to ground cover recovers. Short-term effects from road decommissioning and culvert replacement would be controlled and minimized by mitigations and offset by improved hydrologic function and reduced risk of stream crossing failure which would start or accrue as projects were completed.

WEPP Modeling Results

Without additional road decommissioning, cumulative effects would be nearly the same as direct and indirect effects because other identified effects would be small (increases or decreases in total erosion), indistinguishable from background, and within the range of model variability. With additional road decommissioning identified in Reasonably Foreseeable Actions, road erosion would decline to 412 tons/acre or 19 percent below background road erosion each year following completion of the work.

Water Yield

Alternative B would have no effect to water yield. The effects of past, ongoing, and future foreseeable actions on water yield their magnitude and duration are discussed in cumulative effects for Alternative A and would be the same for Alternative B.

Alternative C

Direct/Indirect Effects – Alternative C:

Hydrologic Function and Condition

Roads
Approximately 28 miles of road would be reopened. These roads are currently categorized as closed, previously decommissioned, and/or unauthorized. About 3 miles of temporary roads would be constructed, and approximately 76 miles of road would be used for commercial haul. Road condition, location, and post-project treatment would be the same as described in Alternative B. All temporary road use categories would be decommissioned at the end of project activities.

Road densities would increase slightly during the project due to new temporary construction, though less in the Tumalum Creek SWS than in Alternative B. Temporary road construction in the heads of ephemeral swales identified in Alternative B would not occur in Alternative C. There would be a short-term expansion of the drainage network as a result of culvert reinstallation in previously decommissioned roads. The project would use and then decommission 4 miles of existing unauthorized roads, including removal of existing culverts and drainage crossings which would result in a net benefit to hydrologic function and condition in the short term. Decommissioning these roads to the desired level i.e., recontouring of cut/fill slopes that existed prior to the salvage sale would require additional funding.

Road use and temporary road construction could have a short-term, small negative effect to hydrologic function and condition followed by a small reduction in hydrologic connectivity relative to Alternative A. Both effects would be similar, but somewhat less than Alternative B since road use and decommissioning would be less.

Water Quality

Erosion and Sedimentation
Design criteria, mitigations, and best management practices described in the effects analysis for Alternative B would apply to Alternative C. Helicopter logging systems would be used to salvage 1,611 acres. Skyline systems would be used to salvage 1,626 acres about 500 acres of which would be yarded with tops attached to reduce fuel loadings. Forwarder systems would be used salvage 951 acres. These logging systems, their effects to ground cover, and the applicable mitigations are described in the discussion of erosion and sedimentation for Alternative B.

Hand work (lop and scatter) would reduce the depth of fuels on 3,687 acres. Prescribed burning would then occur on 760 acres using jackpot burning and 925 acres using broadcast burning. As in Alternative B, very little of this burning would back into RHCAs because fuel which might carry the burn was consumed in the wildfire. All mitigations and design criteria described in the effects discussion for Alternative B discussion would apply.

Seventy-six (76) miles of roads would be used for haul. New construction of temporary roads would amount to 3 miles. About 28 miles of road would be reopened. These roads are currently categorized as closed, previously decommissioned, and unauthorized. The running surface of these roads has revegetated and armored during non-use and would be reopened by blading and other maintenance. Newly constructed temporary, unauthorized, and previously decommissioned roads would be decommissioned by the project to the extent possible under the timber sale contract.

WEPP Modeling Results
Effects would be similar to Alternative B, though 76 miles of road would be used so overall effects would be less. Road erosion would increase approximately 71 percent compared to Alternative A, slightly less than Alternative B, in Year 2. Road erosion would be greater than Alternative A in Year 3 -4, but less than Alternative B. By Year 5, road erosion would be 4 percent less than Alternative A, though slightly more than Alternative B because fewer unauthorized road miles would be decommissioned (Table 3-17).

At the watershed scale, hillslope erosion would be slightly (~1 percent) less Year 2 compared to Alternative A, though differences are not significant or ecologically important because of model variability and natural background. Total hillslope erosion would be ~3 percent greater in Year 3 compared to Alternative A, slightly less (~1 percent) than Alternative B, though differences are again small given variability. Limited road use and road decommissioning would occur in Year 4, with a net increase compared to Alternative A, though slightly less than Alternative B. By Year 5, road decommissioning would reduce erosion by 4 percent compared to Alternative A, slightly less of a reduction than under Alternative B (Table 3-17).

Cumulative Effects – Alternative C:

Hydrologic Function and Condition

Riparian Condition and Function
As discussed above, there would be no effect to riparian condition or function from any alternative. The effects of past, ongoing, and future foreseeable actions on riparian condition and function, their magnitude and duration are discussed in cumulative effects for Alternative A and would be the same for Alternative C.

Roads
Past road construction on NFS lands and its location relative to channels is incorporated with proposed new temporary road construction in the direct and indirect effects for Alternative C by the road density and RHCA road analysis. Very small increases in road density due to new temporary road construction in the alternative are shown in Table 3-19. About 6 of the 22 miles of previously decommissioned roads would be used with this alternative. Road construction associated with fire salvage on state and private lands would be the same as discussed under cumulative effects in Alternative A. Short-term (about five years) increases in road connectivity to the drainage network could occur due to the installation of culverts in previously decommissioned roads. Decommissioning of existing unauthorized roads (4 miles) would remove culverts and other drainage crossings and lead to a small reduction in road connectivity relative to Alternative A following the project.

Water Quality

Water Temperature
Alternative C would have no effect to water temperature and the effects of past, ongoing, and future foreseeable actions on water temperature, their magnitude and duration are discussed in cumulative effects for Alternative A and would be the same for Alternative C.

Erosion and Sedimentation
Accelerated erosion and sedimentation effects from roads (NFS and other) and other past activities that have compacted or displaced soils are present and will persist into the future. Some additional effect over

the short-term (5 years) would be expected as a result of ongoing and future actions including fire salvage on State and private lands. Effects of NFS road use during the proposed salvage sale would be less in Alternative C than in Alternative B since road use would be less. Effects would decline as fire salvage activities are completed and as fire damage to ground cover recovers. Short-term effects from road decommissioning and culvert replacement would be controlled and minimized by mitigations and offset by improved hydrologic function and reduced risk of stream crossing failure which would start or accrue as projects were completed.

WEPP Modeling Results
Without additional road decommissioning, cumulative effects would be nearly the same as direct and indirect effects because other identified effects would be small (increases or decreases in total erosion), indistinguishable from background, and within the range of model variability. With additional road decommissioning identified in Reasonably Foreseeable Actions, road erosion would decline to 412 t/ac, or 19 percent below background road erosion each year following completion of the work.

Findings of Consistency:

Forest Plan Goals and Desired Future Condition
Action alternatives would protect beneficial uses of water and would meet all applicable state and federal water quality standards as documented below. Water temperature, quantity, quality, and timing of streamflows could be affected by effects of School Fire, but would not be affected by proposed fire salvage. Tree mortality and reductions in shade are due to the fire, and protection of PACFISH RHCAs would prevent fire salvage projects from having any effect on them. Fire salvage effects to erosion and sedimentation would be controlled and minimized by design criteria and BMP implementation as discussed above. Road decommissioning at the end of the project would slightly reduce erosion and sediment delivery to streams, an improvement to water quality.

Clean Water Act Compliance
Beneficial uses for streams in the project area could be affected by the wildfire. Proposed activities would not detrimentally impact beneficial uses because action alternatives (B and C) have been designed to prevent damage to RHCAs and to allow recovery at natural rates. Riparian and channel components that protect water quality would be maintained. Other design criteria and BMPs would control disturbance that could lead to erosion and sedimentation. Effects of action alternatives would not adversely or measurably affect water temperature, turbidity, fecal coliform, or pH, the criteria for which streams in the project area are 303d listed as impaired. Because of BMPs and project design, Alternatives B and C are in compliance with the Clean Water Act.

Safe Drinking Water Act Compliance
Source water areas for Boise Cascade's surface water supply on the Columbia River are mapped in the project boundary. Activities associated with salvage logging, yarding trees, road use, and temporary road construction could lead to accelerated erosion. The direct and indirect effects analyses in Alternatives B and C address these effects. Design criteria and BMPs have been adopted that would minimize erosion. Although the filtering capacity of PACFISH interim RHCAs has been reduced by loss of ground cover, some surface roughness remains. Eroded sediments may take years or decades to reach stream systems and much of the sediment is deposited in upland channels and small tributaries (Elliot 2005, personal communication). Routing of sediment through channels is sporadic, occurring during high flows. The project area is located in the upper reaches of the Tucannon River, a tributary to the Snake River, which is a tributary of the Columbia River. There are two dams on the Snake River, Lower Monumental Dam and Ice Harbor Dam between the confluence of the Tucannon River and the Columbia River. No effect to the surface water system of Boise Cascade would occur from proposed actions. A spring mapped as the

drinking water source for Camp Wooten is located on State of Washington land and would not be affected by projects proposed on NFS lands.

FISHERIES

The principle fisheries recommendations from the Tucannon Ecosystem (Watershed) Analysis (U.S. Forest Service (USFS), 2002) most relevant to post-fire conditions on Forest include:

1. Improve or re-establish well developed, mature riparian areas, increased channel stability and sinuosity, and floodplain connectivity on the National Forest.
2. Conduct on-the-ground assessments of previous action plans, current habitat conditions and water quality.
3. Support the goal to increase wild steelhead and spring Chinook to sustainable levels through habitat protection and restoration.
4. Assess current and past management activities and their effects on recovering fish populations and aquatic habitat.

These recommendations were designed to address limiting factors for production and recovery of listed fish in the subbasin, which were identified through Recovery Planning discussions among biologists from cooperating state, federal, and tribal agencies.

These recommendations are consistent with Forestwide Priorities for active watershed restoration, which were developed interdisciplinarily in 2002 (USFS, 2002), in which the Upper Tucannon Watershed was rated as high priority based on hydrologic and fisheries restoration needs based on the number of listed fish species present and the opportunity to modify culverts identified as passage problems. In terms of hydrologic condition and concerns relative to sediment sources potentially affecting fish habitat, the Upper Tucannon watershed was rated low for risk of surface erosion and mass wasting. Pataha Creek watershed rated low for mass wasting but higher than the Upper Tucannon with respect to surface erosion. Both watersheds rated out as possessing moderate integrity relative to their natural potential condition. By definition, portions of the watersheds may exhibit instability.

The Tucannon Ecosystem Analysis (USDA 2002b) noted that past land management activities, particularly diking and agriculture, in combination with multiple large flood events since 1964 in the Tucannon River, have led to channel instability, streambed aggradation, temperature increases associated with channel widening and development of larger deeper mainstem pools through interactions with new inputs of large wood, particularly in the reaches of the Tucannon River below the mouth of Cummings Creek. The watershed analysis provides a detailed discussion of past land management impacts throughout the watershed, including on the private and state-owned portions of the watersheds, as well as impacts on NFS lands, relative to conditions existing prior to the School Fire.

SCALE OF ANALYSIS

School Fire Salvage Recovery project is proposed on National Forest System (NFS) lands within the perimeter of School Fire which occurred in August 5, 2005. The fire burned approximately 28,000 gross acres of NFS lands. Fish habitat within four subwatersheds of the Upper Tucannon River and Pataha Creek Watersheds: respectively known as the Little Tucannon River, Cummings Creek, Tumalum Creek and Headwaters Pataha Creek Subwatersheds constitutes the affected environment for this project. These four subwatersheds are comprised of NFS lands upstream and non-NFS lands downstream.

School Fire burned 702 acres of upland vegetation in the North Patit Creek Subwatershed (<6 percent of total acreage) in the Upper Touchet River Watershed; less than 3 percent of the subwatershed burned at moderate to high severity. The fire burned 7 percent of Lower Upper Tucannon Subwatershed (HUC 170601070606) at moderate to high severity. This subwatershed contains no NFS acreage. The Tucannon River in this subwatershed receives flow from all of the Tucannon River subwatersheds upstream of Pataha Creek confluence, including flow from Tumalum and Cummings creeks which both enter the Tucannon downstream of NFS lands. The extent and severity of the fire in the Lower Upper Tucannon and North Patit Creek Subwatersheds present little hydrologic risk to aquatic habitats therein. The fire burned 77 acres on the ridgetop of the Headwaters Tucannon River Subwatershed. The extent and location of the fire poses no hydrologic risk to aquatic habitats in this subwatershed. These subwatersheds are not included in the affected environment or effects analysis.

Based on review of factors limiting recovery of listed species in the Tucannon River subbasin prior to the School Fire, and in consideration of effects from School Fire itself and/or anticipated from activities proposed in the School Fire Salvage Recovery project area, the following indicators have been selected for subsequent analysis with regard to fish habitat and the associated listed, sensitive and management indicator fish species in the project area:

- Water quality
    - evaluated using temperature and chemical contaminants
- Quantity of spawning habitat
    - evaluated using riffle embeddedness and fine sediment composition of the substrate
- Floodplain connectivity and natural instream cover features
    - evaluated using large wood frequencies
- Functionality, rearing habitat availability
    - evaluated using pool frequencies and presence of artificial in-channel features obstructing juvenile fish passage

Other habitat information is provided for context. Few of the selected indicator variables, with the exception of chemical contaminants, are completely independent from other variables selected for analysis. The Upper Tucannon River and Upper Pataha Watersheds are believed to be in near natural condition with respect to chemical contaminants, in that no stream on NFS lands in these watersheds have been listed other than for temperature. Other 303(d) listings for the Tucannon River and Pataha Creek are for fecal coliform and for pH at locations downstream of the Forest (Peterson 2006). The Forest Service has conducted spot checks for fecal coliform and other pollutants of concern which have not been found in waters on National Forest (Groat 2005). Temperature and sediment data are not available for every stream in affected subwatersheds.

Habitat Interactions Relevant to this Analysis

Riparian Habitat Conservation Areas (RHCAs) have been established per PACFISH policy, which amended Umatilla National Forest's Land and Management Plan in 1995. RHCAs are streamside zones managed for riparian functionality and protection of fish habitat. Their widths vary depending on whether a channel is fish-bearing, perennial non-fishbearing, or intermittent, according to PACFISH requirements. RHCAs, especially those with mature conifers and hardwoods, serve several critical functions: one of which is to supply woody debris to stream channels through time as trees die or are undercut by the stream. Woody debris functions in the stream system to help sort and route sediment, and creates pools through interactions with channel morphology, streambed substrate and stream flows. Wood in the channel creates local variations in stream velocity, thereby creating resting areas for fish during high flows, provides hiding cover during low flows, and also provides food sources and cover for aquatic insects. Headwater intermittent and perennial non-fishbearing reaches influence downstream fish habitat by collecting and transferring wood and sediment downstream to fish-bearing reaches. Woody debris affects the routing of water, influences channel morphology and stabilizes small streams by dissipating energy, reducing the stream's erosive power against both stream banks and stream bed. Often woody debris becomes trapped in steep narrow headwater channels, creating instream storage sites for sediment which become lower-gradient steps or short benches in the channels' longitudinal profiles.

Ephemeral channels, those without a defined stream channel, generally play a minor role in protecting fish habitat downstream. They generally form upstream of more defined channels. They tend to collect and store rock, soil and wood which may accumulate and remain immobile for decades or centuries due to inadequate stream power to mobilize the material. Stored material in either ephemeral or intermittent channels or on adjacent side slopes may be mobilized downstream under uncommon circumstances, resulting in responses such as the shallow debris flows which occurred in lower elevation non-fishbearing side drainages (<4000 feet elevation) of the mainstem Tucannon River in winter 1996, which were triggered by heavy rain-on-snow events in that winter. Such debris flows may end up deposited on the floodplains of larger rivers, as happened along the mainstem Tucannon in 1996, or they may fill the streambed of smaller streams, such as happened in Tumalum Creek in 1964. Intermittent drainages impacted by 1996 debris flows retained living trees in their stream beds, despite the fact that large amounts of sediment entered and moved down the channels from sites of origin on grassy south-facing side slopes (C. Busskohl, personal communication).

Living riparian vegetation shades and protects stream surfaces from heat loading, thereby maintaining cool water temperatures for fish and other aquatic species. Standing dead trees will lose their shading ability over time as needles are lost and smaller limbs are lost to the point that finally only boles remain to block the sun. Large live overstory conifers are most effective at providing thermal protection, but smaller deciduous trees and shrubs can help, particularly on smaller streams. Intact riparian vegetation serves to stabilize stream banks and entrap sediment arriving from upslope sources, dissipates stream energies during overbank flows and helps store sediment on the floodplain adjacent to the channel. Overstory riparian conifers serve as future sources of large wood for the channel

AFFECTED ENVIRONMENT

The discussion of affected environment is based on information presented in the Hydrology/Water Quality section of this chapter, including definitions of levels of burn "severity," which refers to the degree of soil impacts. Wherever used in this section in reference to fire effects on soil, the term "severity" or "burn severity" will be used. Areas of high burn severity are characterized by complete consumption of duff and litter layers, and mineral soils have turned red or orange on the surface. Areas mapped with moderate and high burn severity are especially vulnerable to accelerated erosion and runoff (Soils Specialist Report, on file).

Three Federally listed Threatened fish species, Snake River Spring Chinook salmon (*Oncorhynchus tshawytscha*), Snake River steelhead (*O. mykiss*) and Columbia River bull trout (*Salvelinus confluentus*) are present within the affected subwatersheds, and are also upstream in the relatively unaffected Headwaters Tucannon subwatershed and in the Panjab subwatershed which was unaffected by the fire. The Headwaters Tucannon and Panjab subwatersheds contain most of the bull trout spawning habitat in the Tucannon and Pataha Watersheds, as well as a portion of the spawning and rearing habitat used by steelhead and Chinook salmon in these watersheds.

Two fish species listed as Sensitive by the Regional Forester are also present in the affected subwatersheds; the margined sculpin, (*Cottus marginatus)* and resident redband/rainbow trout, the non-anadromous form of *O. mykiss.* Both the resident and anadromous forms of *O. mykiss* were designated as management indicator species (MIS) in the Umatilla National Forest's Land and Resource Management Plan, and are present throughout the affected subwatersheds. Sculpin are present in both the Upper Tucannon River and Pataha Creek watersheds, but are not known to be present in the Tumalum subwatershed. Unless otherwise noted, unidentified sculpin are presumed to be Margined Sculpin. Other native species present in the affected subwatersheds include mountain whitefish (*Prosopium williamsonii*) and redside shiners (*Richardsonius balteatus*) in the main Tucannon River. A self-sustaining population of non-native brook trout has been present in Upper Pataha Creek Watershed since being introduced several decades ago. North Patit Creek, Panjab, Headwaters Tucannon and Lower Upper Tucannon Subwatersheds will receive only minimal further discussion in this report as any land management activities which may occur on NFS lands in response to current post-fire conditions, are not expected to impact aquatic habitats or species in these subwatersheds.

Designated Critical Habitat for Snake River Spring Chinook salmon is present (Federal Register 58 FR 68543, December 28, 1993). Essential Fish Habitat (EFH) for Chinook salmon under the Magnuson-Stevens Fishery Conservation & Management Act (MSA) is present in the affected area and corresponds to areas mapped as Designated Critical Habitat. Designated Critical Habitat was identified for Snake River steelhead on September 2, 2005 (70 FR 52630) and went into effect on January 2, 2006. Critical Habitat was designated in the Little Tucannon River, Cummings Creek, Tumalum Creek and the Tucannon River, for their full lengths within the affected subwatersheds. Critical Habitat has been designated under the Endangered Species Act for bull trout on select stream segments within the Upper Tucannon Watershed (70 FR 56212, September 26, 2005), and is present on private land parcels on the mainstem Tucannon River and Cummings Creek within the fire perimeter. Bull trout Critical Habitat was also designated on the first reach of Hixon Creek on NFS and State lands, also located within the fire perimeter.

Since Sensitive and MIS species may occur in habitats not formally listed, fish habitat conditions in all fishbearing streams in affected subwatersheds whether listed or unlisted, will serve as the basis for analyzing project effects for these Threatened, Sensitive and MIS species. These species serve as indicators of effects to other fish species using similar habitats in the affected area. Table 3-20 describes overall habitat in use by fish species within the affected subwatersheds, and in Tucannon River and Upper Pataha Watersheds as a whole (includes fish habitat in Lower Upper Tucannon, Panjab and Tucannon River Headwaters Subwatersheds). Species distribution downstream of the Forest is derived from WDFW information and professional judgment by the Pomeroy district biologist (D. Groat, personal communication).

Table 3-20 Miles of Fish-Bearing Streams within Upper Tucannon and Pataha Watersheds*

Watershed	Subwatershed Name		Total Fish-bearing	Chinook Salmon	Steelhead** (Redband)	Bull trout	Margined Sculpin
Upper Tucannon	Lower Upper Tucannon		6.4	6.4	6.4	6.4	6.4
"	Tumalum Creek		10.3	0	0 (10.3)	0	0
"	Cummings Creek		9.6	0	6.7 (9.6)	8.5	7.3
	Little Tucannon:		17.1	11.8	13.4 (17.1)	13.4	13.6
		Hixon/Grubb	2.6	0	0.5 (2.6)	0.5	0.7
		Mainstem Tucannon R.	11.8	11.8	11.8	11.8	11.8
		Little Tucannon R.	2.5	0	1.1 (2.5)	1.1	1.1
"	Panjab and Headwaters Tucannon		32.0	8.4	15.7 (32.0)	23.9	19.1
		Mainstem Tucannon R.	11.9	8.4	11.2 (11.9)	11.2	11.2
Upper Tucannon Total	Affected subwatersheds only		37.0	20.2	20.1 (37.0)	21.9	20.9
	Tucannon R total length		30.1	26.7	29.5 (30.1)	29.5	29.5
	Total fish miles		75.4	26.7	42.2 (75.4)	52.3	31.4
Upper Pataha	Pataha Headwaters:		12.3	0	0 (12.3)	0	10.8
Total Miles	Total		87.7	26.7	42.2 (87.7)	52.3	56.6

*Miles are based on USFS stream survey data on fish distribution (USFS, on file).

** Redband distribution is shown in parentheses, includes areas of overlap with steelhead. Redband trout distribution and total fish-bearing miles are equivalent miles, since redband have the most comprehensive distribution of the species considered here

Snake River Spring/Summer Chinook Salmon Status and Distribution

Within affected subwatersheds, Chinook salmon distribution and spawning are limited to the Tucannon River itself. EFH and Critical Habitat for Chinook salmon are both designated the length of the Tucannon River. The highest incidence of spawning in the river occurs from Tumalum Creek confluence to the mouth of the Little Tucannon River. Adult Chinook enter the river from late April to late June, and hold in the cooler waters of the Upper Tucannon watershed until fall, when spawning occurs. No spawning has been observed in Tucannon River tributaries.

Based on estimates by WDFW biologists, Tucannon River spring/summer Chinook abundance was in the range of 30,000 adult spawners prior to 1916. A spawning index area, monitored by WDFW since 1954, has shown a long-term decline in spring/summer Chinook redds in the subbasin. The entire run averaged 316 wild fish annually between 1985 and 2002. Releases of non-native, hatchery-reared spring/summer Chinook have occurred in the Tucannon River since the early 1980s and returning hatchery-origin adults contribute to the naturally-spawning population. The Tucannon River Fish Hatchery is located upstream of Tumalum Creek, on the Tucannon River.

The highest densities of Chinook juveniles in the subbasin are found below the Forest, in the same river reaches most heavily used for spawning. Juvenile use is particularly concentrated between Tumalum Creek and the Tucannon Fish Hatchery dam.

Steelhead and Redband Trout (MIS) Status and Distribution

The Tucannon watershed has a substantial run of hatchery steelhead supported by two State hatcheries, however their contribution to long-term viability of the ESU as a whole is still being assessed by National Marine Fisheries Service (NMFS). The gene pool for the Snake River Basin *O. mykiss* ESU currently includes both hatchery steelhead and resident redband trout along with naturally-spawning wild steelhead, based on information provided in the Federal Register of June 14, 2004 (69 FR 33102).

This assessment is supported by research findings summarized by Payne and Associates and Cramer and Associates (2005) on the state of knowledge regarding genetic and environmental influences on phenotypic expression of the resident and anadromous life histories in the same subbasins. In particular, Carmichael et al (2005) demonstrated that in the Snake River basin, resident redband trout pairings can produce steelhead smolts equivalent to 20 percent of the number of smolts produced by a pair of anadromous *O. mykiss*. In another study, Pella and Masuda (2001) documented a 15th generation resident population originally derived from anadromous stock. Both steelhead smolts and adults produced from the resident population continued to be detected below an impassible barrier after 15 generations of no contact between steelhead adults and the resident fish. Thus even in Tucannon subbasin streams and reaches dominated by resident fish and/or inaccessible to steelhead spawners, the viability of resident *O. mykiss* populations likely contributes to the maintenance of anadromy in the Tucannon *O. mykiss* population, though the extent of that contribution remains unknown.

Differentiating between juvenile steelhead (Threatened, NMFS 1998) and redband trout (Region 6 Sensitive Species) is difficult, and juveniles (age 1+) of both life histories may use the same stream reaches for rearing, especially where adult steelhead passage is not inhibited. Due to these difficulties, unless definitive information is available indicating distinctly separate rearing areas, this age group of the two life histories is best considered concurrently when describing distribution and when assessing impacts to rearing habitat and to juvenile *O. mykiss*. The text below discusses and refines distribution for juvenile steelhead.

StreamNet (2004) and WDFW (2004) report that, within affected subwatersheds, only Tucannon River and Cummings Creek support steelhead spawning activity. River sections most heavily used by spawning steelhead extend from the Forest boundary to the confluence of the Little Tucannon River, similar to areas most heavily used by spawning Chinook salmon. As with Chinook salmon, the lowest steelhead spawning activity and redd densities are found in the Tucannon River upstream from the Little Tucannon River confluence. Forest Service observations suggest that the lowest segment of the Little Tucannon River also supports steelhead spawning, however only the Tucannon River and Cummings Creek have been listed as Designated Critical Habitat by the National Marine Fisheries Service (NMFS) for steelhead.

The historical extent of steelhead spawning in Tumalum Creek is relatively unknown. The drainage was logged in the 1950's and early 60's on both NFS and private lands. A landscape-scale wildfire in 1960 subsequently burned through private lands in the lower drainage (D. Groat, personal communication.). Post-fire conditions in the drainage interacted with the region wide rain-on-snow flood event of 1964, resulting in mass wasting in side drainages of Tumalum Creek below the Forest (<4000 feet elevation), which delivered mass quantities of loose colluvial rock to Tumalum Creek and filled the channel for several miles below the Forest. Flow now typically goes subsurface by May each year through an extensive section of Tumalum Creek below the Forest boundary (D. Groat, personal communication), preventing steelhead adults from accessing potential spawning areas on the Forest in most years. As a consequence, Tumalum Creek primarily supports resident redband trout at present, though steelhead spawners may have used this drainage prior to 1964.

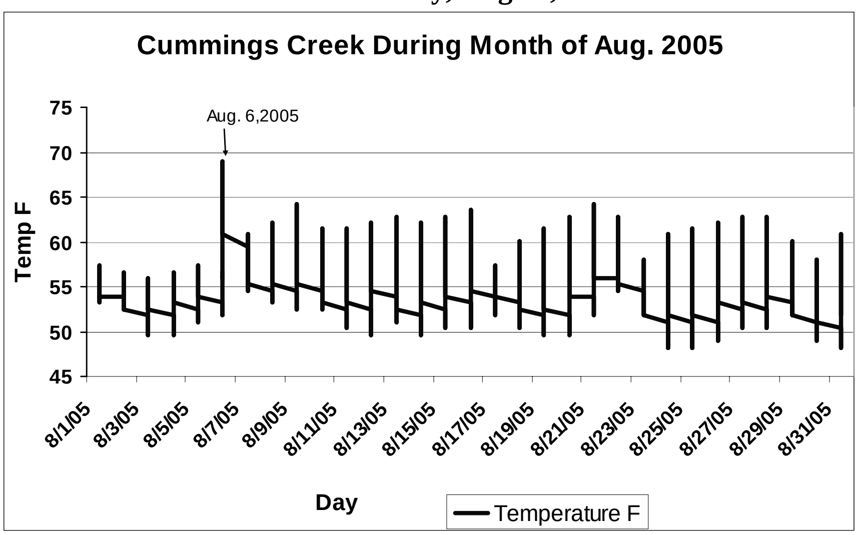
While resident redband are present throughout Pataha Creek, known steelhead spawning use ends well below the Forest. Several barriers low in the watershed prevent steelhead adults from accessing spawning habitat on-Forest (D. Groat, personal communication). As a consequence, upper Pataha Creek primarily supports redband trout at present, though steelhead spawners may have accessed these headwater reaches historically. Cramer et al 2003; cited in Payne and Associates and Cramer and Associates, 2005 showed that steelhead life histories predominate in lower portions of watersheds where summer temperatures tend to exceed 16^{o}C (61^{o}F.). Temperatures in Pataha Creek at the Forest boundary tend to hover around the 61^{o}F mark (Table 3-24 later in this document), suggesting that thermal conditions in the lower end of Pataha Creek on-Forest are such that steelhead spawning would occur at least up to the Forest boundary, if not for a short distance onto the Forest, if access were available.

Rearing areas used by juvenile *O. mykiss* (age 1+ steelhead/redband trout) are distributed somewhat differently than steelhead spawning areas. Juvenile densities of *O. mykiss* have historically been highest in Cummings Creek and in the Tucannon River below the Forest boundary. Redband/steelhead rearing distribution in Cummings Creek extends to the headwaters. Juvenile use of the mainstem Tucannon and upper headwater tributaries extends well upstream of the fire perimeter. Juvenile steelhead/redband trout are also present in Grub and Hixon Creek within the fire perimeter and in the Little Tucannon River within and upstream of the fire perimeter. Where temperatures tend to remain below 16^{o}C (61^{o}F) in the summer, conditions favor the development of residency rather than anadromy, and juveniles are more likely to be resident trout, based on research conducted in the Yakima, Deschutes and Willamette river basins (Cramer et al 2003, cited in Payne and Associates and Cramer and Associates, 2005). Upper Hixon Creek, Cummings Creek at the Forest boundary and upper reaches of the Little Tucannon River all tend to have summer high temperatures less than 61^{o}F as shown in Table 3-24 later in this document, indicating that resident life histories predominate in these reaches, based on those research findings. Summer high temperatures in the Tucannon River at Panjab Creek bridge tend to remain consistently in the upper 50's, favoring juvenile development into resident trout, whereas temperatures tend to rise into the upper 60's at the Forest boundary (Table 3-24), which favors juvenile development into an anadromous life history. Temperatures at these locations also helps to explain why spawning use by steelhead concentrates below the mouth of the Little Tucannon River and downstream.

USFS stream surveys have recorded *O. mykiss* juveniles the length of NFS portions of upper Pataha Creek (USFS, on-file). These are considered to be resident redband trout owing to the distance from known steelhead spawning areas downstream. Based on the findings by Carmichael et al. (2005) and by Pella and Masuda (2001) however, a percentage of these juvenile redband may however eventually leave the watershed and develop into steelhead smolts, as may a proportion of the juvenile redband in Tumalum Creek.

Several reaches of Grubb, Hixon, Cummings and Tumalum Creeks were completely consumed by the fire which resulted in substantial fish kills in Grubb, Hixon, and Cummings drainages on August 6, 2005. Similar fish kills likely occurred in Tumalum Creek as well, for similar reasons, but field reviews of the severely burned sections did not occur and fish kills were not verified. The fire roared through Cummings and Tumalum Creeks in the space of a few hours, later backing through Hixon and Grub Creeks (D.Groat, personal communication). Redband adults, redband and steelhead juveniles were among the species and life histories most affected by the fish kills in these drainages when temperatures underwent abrupt dramatic increases, some within an hour's time, as exemplified by thermograph records on Cummings Creek on August 6, 2005 (Figure 3-2). Fish present in severely burned segments of these drainages at the time, had little or no opportunity to escape or adjust physiologically to the sudden lethal change in their environment. Temperatures remained within survival ranges upstream elsewhere outside of severely burned segments, based on observation of live salmonids in these areas post-fire, for example, they were observed one-half mile below the high-severity boundary-spanning section of Cummings Creek, as well as upstream. Live fish were observed also observed in lower Hixon and Grubb Creeks as well, suggesting that though water temperatures may have been elevated downstream, that temperatures remained survivable in these locations (D. Groat, personal communication).

Figure 3-2 Water temperatures in Cummings Creek, Forest boundary, August, 2005



Resident trout and steelhead both use the first mile of the Little Tucannon for spawning and rearing. The north side of this reach also burned to a minor degree during the fire, with a backing fire similar to the fire activity that severely burned Hixon and Grub Creeks. Because both sides of this reach did not burn, and because burn effects were neither as severe nor as extensive as those experienced in the other affected creeks, fish kills did not occur in the Little Tucannon River. Neither did fish kills occur in Pataha Creek, where the most severe riparian burn effects remained in the "Moderate Severity" range. Steelhead juveniles and redband trout may have either temporarily relocated to cooler water up or downstream, or were able to remain within the affected reaches without being subjected to lethal changes in water temperatures experienced elsewhere in the Upper Tucannon and Pataha watersheds. Tributary populations of redband trout in Cummings, Grubb, Hixon, and Tumalum Creeks have likely experienced at least temporary partial loss of local viability, while portions of up to 4 year classes of juvenile steelhead may have been lost from the Upper Tucannon subbasin population.

Bull Trout Status and Distribution

Both resident and migratory forms of bull trout occur in the Upper Tucannon River Watershed. Radio-tagging studies have shown that within the Little Tucannon Subwatershed and downstream, the Tucannon River functions as a migratory corridor. The species was historically present in the Pataha Watershed but has since been displaced by brook trout. They were last detected in Pataha Creek (Pataha Headwaters Subwatershed) in the early 1970's in close association with an established brook trout population (USFS, on file). Brook trout are relatively prolific breeders and will interbreed with bull trout, producing sterile hybrids. Elsewhere within the range of bull trout, local bull trout populations have gone extinct in the presence of well-established brook trout populations (Federal Register 63 FR 31647, June 10, 1998).

Bull trout spawning surveys in the Tucannon subbasin have been conducted intermittently since 1990. The majority of streams known to support bull trout spawning and rearing in the subbasin are predominantly located in the Upper Tucannon watershed upstream of the affected subwatersheds (StreamNet, 2004; USFS, on file). Known spawning tributaries in the affected subwatersheds include Cummings Creek and the Little Tucannon River. Spawning has been documented in Cummings Creek since 1998.

Bull trout probably are the most temperature-sensitive of fish species in the Tucannon River. Juveniles often spend 2-4 years of their lives in cool headwater or upstream locations (Meehan 1991), and may remain as residents in these areas, especially where summer temperatures remain below 12^{o}C (54^{o}F) (Pratt 1985). Fluvial and adfluvial bull trout will migrate downstream to rear in somewhat warmer but larger riverine or lake habitats where they feed on other fishes, larger macro invertebrates and crayfish, but where temperatures still tend to limit downstream distribution during the warmer months. Adult and larger juvenile fluvial bull trout elsewhere have not been found where temperatures exceeded 18^{o}C (65^{o}F), but have been found where water temperatures remained at or below that value (Shepard 1985) and are most generally found in waters colder than 15^{o}C (59.3^{o}F) (Rieman and McIntyre 1993). Individuals will migrate farther downstream in winter months and move progressively back upstream as water temperatures rise in the spring and early summer.

Temperatures in the Tucannon River below Tumalum Creek commonly reach into the 70°F range (D. Groat, personal communication). This creates stress and thermal barriers that, unless fish move upstream beyond Tumalum confluence early enough, they may not migrate through successfully from the lower Tucannon and Snake rivers which also suffer from summertime highs. These temperatures however, normally occur after bull trout and other migratory species will have moved through and upstream to cooler waters of the Upper Tucannon Watershed. Bull trout in the Tucannon River are thought to spawn from September through November with activity peaking in the first two weeks of October. Spawning is triggered as temperatures fall below 50^{o}F (Fraley and Shepard 1989).

Though Cummings Creek provided both spawning and rearing habitat prior to the School Fire, the entire subwatershed burned on August 6th (a period of time when both bull trout juveniles, and possibly spawners, were present. A two mile section of the drainage burned severely, spanning the forest boundary, while a disjunct segment of channel in the uppermost reach also experienced high-severity burning. Water temperatures became lethal in the severely burned reaches (Figure 3-2), exemplified by the fact that stream temperatures at the Forest boundary increased more than 13^{o}F (peaking at 69^{o}F) in less than one hour and stayed elevated above 65^{o}F for at least 3 hours that day before dropping. Fish kills were observed throughout the lower of the severely burned segments following the fire. Examples from the literature have recorded lethality at 22.8^{o}C (73^{o}F) for lake trout, (a relative of bull trout) or at 25^{o}C (79^{o}F) for rainbow trout, when exposed to instantaneous increases in temperature (Brett, 1952).

Following the burnover on the 6th, daily maximum stream temperatures at the Forest boundary remained elevated in the 60-65^{o}F range through the end of August, whereas pre-fire temperatures had daily peaks in the upper 50's prior to the fire. Temperatures had likely already reached annual peaks in July and were experiencing normal fall patterns of declining temperature by early August prior to the fire, based on earlier years of data at this location (USFS, on file).

Approximately one mile of fish habitat in a middle reach of Cummings Creek experienced neither moderate nor high-severity burning within 300 feet of the channel, and individual bull trout in Cummings Creek may have survived, based on observations of live salmonids in this area following the fire, as well as on private lands downstream one-half mile below the segment where fish kills were observed (D.Groat, personal communication). Trout can be creatures of habitat, especially when not evolutionarily adapted to abrupt changes in temperature in their habitual environment. Munson (1980) found rainbow trout entering customary areas to feed even after temperatures had become lethal in those areas. Bull trout are even less adapted to high temperatures. Owing to loss of shade throughout the majority of the drainage, the overall thermal character of Cummings Creek now appears marginal for bull trout, and the local subpopulation likely has experienced reduced viability due to loss of individuals. The upper portion of Hixon Creek also burned severely with fish kills observed (D. Groat, personal communication), and bull trout fatalities may have occurred among some rearing juveniles and possibly some adult fish which may have been present in upper Hixon Creek during the burnover on August 6th.

Margined Sculpin Status and Distribution

The margined sculpin (*Cottus marginatus)* is currently only known in the state of Washington from portions of the Tucannon and Walla Walla Walla subbasins, and its entire present range is restricted to higher-elevation streams of the Walla Walla, Umatilla and Tucannon subbasins in the northern Blue Mountains of Oregon and Washington (Mongillo and Hallock, 198). The only other sculpin species sharing the range of the margined sculpin is the Piute sculpin (*C. beldingii*). Individuals of the two species must be observed quite closely to distinguish the physical characteristics separating the two species taxonomically. Thus, where USFS or WDFW stream surveys in the Tucannon system have simply documented the presence of "sculpins" or *Cottus sp*., they are presumed to be margined sculpins unless evidence to the contrary is available.

Margined sculpin are locally rare to common within inhabited stream reaches in the Upper Tucannon and Pataha watersheds, based on pre-fire surveys in 2005 (Mendel et al. 2005). The state considered the species to be locally common in the mainstem Tucannon River downstream of Sheep Creek, rare in Cummings Creek, and absent to uncommon in other tributaries from Panjab Creek upriver. Margined sculpin have been documented downriver almost to the mouth of Pataha Creek (Mongillo and Hallock, 1998). Surveys by USFS crews have documented their presence in Grubb, Pataha, and Cummings creeks as well as in the Little Tucannon and in the mainstem Tucannon from below Tumalum Creek's confluence to River Mile (RM) 54.3, between sheep and Bear Creeks in the Tucannon Headwaters subwatershed. Given the very limited range of the species, the state of Washington has expressed concern that localized disturbances may severely impact the long-term viability of the species (Mongillo and Hallock 1998).

Margined sculpin typically prefer lower gradients, particularly pool habitats, and tend to associate with relatively small substrate sizes, e.g. gravels, as opposed to larger substrates, and prefer water deeper than 34 cm. (Lonzarich 1993). Sculpin as a genus are typically bottom-dwellers with preference for good water quality and are not very mobile compared to salmonid species. These traits have led to the use of various sculpin species elsewhere as indicators for monitoring water quality in terms of acidic heavy metal pollution, since once displaced from a section of stream by poor water quality, they are slow to repopulate that section (Baker et al. 1996). Based on a synthesis of data from other researchers on water temperatures associated with margined and other sculpin species, Mongillo and Hallock (1998) concluded that margined sculpin most likely prefer temperatures between 5-20^{o}C (41-68^{o} F) and that temperatures exceeding 27^{o}C (81^{o}F) would be lethal.

Cummings Creek was the largest tributary to be severely burned by School Fire. A two-mile section of the drainage burned severely on the 6th of August, spanning the forest boundary, while moderate severity burning occurred downstream to the confluence as well as in the headwaters. Water temperatures became lethal in the severely burned section (Figure 3-2), exemplified by the fact that stream temperatures at the Forest boundary increased more than 13^{o}F (peaking at 69^{o}F) in less than one hour and stayed elevated above 65^{o}F for at least 3 hours that day before dropping. Fish kills were observed throughout this severely burned segment following the fire, though live fish were observed upstream in less affected sections of the channel (D. Groat, personal communication). Grubb Creek, a smaller tributary, was burned as severely as Cummings Creek. Substantial fish mortality was also observed in upper Grubb Creek following the fire, indicating sudden lethal temperature increases there as well. Examples from the literature, reviewed by Bjornn and Reiser (1991) have recorded lethality at 22.8^{o}C (73^{o}F) for lake trout, a relative of bull trout (Brett, 1952) or at 25^{o}C (77^{o}F) for rainbow trout (Charlon et al. 1970), when exposed to instantaneous increases in temperature. Fish kill at the temperatures recorded during the fire, demonstrates that the research findings were conservative as to incipient lethal temperature in high-severity burning situations. Following the burnover on August 6th, daily maximum stream temperatures in Cummings Creek at the forest boundary remained elevated in the 60-65^{o}F range through the end of August 2005, whereas pre-fire temperatures had daily peaks in the upper 50's prior to the fire. Temperatures were undergoing normal early fall patterns of declining temperature by early August prior to the fire. The annual 7-day average maximum temperature at this site probably occurred in July based on the timing for most years that data are available for a site at Cummings Creek confluence, though occasionally annual 7-day average maxima have not been reached until early August (USFS data, on file).

Approximately one mile of fish-bearing habitat in a middle reach of Cummings Creek experienced neither moderate nor high-severity burning within 300 feet of the channel, and individual sculpin in Cummings Creek may have survived based on observations of live salmonids in sections both up and downstream which did not experience high-severity burning (D. Groat, personal communication). Owing to the scarcity of sculpin in Cummings Creek even prior to the fire, the magnitude of fire effects and fish kills experienced in both Grubb and Cummings Creeks, together with the limited mobility of the species, these two local-populations likely have experienced reduced viability due to loss of individuals.

Overview of Fish Habitat Conditions

Fish habitat condition data and interpretations are derived from several sources. Personal knowledge by local fish biologists contributes to interpretation of passage conditions. Habitat surveys conducted per Forest Service Region 6 protocols are the basis for assessing in-channel habitat structure including wood and pool frequencies, embeddedness and substrate composition. Temperature data is collected using thermographs deployed strategically as part of a long-term forest-wide Forest Plan monitoring program which addresses the Clean Water Act and PACFISH temperature requirements. Culvert Fish Passage Barrier inventories were conducted between the years 2000-2001, per Forest Service Regional protocols. Riparian Area conditions are evaluated using GIS-based spatial data for streams, mass wasting, and harvest. Fire intensities were mapped and interpreted by the BAER Team following School Fire. Chemical water quality assessments for the affected subwatersheds are based on the State of Washington's 303(d) list.

The recently finalized Snake River Salmon Recovery Plan (Snake River Salmon Recovery Board, 2005) identified limiting factors for recovery of Chinook salmon, steelhead and bull trout in the Upper Tucannon River and Upper Pataha Watersheds, which are summarized in the tables below.

Table 3-21 Limiting Factors* for Bull Trout in Affected Subwatersheds of the Upper Tucannon and Upper Pataha Watersheds

Subwatershed	Streams (as described in the Recovery Plan)	Primary Limiting Factors	Secondary Limiting Factors*
Little Tucannon	Mainstem Tucannon River and tributaries	Temperature, sediment	Fish passage
Cummings	Cummings Creek	Temperature, sediment	
Tumalum	Tumalum Creek	Temperature, sediment	Fish passage
Pataha Headwaters	Upper Pataha Creek and tributaries	Temperature, sediment	Fish passage

* Although the Recovery Plan identified fish passage as a concern for Tucannon subbasin bull trout, it did not identify specific streams where passage was an issue within these subwatersheds. This concern has been refined for the affected subwatersheds, based on local knowledge of current channel conditions and culvert and habitat inventories conducted by the USFS since 2000 (USFS, on-file).

Table 3-22 Limiting Factors for Spring Chinook Salmon in Affected Subwatersheds of the Upper Tucannon and Pataha Watersheds

Subwatershed	Streams (as described in the Recovery Plan	Primary Limiting Factors	Secondary Limiting Factors*
Little Tucannon	Tucannon River mainstem (river upstream to Little Tucannon confluence)	Key Habitat quantity**, Habitat diversity***	Flow, channel stability, sediment, food

*Although the Recovery Plan identified fish passage as a concern for Tucannon subbasin salmon, it did not identify specific streams where passage was an issue within these subwatersheds. This concern has been refined for the affected subwatersheds, based on local knowledge of current channel conditions and culvert and habitat inventories conducted by the USFS since 2000 (USFS, on-file).

** Key habitat quantity refers to the availability of habitats for spawning and rearing, such as pools, and extent of species distribution

***Habitat diversity refers to habitat complexity in terms of components such as frequency of pools.

Table 3-23 Limiting Factors for Snake River Steelhead in Affected Subwatersheds of Upper Tucannon River and Upper Pataha Watersheds

Subwatershed	Streams (as described in the Recovery Plan)	Primary Limiting Factors	Secondary Limiting Factors
Little Tucannon	Tucannon River mainstem (upstream to Little Tucannon confluence)	Key Habitat quantity** Habitat diversity***	Flow, channel stability, sediment, food
Pataha Headwaters	Upper Pataha Creek	Temperature, sediment, key habitat quantity, habitat diversity, channel stability	Flow

**Key habitat diversity refers to habitat complexity in terms of components such as frequency of pools and large wood.

*** Key habitat quantity refers to the availability of habitats for spawning and rearing, such as side channels and riffles.

Overall Watershed Habitat Conditions – Upper Tucannon and Upper Pataha

In the following discussions, some pre-fire data may be presented. In such cases, current conditions are considered to resemble pre-fire conditions unless otherwise noted.

Pool Frequency: Construction in the late 1980's added 34 man-made deep pools to lower Cummings Creek. Thirty-three of these pools were still present and functioning as recently as 1998. Pool frequencies in most streams prior to the fire were typically lower than Riparian Management Objectives established by PACFISH for streams of these sizes and this condition is assumed to still have been true at the time of the fire, despite some recovery associated with improved streamside and watershed management practices since 1995 when PACFISH policy went into effect. In the immediate post-fire environment, pool frequencies are unlikely to have changed as yet given the absence to date of major rainstorm run-off events which have not yet occurred.

Large Wood Frequencies: Wood frequencies within the Forest portions of the Upper Tucannon and Upper Pataha watersheds prior to the fire, met PACFISH objectives in the Pataha drainage and in the lower portion of the Tucannon River. The lower elevation reaches on-Forest that have been dominated by ponderosa pine (Hixon, Grub, possibly Cummings, the lower end of the Little Tucannon, and probably Tumalum Creeks) were generally more likely to have been wood deficient prior to the fire, based on available data. Initial observations of Cummings, Hixon and Grubb Creeks noted the partial or total loss of many RHCA trees and in-stream large wood pieces as a result of the fire, and such losses were likely in Tumalum Creek as well (D. Groat, personal observation), given the extent of high severity burning experienced along those creeks and in hose subwatersheds. Pataha, Tumalum and other tributaries likely suffered some degree of loss even where moderate-severity burning predominated. Loss of in-stream wood from fire in RHCAs has likely created a net loss of floodplain connectivity in the immediate post-fire environment, and have likely altered the routing of water and sediment to an unknown degree.

Temperature and Stream Shade: Historically, for years when records are available, temperatures at the Forest boundary where Tucannon River and Cummings Creek cross fell within thermal preferences for most native fish species present in the system, prior to the fire in August 2005. Data for temperature (7-day moving average maxima) have been collected under a long-term Forest Temperature Monitoring Program. Temperature regimes have likely been reset by the School Fire, due to the extent of mortality within the two watersheds, which resulted in a substantial loss of loss of stream shade in fishbearing RHCAs, particularly in Cummings, Hixon, Grubb, Pataha, and Tumalum Creeks. Below Tumalum Creek, summertime highs in the mainstem Tucannon River typically exceeded ideal conditions for salmonids even prior to the fire (D. Groat, personal communication).

Temperature records are not available for all Tucannon watershed streams. Seven-day moving average annual maximum temperatures for some of the most important fish bearing streams in the watershed are shown in Table 3-24**.** Although downstream water temperatures often exceed 70^{o}F on State and private lands below the confluence of Tumalum Creek, stream temperatures for streams on-Forest generally have fallen within Washington State Standards and Guidelines for Class AA streams for seven-day average maximum temperatures of 64^{o}F, a standard based on Chinook salmon and steelhead thermal requirements for rearing and migration. Only temperatures on the mainstem Tucannon River at the Forest boundary have typically exceeded 64^{o}F as 7-day moving averages, based on available data.

Table 3-24 Temperature Monitoring 1992 – 2004 (7-day moving average maxima), within Tucannon Subbasin Streams

Year	Hixon Above culvert.	Cummings @ FS boundary	Tucannon @ Panjab Bridge	Little Tuc @ mouth	Little Tuc. @ 2mi. up	Tucannon @ FS boundary	Pataha @ FS boundary
1992		ND*	ND	61	59	ND	63
1993		52	ND	57	55	ND	58
1994		57	ND	61	58	ND	ND
1995		53	57	58	55	ND	58
1996		ND	57	ND	ND	ND	ND
1997	54	ND	56	58	ND	ND	ND
1998		ND	59	61	ND	ND	62
1999	58	ND	56	58	ND	ND	60
2000	57	ND	58	59	ND	ND	60
2001	57	ND	58	59	ND	ND	ND
2002	55	ND	ND	61	ND	ND	62
2003	57	ND	60	60	ND	ND	61
2004	58	57	ND	59	ND	68	ND
2005		63	ND	ND	ND	64**	ND

* ND indicates no data available.
** Data in 2005 was only recorded up to the onset of the fire and does not necessarily reflect the 7-day moving average maximum for 2005 which may have occurred in July, prior to the fire.

Passage Barriers: Several barrier culverts are present on Little Tucannon, Pataha, and Hixon Creeks. Preliminary assessments have determined that all of these culverts block fish passage to some degree (USFS, on-file), however field observations by district fish biologists indicate they do not pose full barriers to juvenile salmonids at this time (D. Groat, personal. communication).

Substrate Conditions: In 2005, Wolman pebble count data were collected in riffles within the margins of the bankful channel per Regional stream survey protocols (Table 3-25). Cobble embeddedness data were collected using a locally developed variant (D. Groat, in review) on Chapman and McLeod's 1987 protocol (Table 3-26), within the inner 2/3 of the wetted channel, in conjunction with Wolman pebble counts.

Substrate composition data were collected along the Tucannon River during August 2005, immediately before or after the fire had burned through the watershed, before any other natural events or management-related activities had opportunity to further impact the watershed (Table 3-25). These surveys were conducted using Wolman Pebble Count and published embeddedness protocols, and were taken from headwater reaches to below Cummings Creek confluence. They represent current post-fire conditions. Data in Table 3-25 are displayed progressively from the lower end of the river upstream to the head of the watershed, with tributaries indented. State and Federal land sites begin 300 feet above Cummings Creek. Current substrate conditions are comprised of anywhere from 3 percent to 35 percent surface fines, depending on location. "Fines" are defined as substrate particles < 6mm median diameter.

Substrate composition at the mainstem Tucannon sites currently consists of less than 10 percent surface fines, particularly for the majority of sites on State and NFS lands. Conditions in tributaries (sites indented in Table 3-25) often approach 20 percent surface fines where alluvial fans have developed in response to grade changes near the mouths. More than half the private land sites downstream also had fines of less than 10 percent. A representative reach on the mainstem Tucannon (site 300 feet above

Cummings confluence) has retained less than 25 percent average composition by fine sediment for more than five years based on annual re-measurements since 1995 (USFS, on file)

Tributary floodplains are generally free of barriers to flooding along stream channels. Repairs and replacements have been completed under Burned Area Emergency Response activities to culverts at risk for inadequate passage of water. Some recently created rolling dips may improve drainage affects from the current road system along Forest Road 47 within the riparian zone of the mainstem Tucannon River and at key locations in the Tumalum and Pataha Subwatersheds. Loss of in-stream wood from fire in RHCAs has likely created a net loss of floodplain connectivity in the immediate post-fire environment.

Table 3-25 Wolman's Pebble Count Survey, Tucannon Watershed August 2005, circa School Fire (wetted channel)

Site	Date	%Fines <6mm	D50*
Tucannon Marengo 400' upstream of bridge	8/15/05	13%	52.4
Cummings Creek 500' upstream of mouth	8/24/05	25%	61.6
Tucannon 300' upstream from mouth of Cummings Creek	8/23/05	6%	43.4
Tucannon upstream of Tucannon Fish Hatch Br	8/24/05	9%	111.9
Tucannon 100' above USFS boundary	8/5/05	4%	55.8
Tucannon Beaver Lake 100' downstream from footbridge	8/25/05	7%	99.3
Tucannon 100'above confluence Little Tucannon	8/5/05	6%	67.8
Little Tucannon 700' upstream of cattle guard	8/25/05	19%	97.1

* spawning gravels are classified as particles 6 mm to 62mm in diameter; cobbles are substrate particles 62-116mm in diameter. D50 describes the median particle size found in a reach of stream, i.e. 50% of particles are smaller than this size, and are considered mobile during bankful flows. This is the particle size used to describe stream reaches based on Rosgen classification terminology (Rosgen, 1996)

Cobble embeddedness was summarized in Table 3-26 for the mainstem Tucannon and some tributaries. Data in Table 3-26 are displayed in order progressing from the lower end of the river upstream to the head of the watershed, with tributaries indented. State and Federal lands sites begin 300 feet above Cummings Creek. Embeddedness data were collected simultaneously with a Wolman's Pebble count inventory on line transects within the inner 2/3 of the wetted stream channel. Particles in the 6mm to 102mm range are considered to be the preferred substrate size range for spring Chinook salmon spawning, which occurs in the fall when flows are low. Limiting substrate measurements to the inner 2/3 of the wetted channel enables evaluation of habitat available for fall-spawning fish, i.e. Chinook and bull trout. Additional substrate is available to spring spawners such as steelhead, sculpin and rainbow trout when flows are higher in the spring and the wetted width approaches bankful dimensions. Cobble embeddedness does not typically exceed 35 percent in most of the fish bearing reaches surveyed in the Tucannon River in late summer. In the mainstem Tucannon in the first two surveyed reaches, sand, cobble and gravel tend to dominate the substrate. This is expected in systems whose gradients are less than 2 percent. The dominance of small boulder and cobble substrate is common in most of the higher gradient streams in this watershed. The dominance of cobbles and small boulders in higher gradient reaches provides complex hiding cover in salmonid rearing areas. With the loss of in-channel large wood in a number of tributaries, sediment routing and storage have likely been affected to an unknown degree.

Level II stream inventories indicated that most stream systems within the watershed were stable prior to the fire. Vegetation covered most streambanks. Much of that vegetation has been lost within all of the affected subwatersheds, and floodplains are generally free of barriers to flooding along stream channels. Streambanks are more vulnerable to erosion over the winter as a consequence. Repairs and replacements have been completed under Burned Area Emergency Response activities to culverts at risk for inadequate passage of water. Some recently created rolling dips may improve drainage affects from the current road system along Forest Road 47 within the riparian zone of the mainstem Tucannon River and reduce the risk of road failure if culverts plug from new sediment inputs over the winter.

Table 3-26 Cobble Embeddedness Survey conducted within the Tucannon Watershed August 2005, circa-School Fire

		Cobble Embeddedness (%)	
Stream site	**Date**	**All particles**	**Particles 6mm - 102mm**
Tucannon Marengo 400' upstream of bridge	8/15/05	23.1	16.7
Tucannon 300' upstream from mouth of Cummings Creek	8/23/05	17.9	13.5
Cummings Creek 500' upstream of Mouth	8/24/05	21.6	14.6
Tucannon upstream of Tucannon Fish Hatch Br	8/24/05	31.3	17.2
Tucannon 100’above USFS Boundary	8/5/05	29.9	21.2
Tucannon Beaver Lake 100' downstream from footbridge	8/25/05	26.2	23.3
Tucannon 100’above confluence Little Tucannon	8/5/05	23.9	21.6
Little Tucannon 700’ upstream of cattle guard	8/25/05	36.8	34.5

Aerial erosion control mulching and seeding (BAER) occurred in fall 2005 in areas identified by the Forest BAER team as highest immediate concerns for hillslope erosion and weed control, prior to onset of winter, but resultant vegetation has not yet established itself. The mulching is currently providing ground cover on some of the most vulnerable slopes to reduce surface erosion in key locations. The majority of severely burned slopes did not receive this post-fire mulching however, and the affected subwatersheds are poised for significant surface erosion to occur during the first year post-fire in response to runoff from extreme rain-on-snow and/or intense summer thunderstorm events, should any such occur during that timeframe. Though “rain on snow” events are common within this region, the high-intensity storm events which pose the greatest risk are rare. The erosion risk from such events will gradually decline as groundcover re-establishes but the risk will remain elevated for the next 3-5 years by which time ground cover is expected to return to essentially pre-fire levels.

Chemical Contamination/Nutrients: - The Upper Tucannon River and Upper Pataha watersheds are believed to be in near natural condition with respect to chemical contaminants. None of the streams in these watersheds have been listed for chemical contaminants. During Forest Service water sampling, spot checks have been made for fecal coliform and other pollutants, which have not been found. Pollutants have been noted in the Tucannon River on private lands downstream of Pataha Creek confluence.

ENVIRONMENTAL CONSEQUENCES

Alternative A – No Action

Under this alternative, none of the management activities proposed in the School Fire Salvage Recovery Project would be implemented. No vegetation management actions (salvage timber harvest, tree planting, and fuel treatments) or associated activities would be performed, including decommissioning of existing unauthorized roads.

Fish Habitat

Biological and ecosystem functions and processes would continue to affect fish habitat quantity and quality in the absence of new management activity within the affected subwatersheds. Indicators selected to evaluate fish habitat quantity and quality include Large Wood frequencies, pool frequencies, substrate conditions in terms of cobble embeddedness and substrate composition, fish passage, water temperatures and chemical contaminants. Rates and directions of change in individual fish habitat indicators are likely to vary with location, scale and with time passed since the fire. Direct effects to fish habitat are those that would occur in fishbearing reaches at the same time as the causative factor. Indirect effects to fish habitat are those that would occur at a later time or result from a distant causal factor. In this case, direct and indirect effects to fish habitat would come from post-disturbance natural climatic events and ecological processes, and their interactions with post-disturbance landscape features.

Direct/ Indirect Effects – Large Wood Frequencies – Alternative A:

The Tucannon River and Little Tucannon River floodplains experienced lower burn severity and less mortality than experienced within most tributary RHCAs. Other streams within School Fire perimeter experienced 70-100 percent tree mortality for most of their length, based on silvicultural modeling of expected mortality.

Areas of high tree mortality (defined as >70 percent stand mortality) include delayed mortality anticipated within the next 5 years, based on the project silviculturist's analysis (on file). Fire-injured true firs are likely to fall within 3-4 years post-injury, while seriously injured large pines may take longer to fall, given that they may not die for up to 5 years post-injury. Thus a pulse of large wood recruitment is likely to extend over 5-15 years and will likely result in a net increase in large wood in both fishbearing and non-fishbearing streams. Non-fishbearing reaches are even more likely to capture and accumulate Large Wood than wider fish-bearing reaches. Relatively greater amounts of large wood can hang up in narrower drainages where smaller peak flows are less able to mobilize and transport wood downstream to fishbearing reaches.

Some large wood inputs will initially serve to simply replace pieces lost from the fire, so that there may be a short time lag before large wood frequencies increase above pre-fire levels even in the near-term (Berg et al. 2000). Net increases in large wood initially recruited to fishbearing streams will likely be greatest in Hixon, Grubb, Cummings, Tumalum, and Pataha creeks which all experienced 70 percent or greater projected tree mortality in most reaches affected by the fire. The felling of 40 large snags into fishbearing portions of Cummings Creek in fall 2005 was a post-fire effort to partially replace instream wood lost in the fire, and represents accelerated large wood recruitment relative to natural fire-recovery rates.

Fire effects in the Tucannon floodplain (within 300 feet of the channel) were not as severe as in forested stands on surrounding hillslopes. Moderate burn severities in the floodplain predominantly occurred from below Big Four Lake downstream to the Forest boundary. The majority of the floodplain, extending from below Big Four Lake upstream to Panjab confluence, remained unburned or experienced low severity fire. Floodplain mortality within 300 feet of the river was somewhat patchy, particularly upstream of Big Four Lake, where some areas of the floodplain experienced low mortality as well as limited burn severity. Large wood may be recruited directly to the Tucannon River from the floodplain or indirectly from wood delivered from upstream tributaries, but net accumulations are unlikely unless pieces recruited are greater than 23-inches in diameter at their points of contact with the channel (Beechie et al. 2000). Pieces this size or larger stand the greatest chance of providing stable points for development of wood jams and pools in streams the size of the Tucannon, based on equations discussed by Beechie et al. (2000). Groat (2005) noted that some, though not all, 20-inch diameter (measured at the small end) pieces of large wood in the Tucannon River moved downstream with high flows in 1996, which were estimated to be 25-year flood events (Clifton 1999). The majority of the potential wood recruitment zone for the river is located on state lands on the valley floor and moderate-severity burning effects in portions of the floodplain suggests that recruitment of suitably-sized wood could occur, though no post-fire inventory of wood available for recruitment has been done, and the potential for recruitment over the next 5-15 years is unknown. Whether large wood frequencies will increase in the Tucannon River as a result of the fire is an unknown, and will depend on the magnitude and frequency of subsequent peak flows and upon the extent of mortality and recruitment of stable pool-forming single pieces.

The potential for increased peak flows would depend upon the intensity of precipitation and snowmelt rates relative to infiltration capacity, which cannot be easily predicted beforehand (hydrology report, on file). In the event that above-average peak flows occur, large wood pieces that would remain stable at normal bankful flows are much more likely to become mobile and to be transported downstream. The largest pieces of large wood recruited will be the most likely to remain as stable pool-forming structures for the longer term (Murphy and Koski 1998; cited in Rosenfeld and Huato 2003). A gap in recruitment of large wood would follow the initial pulse recruitment and would likely persist for several decades until reinitiated stands develop to the point at which new net recruitment of pool-forming large wood begins.

Regrowth of stands is likely to be slow in severely burned RHCAs where soil seedbanks were most likely eliminated and would also likely be slow in RHCAs where tree mortality of overstory trees was 70 percent or greater, though some residual trees may survive to produce seed in those areas. Reaches which burned at low-to-moderate severity are likely to recover forested conditions more quickly from residual seed-producing trees and/or residual seed banks. A new phase of large wood recruitment would begin once new stands grow to a size where individual trees in RHCAs become large enough to meet large wood criteria and begin dying. There may be a time lag before rates of fresh recruitment exceed natural rates of loss of large wood from decay and transport (Beechie et al. 2000; Young, 1994, cited in Beechie et al. 2000).

Beechie et al. (2000) calculated that net recruitment of pool-forming sizes of large wood from the riparian zone may not begin for 30 years after clearcutting, in channels smaller than 16 feet bankful width in western Oregon, based on growth rates for Douglas-fir. Rosenfeld and Huato (2003) determined that pieces 12-23 inches in diameter are somewhat effective (20-40 percent chance) at forming pools in channels that size. Net recruitment of large wood from reinitiated stands may take longer than 30 years in Tucannon tributaries of similar size (Cummings, Tumalum, Hixon, and Grubb Creeks), due to a dryer climate and slower growth rates relative to western Oregon. Based on their work and for similar reasons, net increases in recruitment of pool-forming sizes of large wood may require more than 30-40 years on wider stream reaches such as the two lower reaches of Pataha Creek which have bankful widths of 16-32 feet. The most effective sizes for recruitment to channels that size would be pieces at least 23 inches in diameter, with 12-23 inch pieces generally posing less than 20 percent chance of pool-formation in channels that size (Rosenfeld and Huato 2003).

Cumulative Effects - Large Wood Frequencies – Alternative A:

Land management activities conducted through fall 2005 and their relation to current or future fish habitat conditions in the School Fire area have been discussed previously, including pre-fire grazing on the Pomeroy Allotment, past timber management, BAER activities, wildfire suppression, and road management activities. This discussion focuses on those activities currently ongoing or expected to occur within five years post-fire. (This statement applies to all subsequent fisheries cumulative effects analysis).

Post-fire salvage harvest on 2,636 acres of state lands along the Tucannon River, Cummings Creek and Tumalum Creek is actively removing fire-killed trees at the present time. The relative amount of harvest by the state that would occur in each drainage is unknown. Danger tree felling and salvage logging of the Tucannon floodplain and along Cummings and Tumalum creeks by the State of Washington may remove some large wood that otherwise potentially could be recruited from the outer edge of the recruitment zones. Within 200 feet of the Tucannon River and Cummings Creek and within 100 feet of Tumalum Creek, most fire-killed trees would remain available for recruitment of large wood, but net recruitment, particularly to the river, would likely be measurably reduced by removal of the 16-foot long butt logs of danger trees, as allowed by state contracts. The butt log is the largest diameter portion of the tree. Its unavailability for recruitment reduces the potential for recruitment of large wood capable of pool-formation, particularly to the river. The upper portions of danger trees would still be left for recruitment, but residual dimensions are much less likely to be large enough to form pools in the Tucannon. Private land harvest along Pataha Creek and its tributaries below the Forest would have similar effects to state harvest in Cummings Creek.

Riparian plantings in Cummings, Tumalum, Grubb and Hixon Creeks would accelerate redevelopment of forested riparian zones, reducing the timespan between post-fire recruitment and renewed recruitment of large wood from regrown stands decades in the future.

Other ongoing and reasonably foreseeable activities such as recreational use of the Stevens Ridge ATV complex, upland reforestation, culvert removals, and road decommissioning, are unlikely to influence large wood frequencies in either the short or long-terms because they would not enter RHCAs, and/or are not expected to retard development of future sources of large wood.

Direct/Indirect Effects – Substrate Conditions – Alternative A:

Greatly increased volumes of fine sediment may enter the drainage network over the next two years, whether directly to fishbearing reaches or indirectly through delivery to upstream non-fishbearing reaches. Surface erosion, primarily from steep severely burned slopes and secondarily from the road network, is expected to be the dominant process for immediate sediment delivery to stream channels during the first two years post-fire. Only stream channels at the base of severely burned steep slopes or at road crossings are likely to be directly impacted by immediate delivery of eroded material from these two sources. Both sources could easily increase sediment delivery by an order of magnitude above respective pre-fire erosion rates in the event of intense storms during that initial period, based on the project hydrologists' WEPP Modeling (Appendix I) and analysis. Thereafter, needle cast from dead and dying trees, regrowth of surviving vegetation, and establishment of new vegetation from residual seedbanks are expected to restore protective ground cover to pre-fire levels and erosion rates are expected to drop once more to pre-fire rates (hydrology report and WEPP Modeling Appendix I). The risk of sediment delivery to stream channels from surface erosion is expected to decline as erosion rates drop to pre-fire levels.

Fishbearing reaches of Tumalum Creek below the Forest boundary bear the greatest direct risk of increased sediment delivery from surface erosion in the near term, based on proximity of severely burned hillslopes and riparian zones. Fishbearing portions of Cummings Creek, Hixon, and Grubb Creeks also likely to be directly impacted for similar reasons. Risk of substrate impacts from direct sediment delivery to fishbearing reaches of Pataha Creek and the Tucannon River is relatively low in comparison due to limited presence of severely burned hillslopes adjacent to the channels. Post-fire BAER seeding was done on approximately 250 moderately burned acres of the Tucannon River floodplain, as well as on 200 severely burned acres of the bottoms of Cummings Creek and a major non-fishbearing tributary on and below the Forest. Seeding was also done on severely burned slopes above Tumalum Creek on-Forest. By the second year post-fire, these seedings would reduce potential for floodplain and hillslope erosion and consequently reduce the risk of direct or indirect sediment effects to substrate in fishbearing reaches of Cummings Creek and the Tucannon River. The seeding would also reduce risk of direct effects to substrate in fishbearing portions of Tumalum Creek on-Forest.

The greatest risk for indirect sediment effects to fishbearing reaches would come from severely burned hillslope delivery to non-fishbearing perennial and intermittent channels upstream. These effects are most likely to occur in the Little Tucannon and Cummings Creek subwatersheds (hydrology report and WEPP Modeling Appendix I). Post-fire BAER seeding, particularly the second year post-fire, would somewhat reduce the risk of indirect sediment delivery to fish-bearing reaches of Hixon, Grubb, Cummings and Tumalum Creeks, as well as to the Tucannon River. Fishbearing reaches of Pataha Creek below the Forest boundary are likely to experience increased cobble embeddedness and increased proportions of fine particles in the streambed as an indirect effect of sediment delivery from severely burned headwater tributaries below the Forest boundary which received neither BAER seeding nor mulching treatments. On-Forest, the Pataha Headwaters subwatershed experienced little high-severity fire. Increases in sediment delivery to Pataha Creek from severely burned slopes on-Forest are therefore likely to be limited relative to increases that may occur in subwatersheds which were more affected by the fire.

Most crossings associated with the existing road network occur in non-fishbearing perennial or intermittent channels on upper slopes. Indirect effects from road-related sediment delivery are most likely to occur in Pataha and Tumalum creeks and the Tucannon River due to the number of road crossings of headwater streams in burned portions of their respective subwatersheds. The greatest potential for near-term indirect sediment delivery from the road network comes from the drainage ditch alongside Forest road 47, which intercepts severely burned hillsides in close proximity to the Tucannon River. Direct sediment delivery from the road network is most likely to occur in the vicinity of road crossings of fish bearing reaches. The majority of such crossings are located on Cummings, Pataha, and Hixon Creeks.

Drain dips constructed since the fire have reduced the risk of road failures at stream crossings in the event that culverts plug from inability to pass large amounts of sediment and wood, as could occur with shallow debris flows originating upstream. Drain dips would facilitate the passage of water, instream sediment and debris over the road during high run-off events thus minimizing the risk of road failures into stream channels at crossings. Cleanout of sediment traps has reduced the potential for surface erosion from road surfaces to be carried through drainage ditches to stream crossings. These actions would reduce risk of indirect delivery of sediment to Pataha Creek, and will reduce risk of direct delivery of sediment to Grubb and Hixon Creeks.

Though posing relatively a smaller degree of risk to fish habitat, there is some potential for mass-wasting in the form of debris slides down intermittent and perennial non-fishbearing tributaries below the 4,000-foot elevation, in the event of high-intensity rain-on-snow events, based on past occurrences in the Little Tucannon and Tumalum subwatersheds in 1996. The probability of occurrence is uncertain but would potentially be highest during the first two years following the fire, in that most previous slides in the Upper Tucannon watershed have originated on naturally non-timbered hillslopes. Any sediment delivered directly to fish-bearing habitat from such sources would likely consist of a mixture of fine and coarse sediment, including spawning-sized gravels. Headwater intermittent and non-fishbearing perennial channels above 4,000 feet are unlikely to experience debris slides due to the low probability of high-intensity rain-on-snow events above that elevation.

Debris flow runout may deliver mixtures of both coarse and fine sediments either directly or indirectly to fish-bearing reaches, depending upon proximity to fishbearing reaches, the gradient at the tributary confluence, length of the runout, and the potential for prior interception of the runout by road segments crossing or adjoining the channel. Debris slides typically also accelerate delivery of large wood to stream channels, where it can increase channel bed roughness, reduce stream energy, and facilitate storage of fine sediment. Slides that occur more than two years post-fire could transport fire-killed trees from intermittent draws to perennial streams once the trees have lost their root strength, which may not occur for up to 10 years post-fire (Rieman and Clayton 1997; Wondzell and King 2003).

Accelerated streambank erosion may function as an additional source of fine sediment and larger particles delivered to the drainage network in both the short and long terms, whether directly to fishbearing reaches or indirectly through delivery to upstream non-fishbearing reaches. Streambank stability provided by tree rooting strength prior to the fire may be affected for a long period in RHCAs where high tree mortality (>70 percent mortality) occurred. Streambanks in tributaries carry extended risk of erosion in part due to the potential for higher peak flows in smaller drainages burned by the fire in the short-term, and would be more vulnerable to bank erosion from average flows in the long-term, until new stands regrow and are able to again provide streambank stability comparable to pre-fire levels. Large wood felled into severely burned segments of Cummings Creek in fall 2005 will help during the first year post-fire to stabilize and protect streambanks by reducing stream energy. Post-fire planting of 5,000 riparian shrubs and trees along Cummings Creek in fall 2005 will accelerate recovery of bank stabilizing woody vegetation in the long-term.

Loss of large wood in the fire would in the near-term facilitate the release of in-channel sediments previously stored behind or near these obstructions which created localized microsites for deposition. Sediments thus released would begin to move downstream at variable rates to new sites of deposition. Among fishbearing streams, this process is likely to occur in Tumalum, Hixon, Grubb, and Cummings Creeks where burn severities were high and most organic material was consumed even in the stream bottoms. The replacement of fire-damaged large wood pieces has already begun in Cummings Creek with BAER activities which resulted in 40 trees being felled into Cummings Creek in fall 2005 to help capture and store sediments released from channel storage sites associated with large wood lost in the fire. The recruitment of large wood through BAER activities will help during the first year post-fire to store and route sediment moving into and down the creek from exposed roads and severely burned hillslopes, as well as sediment remobilized from the streambed. Fresh inputs of large wood may also help to retain spawning gravels (Martin 2001) that would otherwise be lost from spawning reaches.

The actual volume of sediment delivered to the drainage network in the near-term will depend on the intensity and timing of post-fire storm events during the two year window of increased landscape vulnerability. Changes in cobble embeddedness and the degree to which fine sediment comprises substrate would reflect sediment storage characteristics of the receiving reaches, as well as the timing, magnitude and spatial distribution of sediment delivered to and through the drainage network from various potential sources. Commandeur et al. (1996) found that in steep headwater tributaries (gradients > 30 percent), that logging slash created somewhat lower-gradient microsites for storage of coarse sand and larger-sized substrate while routing finer sediments downstream. Fresh inputs of large wood over the next several years are likely to create many new in-channel storage sites for sediment throughout the affected subwatersheds, once new inputs exceed levels that simply replace large wood lost in the fire. Fire-derived sediments captured in non-fishbearing streams in the upper portions of the subwatersheds would gradually work their way downstream to fishbearing reaches over time, but the greater the channel complexity and localized storage capacity created by large wood inputs in upstream areas, the longer sediments are likely to be stored in upstream locations and downstream delivery rates to be moderated.

Once delivered to the stream network, fire-generated pulses of sediment are likely to be carried downstream either as suspended fine sediment (including ash), a portion of which may pass downstream out of the Upper Tucannon and Pataha watersheds relatively quickly, or as sand and larger-grained suspended sediment and bedload. These larger materials would potentially require decades for complete transport from the watersheds (NCASI 1999), due to potential for interim in-channel storage among larger substrate particles in the streambed and behind channel obstructions such as large wood. Fine sediments including sand particles would be gradually released from these transitory storage sites through complex instream processes of sediment transport.

As the initial pulse of large wood deteriorates over the long-term, a cycle would begin again in which stored sediments behind these obstructions would be released downstream. Once a gap in large wood recruitment begins, in-channel sediment storage would gradually decrease until new large wood recruitment again rebuilds in-channel storage capacity for sediment.

Suspended sediment studies done by the Forest's hydrology program, indicate that storage of suspended sediment occurs in the channel and/or floodplain of the Tucannon River between Panjab Creek and the Forest boundary (WEPP Modeling Appendix I). Such reaches are depositional by virtue of their low-gradient character (<2 percent gradient) (Montgomery and Buffington 1993). These depositional reaches will likely still gradually lose fire-generated fines over a period of time once steeper reaches upstream have fully flushed their loads of fire-generated fine sediments, which will take anywhere from years to decades (NCASI 1999). In high-gradient channels like much of Cummings Creek (> 5 percent), upper Hixon Creek (. 4 percent), and Grubb Creek (9 percent) fine sediments delivered to the channels, unless retained by large wood in upstream locations, are likely to be flushed downstream quickly to the river and floodplain where they may accumulate.

Cumulative Effects - Substrate Conditions – Alternative A:

The risk of surface erosion from burned hillslopes is expected to decline to pre-fire levels by the third year post-fire. Reforesting 410 acres of uplands in the Willow Springs Roadless Area is unlikely to measurably reduce risk of soil erosion within that timeframe. Surface erosion from the existing road network is also expected to decline to pre-fire levels by the third year post-fire. During the post-fire period of instability, a culvert would be removed from the ditchline of the road adjacent to Grubb Creek. Removal of this culvert would reduce the risk of the culvert plugging and causing a road failure into Grubb Creek, reducing risk of inputs from the road network. There are no reasonably foreseeable road decommissioning efforts associated with this alternative so once restabilized to pre-fire levels, chronic inputs would remain elevated above background levels associated with comparable unroaded conditions. The Stevens Ridge ATV Complex established in 2005, uses existing roads on ridgetops and continued use is not expected to contribute sediment to the drainage network at rates higher than existed prior to the fire. Removal of the Hixon Creek culvert would likely contribute some short-term sediment to the spawning reach downstream. Removal of this culvert would eliminate a potential barrier to sediment transport from upper Hixon Creek to the Tucannon River, and would reduce the long-term risk of road failure into the channel in the event of the culvert plugging from sediment delivery from upstream reaches. Removal of an in-channel culvert and an adjacent in-ditch culvert in the head of Grubb Creek similarly removes potential for road failure into a fishbearing section of that creek.

The Pomeroy Allotment within the School Fire Salvage Recovery project area would not be grazed in 2006, during which time data from observational survey plots will be collected and used to determine when soils and vegetation are sufficiently recovered to withstand renewed grazing without detrimental impacts to the watershed or fish habitat. Renewal of grazing activity in 2007 or later, will be contingent upon interdisciplinary review and assessment of the plot data from 2006.

Riparian planting of 35,000 or more native shrub and tree seedlings in Grubb, Hixon, Tumalum, and Cummings creeks in 2006 would potentially accelerate streambank recovery and stabilization by up to five years relative to natural recovery rates for riparian shrub species. Dwire et al. (2004) found that 10 percent of burned riparian shrubs did not survive a moderate-to-high severity fire in western Wyoming, and that nearly 25 percent of the resprouting riparian shrubs that did survive, did not begin regrowth for 3-4 years following the fire. New plantings would have little effect on streambank erosion during the first

5 years post-fire due to limited rootmass, but would reduce streambank erosion in the long-term by accelerating recovery of bank-stabilizing woody vegetation as planted stock begins to grow and develop significant root mass, and as recruitment of additional shrubs begins later through root suckering, clonal growth or seed production as planted stock matures.

BAER seeding and mulching in Little Tucannon, Cummings, and Tumalum Creek subwatersheds are expected to slightly reduce the risk of hillslope erosion during the first two years post-fire, until other protective surface cover redevelops. Only 5 percent of the entire fire area was seeded, and seeding and mulching treatments are only expected to result in 60 percent reduction of potential erosion on treated areas (Clifton, personal communication).

Ongoing salvage logging of state and planned salvage logging of private lands are subject to Best Management Practices (BMPs) required by the state, including cessation of log haul under exceptionally wet conditions that would cause road surfaces to deteriorate. Other measures would also be employed to minimize soil erosion and sediment delivery, including specifications for logging systems and other operational limitations. Most work is being done by helicopter to minimize soil erosion relative to background post-fire levels. Riparian Management Zone (RMZ) widths, particularly along the Tucannon River should be sufficient to maintain sediment-filtering functions, especially since burning was not severe, the valley floor is relatively flat, overland flow is unlikely, and ground cover is still present and functioning to varying degrees. Whatever sediment is delivered to the river directly from the floodplain or indirectly from state land logging in Cummings Creek or Tumalum Creek, is likely to accumulate for a time in the low-gradient depositional reaches of the river, until the fire-generated supply of sediment from steeper tributaries is finally depleted and net transport begins to deplete excess sediments accumulated in the riverbed.

In summary, substrate conditions resulting from cumulative effects of past, present, and future management activities would be dominated by the effects of the fire, and secondarily by the existing road system. Other foreseeable activities are not expected to measurably contribute to accumulations of fine sediment in fishbearing reaches, whether directly or indirectly. Reductions in sediment inputs would be expected in the long-term as a consequence of proactive BAER-instigated road maintenance at stream crossings since the fire, and as a consequence of riparian woody plantings. Changes in sediment delivery would not likely be detectable at subwatershed-scale, and cumulative effects of management actions would likely be indistinguishable from fire effects in terms of net changes in embeddedness or fine substrate composition at established monitoring sites.

Direct/Indirect Effects - Pool Frequencies – Alternative A:

The magnitudes and rates of change in pool frequencies within the fire area will depend in part on the gradient, channel size and morphology of the affected stream reaches, in part on the timing and magnitude of pool-forming large wood and sediment inputs and in part on the interaction of these factors with annual hydrographs for each stream. Pools are formed and maintained through dynamic complex interactions between instream large wood, flow regimes and sediment supply at both local and reach scales. As discussed in the Hydrology/Water Quality section, annual water yields in fish-bearing tributaries to the Tucannon River within the School Fire area are likely to be greater than pre-fire norms due to the magnitude of tree mortality, particularly in Cummings and Tumalum creeks. The duration of increased water yields will depend on the redevelopment of plant cover and its composition.

As also noted in the Hydrology/Water Quality section, the greatest increases in soil-water content often occur in the second year after a fire, and correspond to reduced evapotranspiration rates which result from losses of vegetation in wildfires. These increases in soil-water content render soils less able to accommodate additional infiltration from rainstorms, and can potentially result in higher than normal levels of overland flow. Sediment inputs are likely to be highest within the first two years post-fire, while fresh inputs of large wood are likely to occur over a 5-15 year period, replacing pieces lost from the fire and eventually resulting in net increases in large wood relative to pre-fire conditions. Pool frequencies and locations at the reach scale may be dynamic for a period of years as large wood is lost and recruited, and sediment pulses are delivered and routed through the drainage network. Rieman et al. (1997) observed existing pools filled by sediment as well as new pools created through channel interactions with new inputs of large wood, following wildfires and hydrologic events in the Boise River basin.

To the extent that pre-fire large wood pieces burned and have become non-functional, particularly in severely burned stream reaches, pools may be temporarily lost as fire-damage wood pieces become unstable or too short to maintain pools they had previously maintained through localized streambed scour. New wood inputs may serve initially to replace lost pieces. These new wood inputs would interact with peak flows and available substrate to create and maintain new pools to replace pools that are lost, and once net increases in large wood have been achieved, net increases in pool frequencies are likely to result at stream-scale in fish-bearing tributaries and possibly at watershed-scale.

Rosenfeld and Huato (2003) found that wood pieces larger than 23-inches in diameter created a proportionately greater number of pools in channels up to 32 feet wide. Wood pieces 12-23-inches in diameter are somewhat capable of forming pools in channels up to 16-feet wide, generally losing their effectiveness as channel widths increased above that point. Pataha Creek, with reaches wider than 16 feet at bankful, is most likely to see increases in pool frequencies in the middle reaches where a C1-Designated Old Growth stand extended into the RHCA and experienced high mortality, with high probability that 23-inch trees were killed. It is likely that little of the large wood present prior to the fire on-Forest along Pataha Creek was lost, since burn severity in the Pataha RHCA on-Forest was low or did not occur. Net recruitment of large wood, with subsequent increases in pool frequencies, is likely to occur in Pataha Creek quickly relative to other tributaries such as Tumalum and Cummings Creek where the majority of fishbearing reaches were affected by moderate and high severity fire both on and off Forest. Pool frequencies may initially decline due to initial losses of large wood from the fire in these two streams, but are expected to increase above pre-fire levels as fire-killed trees (12-23 inches in diameter) fall and eventually exceed pre-fire levels. Tucannon River may see some increases in pool frequencies as well, depending on the degree to which large trees (>23 inches diameter) were killed on the floodplain. Only the first reach of the Tucannon River was affected by moderate severity fire. This would have been the only area of the river itself where large wood frequencies may have initially declined due to the fire. Mortality was not estimated or mapped for state and private lands as it was on-Forest, and the potential for recruitment of pool-forming sizes of large wood to the river is unknown.

Pool frequencies in steeper streams (>4 percent gradient) tend to be less strongly correlated with the presence of single pieces of large wood than in streams with lower gradients, even so, pool frequencies show some positive correlation in steeper streams (>4 percent gradient) with the presence of wood jams (Rosenfeld and Huato, 2003). Single pieces are most likely to form pools in lower-gradient reaches within the fire area: Pataha Creek, the two affected reaches of Tucannon River, and in Reach 1 of Hixon Creek below the problem culvert. As wood jams accumulate in steeper, narrower tributaries, particularly in Tumalum (on-Forest), Cummings, Grubb, and upper Hixon Creeks, pool frequencies can be expected to increase as jams interact with stream flow, creating locally complex patterns of stream flow and velocity, with associated complex patterns of localized substrate scour and deposition. Depending upon the magnitude of local sediment supply relative to the volume of wood available to create storage sites, as well as on flow available to transport and sort those inputs, steeper gradient fishbearing reaches may for periods of time experience aggradation despite gradients that would normally serve to transport new sediment inputs through and downstream to more typical depositional reaches (Montgomery and

Buffington 1993). Where such aggradation occurs, pool frequencies may decline until the excess load of sediment is routed through and a more normal channel gradient is restored in the reach.

Increased wood frequencies in intermittent segments of Tumalum Creek below the Forest boundary are unlikely to contribute measurably to year-round pools within the first 5 years post-fire due to the coarse nature of the current streambed. In the long-term, measurably increased inputs of wood could help scour new pools, slow water velocities in the spring when surface flow is present, and allow smaller sizes of sediment to be stored in the intermittent segments of channel, and help provide cover for fish exposed in residual pools in an intermittent streambed during summer low flows. With reduced evapotranspiration rates until forest cover fully returns, more flow may become available during the summer months. With increased storage of fine sediments and gravels, surface flow may eventually remain present longer into the summer and any net increases in pool habitat would potentially become available longer into the summer as well.

Cumulative Effects - Pool Frequencies – Alternative A:

Danger tree felling and salvage logging of the Tucannon floodplain and along Cummings and Tumalum creeks by the State of Washington may remove some pool-forming pieces of large wood that otherwise potentially could be recruited from the outer edge of the recruitment zone. Within 200 feet of the River and Cummings Creek and within 100 feet of Tumalum Creek, most fire-killed trees would remain available for recruitment of large wood, but net recruitment, particularly to the river, would likely be measurably reduced by removal of the 16-foot long butt logs of danger trees, as allowed by the state contracts. The butt log is the largest diameter portion of the tree. Its unavailability for recruitment significantly reduces the potential for recruitment of large wood capable of pool-formation, particularly in the river. The upper portions of danger trees would still be left for recruitment, but residual dimensions are much less likely to be large enough to form pools, especially in the Tucannon. Harvest of the outer 2/3 of the potential recruitment zone along Tumalum Creek could retard recovery of pool habitat in the intermittent section of channel by removing potential large wood that would otherwise be available to create pools, store fine sediment and indirectly help restore surface flows. Private land harvest along Pataha Creek and its tributaries below the Forest would have similar effects to state harvest in Cummings Creek.

Riparian plantings in Cummings, Tumalum, Grubb, and Hixon Creeks would accelerate redevelopment of forested riparian zones, reducing the time span between post-fire recruitment and renewed recruitment of large wood from regrown stands decades in the future. Pool formation and maintenance would benefit to an unknown degree by the reduced span of time between periods of large wood recruitment.

Other authorized federal management activities ongoing within the affected subwatersheds, with the exception of grazing, would continue to affect pool frequencies indirectly at pre-fire levels, the effects of which are reflected in current habitat conditions and trends based on factors discussed in the current condition portion of this report. Other reasonably foreseeable activities are unlikely to influence pool frequencies in either the short or long terms, since they are unlikely to add measurably to sediment loads that would fill pools, are unlikely to affect current or future recruitment of pool-forming large wood to stream channels, and are unlikely to alter magnitude or timing of peak flows in future due to the limited acceleration of forest recovery.

Direct/Indirect Effects - Fish Passage – Alternative A:

Pataha and Hixon Creek culverts were previously identified as being partial barriers to fish passage. Sudden increases in sediment loads upstream, in particular any mass-wasting that delivers quantities of coarse sediment as well as fine sediment to the channel may cause one or more of these culverts to plug. Fish passage conditions at those particular culverts could temporarily deteriorate until routine road maintenance activities clear fresh obstructions which would be detected through road patrols typically conducted following severe storm events.

With the possibility of increased peak flows and anticipated increased surface erosion from burned hillslopes (Hydrology/Water Quality section and WEPP Modeling Appendix I), and the potential for storm-triggered mass wasting processes within or to channels, large volumes of sediment may be routed into roadside ditches or stream channels at road crossings. Locations where passage is most at risk from culvert plugging, would be those culverts on fishbearing streams which have been previously identified as partial barriers within the affected subwatersheds, two on Pataha Creek near the Forest boundary, one on lower Hixon Creek. Another at-risk culvert has been identified in the Pataha Headwaters subwatershed, one where a drain dip was constructed post-fire, on mainstem Pataha Creek, based on concerns for blockage. The increased risk of passage conditions deteriorating would persist for a couple years, after which risk would return to pre-fire levels of probability.

Cumulative Effects - Fish Passage – Alternative A:

The culvert on Hixon Creek would likely be removed within the next 5 years, removing a management-created barrier. Because the channel was previously rerouted and forms an unnatural angle at the same place as a significant gradient change, this location may still create a natural area for significant in-channel deposition and passage problems in the long-term, which would need to be monitored periodically.

An in-channel culvert near the head of Grubb Creek would be removed in the near-future. Fish distribution presently ends below this culvert, which may be a natural limitation, based on gradient. Removal may allow for extension of the population upstream to a minor degree. The passage benefit would be minor, in that stream gradient upstream of the culvert is in excess of 9 percent and provides marginal fish habitat benefits.

Other ongoing and reasonably foreseeable activities are unlikely to influence fish passage in either the short or long-terms. They are not expected to alter channel stability or impact sites identified as prone to mass wasting by removing ground-stabilizing live vegetation or increasing surface runoff. Neither are they expected to significantly contribute additional fine sediment to stream channels from surface erosion or by altering channel morphologies and sediment-routing characteristics.

Direct/Indirect Effects – Water Temperature – Alternative A:

High losses (>70 percent) of live trees in RHCAs would negatively affect stream shade and summer water temperatures in fishbearing streams for decades. Summer temperatures, specifically in Cummings Creek, upper Hixon, Grubb, Tumalum and Pataha creeks, would likely remain elevated until stream-shading vegetation re-establishes and grows to heights and densities sufficient to restore pre-fire shade levels with associated reductions in water temperature. Hardwood shrub plantings completed last fall would somewhat accelerate the recovery of stream shade and water temperatures in Cummings Creek. Temperature recovery in other fishbearing tributaries would occur at natural rates and would necessarily rely on resprouting of tall riparian hardwood species where they survived the fire, and upon establishment of new conifer and hardwood seedlings from residual seedbanks in RHCA segments that did not burn completely down to bare mineral soil. Though the presence of a residual seedbank and survival of resprouting riparian hardwoods is unlikely in severely burned reaches of Tumalum Creek, re-establishment of woody vegetation along Pataha Creek is likely to progress more quickly, since burn severity in the RHCA was moderate for the most part, and seed sources may remain beneath the charred surfaces of the organic layers that remain, as may unburned root crowns of hardwoods with resprouting capabilities.

As already exhibited in Cummings Creek immediately post-fire, the School Fire will indirectly affect water temperatures for the long-term in fish-bearing tributaries of the Tucannon River due to near total loss of riparian shade, based on high tree mortality predictions modeled by the project silviculturist after the fire. Temperatures in the smaller fishbearing tributaries will likely show temperature increases as high as 5^{o}F warmer at low flow for a number of years, and may even show drops of several degrees in winter minimum temperatures due to exposure until stream-shade recovers substantially enough to influence temperatures once more. Lack of winter cover may result in formation of anchor ice in exposed reaches of the smaller fishbearing tributaries for at least the short-term.

Temperatures in the mainstem Tucannon River, due to its width, would not be measurably influenced by loss of streamside shade, but would more likely be influenced by lateral movement of the channel if it occurs, and by groundwater exchange in the floodplain which may result from increased annual water yields and potential for the two affected low-gradient reaches, to accumulate sediment and aggrade during the period of time in which fire-generated sediment is routed from the Upper Tucannon watershed.

Temperatures in the mainstem Tucannon River and on Little Tucannon River are unlikely to show measurable rises in temperature. Shade did not likely play a strong role in temperature regulation in the Tucannon River at the Forest boundary or downstream prior to the fire, based on its channel width and base flow. The RHCA of Little Tucannon River experienced relatively minor loss of stream shade from tree mortality, and only on the outer fringes of the north side of the RHCA, which will have little ability to increase water temperatures in this tributary.

Cumulative Effects-Water Temperature– Alternative A:

Riparian plantings of 35,000 shrubs and trees in Cummings, Tumalum, Grubb, and Hixon Creeks will accelerate redevelopment of forested riparian zones, reducing the time span for restoration of stream shade and lower water temperatures resulting from restored stream shade in fishbearing reaches.

Ongoing salvage logging of state and planned salvage logging of private lands are not likely to measurably influence water temperatures on the mainstem Tucannon River, despite some minor removal of streamside shade. The channel is too wide for streamside shade to influence water temperatures to any significant degree.

Grazing of the Pomeroy Allotment within the School fire area would be discontinued unless interdisciplinary review finds that soils and vegetation are sufficiently recovered to withstand this renewed activity at pre-fire levels, and determined not to retard recovery of the watershed or fish habitat. Review would be based on data collected from observational plots in 2006. Grazing activity prior to the fire was being effectively managed to avoid impacts to riparian vegetation, and post-fire grazing would continue that management strategy, which has benefited Pataha Creek since the early 1990's. Water temperatures are therefore not expected to be impacted more, or for longer than would occur during the period of time required for stream shade to recover from the fire.

Other authorized federal management activities ongoing within the affected subwatersheds, with the exception of grazing, would continue to affect water temperatures at pre-fire levels, the effects of which are reflected in current habitat conditions and trends based on factors discussed in the current condition portion of this report.

Direct/Indirect Effects – Chemical Contaminants - Alternative A:

Water quality in fishbearing streams may be detrimentally affected by naturally fluctuating concentrations of mineral nutrients (nitrates, cations, and alkalinity) comprising mineral ash released from burned vegetation, in the event that surface runoff mobilizes and delivers significant quantities of ash and surface soil layers from severely burned hillslopes directly to fishbearing streams during intense storms that may occur within the first 2-3 years post-fire, regardless of management activities that may be occurring at the time.

Cumulative Effects-Chemical Contaminants - Alternative A:
Ongoing helicopter salvage logging of state lands and planned salvage logging of private lands on the mainstem Tucannon River presents a small risk for accidental spillage of petroleum products which could enter fishbearing or non-fishbearing streams inadvertently. Best Management Practices employed by the state include having a Spill Containment and Control Plan in place, and includes ensuring fuel storage and refueling occurs in locations farther than 300 feet from the Tucannon River. Though accidental spills could happen, their significance would depend upon the volume spilled and proximity to the river. Plans and equipment are in place that would expedite cleanup of any spills and minimize the risk of any direct or indirect chemical impacts to fish habitat.

Sensitive and Listed Fish Species

Effects to fish species present in the Upper Tucannon and Pataha watersheds are considered in light of short and long-term changes in habitat conditions and local population impacts from mortality that occurred during or shortly after the fire passed through.

Direct /Indirect Effects-bull trout - Alternative A:
The bull trout metapopulation in the Upper Tucannon watershed will be directly and indirectly affected for a generation (5-7 years) or more, due to significant mortality that occurred during the fire and due to fire-induced habitat changes that for decades will continue to affect spawning and rearing habitat provided by Cummings and Hixon creeks and migratory habitat provided by the Tucannon River. Significantly concentrated influxes of ash and fine sediment delivered to streams could add to total suspended solids to a degree that would be detrimental to fish exposed to such concentrations in the water column. Fish kills have been recorded 1-2 years after wildfires, due to toxic slurries of ash and fine sediment delivered to the stream network by overland flow during post-fire storms (Rinne 1996; Rieman and Clayton 1997; Bozek and Young 1994). Hixon and Cummings Creek are potentially at risk for such slurry flows within the next 2-3 years until ground cover is re-established and soil-water content subsides with new uptake by recovering vegetation.

Some fluvial bull trout still present in the mainstem Tucannon River may have been spawned and reared in either Cummings Creek or Hixon Creek. These and exploratory individuals reared in other local Tucannon streams may recolonize or supplement any residual populations in Cummings and Hixon creeks within 2-3 years after the fire, based on studies done on streams in Idaho that were depopulated by wildfire (Burton and Jacobsen 2001; Rieman et al. 1995). Regardless of recolonization rates, Cummings Creek in particular is likely to provide marginal habitat for bull trout in the long-term due to significant increases in water temperature (>5^{o}F) which have already been documented as a result of stream shade lost to the fire. More exposed winter conditions are likely to result in supercooling (<1^{o}C) and/or chronic development of anchor ice for 20 years or more, which could potentially reduce survival of any over-wintering fish or eggs which may be present once depopulated reaches are recolonized. Individuals which repopulate reaches where most shade has been lost may have to travel more extensively in winter to find less adverse winter habitat conditions (Jacober et al. 1998) in more hospitable reaches of Cummings Creek or in Tucannon River. Substantial increases in summer-fall temperatures and potential implications of winter exposure may reduce spawning and rearing success for several generations in Cummings Creek even after the species repopulates the drainage, since summer water temperatures especially are unlikely to fully recover until reinitiated stands achieve sufficient height and density to restore stream shade to pre-fire levels.

Impacts in terms of direct mortality were likely lower in Hixon Creek than in Cummings Creek due to smaller carrying capacity particularly in upper reaches, and will likely have a lesser impact on long-term viability of the Upper Tucannon bull trout metapopulation. Post-fire changes in habitat conditions in Hixon Creek are also expected to be less critical to long-term viability of the metapopulation relative to changes in Cummings Creek due to the relative quantity of spawning and rearing habitat normally available in the two drainages. The lower reach of Hixon Creek was relatively untouched by moderate and high-severity fire, and lost negligible amounts of shade. This low-gradient reach will likely continue to provide quality spawning and rearing habitat unless substrate conditions deteriorate for a period of time due to accumulation of fine sediment delivered from higher up in the drainage. Shephard et al. (1984) found that bull trout embyo survival to emergence declined significantly at levels above 30 percent streambed fines less than 6.4 mm. Stream shade and intragravel flows will help to maintain water temperatures conducive to bull trout spawning and rearing in the lower reach, despite loss of stream shade in the upper reach. Habitat upstream of the culvert was not high quality prior to the fire, due to steep gradients, and recovery of the local bull trout population in Hixon Creek will be more contingent on the extent and duration of substrate impacts in the lower reach.

Once stream shade and water temperatures recover, long-term habitat conditions for bull trout in Cummings Creek are likely to see net improvement relative to pre-fire conditions due to increased inputs of large wood and probable increases in pool frequencies which would last for an extended period of time. While significant amounts of sediment may enter Cummings Creek from various existing potential sources in the short-term, it would be working its way downstream to and through moderate and high-gradient fishbearing reaches during the period of time in which water temperatures remain less than desirable for bull trout. Much of the fine sediment delivered to Cummings Creek early in the post-fire period would likely have passed downstream to the Tucannon River by the time shade and water temperatures in Cummings Creek recover. The local population is likely to respond positively to overall improved habitat conditions in the long-term, relative to pre-fire habitat conditions and population levels, as water temperatures recover, habitat complexity increases above pre-fire levels, and fine sediment locations and accumulations begin to reflect the normative transport and storage capabilities of the moderate and high-gradients that characterize fish-bearing reaches of Cummings Creek. Gradients in these reaches would normally facilitate passage of fine sediments downstream to low-gradient depositional reaches such as the Tucannon River.

The lower reach of Hixon Creek, with its gentle gradient, would likely continue to provide quality spawning and rearing habitat for bull trout in terms of water temperatures due to the cooling influences of intragravel flow and stream shade, unless substantial sediment delivery occurs upstream and begins to impact spawning and rearing substrate in the lower reach where deposition would naturally occur. Habitat conditions in upper Hixon Creek would remain marginal due to potential increases in sediment storage concurrent with new increases in large wood and due to potential increases in water temperature until shade recovers to pre-fire levels. So long as at least partial fish passage through the culvert continues, there is potential for bull trout to repopulate all of Hixon Creek within the next 2-3 years.

The majority of bull trout spawning and rearing in the Upper Tucannon watershed takes place upstream of the fire area, and the migration corridor of the mainstem Tucannon River remains relatively unaffected by the fire. When considered together with projected population and habitat responses in Hixon and Cummings Creek, the bull trout metapopulation in the Upper Tucannon watershed is likely to persist for the foreseeable future since the migratory corridor is relatively unaffected by the fire, a migratory life history still provides support for recolonization and the majority of spawning and rearing habitat and local populations in the watershed were not affected by the fire. Research on population responses to fire indicate that populations can actually rebound and increase following major disturbances, particularly where landslides (often triggered by floods) followed fire, resulting in creation of more complex habitats (Reeves, G.H., L.E. Benda, K.M. Burnett, P.A. Bisson, J.R. Sedell 1995). Conversely, Sestrich (2005) during a 3-year post-fire study found in severely burned reaches that, relative to unburned control reaches, abundance did not change significantly for bull trout in the three years following the 2002 fire, relative to pre-fire abundances. He also found that Young:Adult Ratios (YAR) in severely burned reaches that did not experience debris flows, remained less than 50 percent of YAR in unburned reaches during the first 3 years post-fire, although the severely burned reaches appeared to be used more by larger fish relative to fish using unburned reaches by the second and third years post-fire. Bull trout maintained a token presence in reaches impacted by debris flows, both before and after the fire. Habitat conditions in the severely burned reaches remained significantly less suitable than in the unburned reaches over the three-year period, in terms of temperature. The 7-day moving average maximum daily temperature in severely burned reaches increased from 12^{o}C to 18.5^{o}C, whereas unburned reaches remained below 15^{o}C throughout, which may explain the relatively reduced rate of reproduction in the severely burned reaches. The Tucannon metapopulation will likely be similarly affected by reduced viability in the Cummings and Hixon creek local populations until local habitat conditions recover to or become better than pre-fire conditions.

Table 3-27 is a summary of direct and indirect effects on indicators to bull trout streams.

Table 3-27 Alternative A – Direct/Indirect Effects on Indicators to bull trout streams and recovery of bull trout Critical Habitat in affected subwatersheds of Upper Tucannon and Upper Pataha Watersheds.

Indicator	**Related Recovery Limiting Factor*****	**Indicator Potential Direction of Change (by affected subwatershed)**	
		Little Tucannon (mainstem Tucannon R. and tribs.)	**Cummings**
Large Wood	NL	I	I
Pools	NL	V	V
Temperature	T	I	I
Sediment/ Substrate	S	I	I
Fish Passage	P	D (Hixon)	NC
Water chemistry (industrial chemicals)	NL	NC	NC
Increase, Variable, Decrease, No Change *****Temperature, **S**ediment, **H**abitat **Q**uantity, **H**abitat **D**iversity, **P**assage, **W**ater Chemistry. **N**on-**L**imiting			

Cumulative Effects-bull trout - Alternative A:

Past Actions: Bull trout habitat within the Little Tucannon and Cummings Creek subwatersheds has been cumulatively impacted by past management activities on NFS lands as well as on state and privately owned lands within the subwatersheds (USDA 2001). Those past management activities have included livestock grazing on the Pomeroy allotment, road construction and management, riparian and upland timber harvest, wildfire suppression and post-fire Burned Area Emergency Response (BAER) actions, as well as introductions of non-native brook trout into the Pataha Creek watershed.

The cumulative effects of these historic and recent activities on bull trout populations in the School Fire area are reviewed in the Affected Environment section of this report. More details are available in the Tucannon Ecosystem Analysis (USDA 2001).

Ongoing and Reasonably Foreseeable Actions: This section of effects analysis focuses on those activities currently ongoing or expected to occur within five years post-fire with potential to affect bull trout populations in Cummings and Hixon Creeks, and/or Tucannon River relative to post-fire conditions and trends previously discussed.

Dispersed Recreation-On-going activities such as dispersed camping, hunting, sightseeing, etc. occur year-round in the Upper Tucannon. Public firewood gathering and snowmobile use would continue to occur on NFS lands, with limited effects to bull trout in Hixon and Cummings creeks or the Tucannon River.

Firewood cutting within 300 feet of perennial streams is not allowed on the Umatilla National Forest, which helps maintain sources for large wood recruitment and pool development, and use of ground-disturbing heavy equipment by firewood cutters for log skidding is prohibited which minimizes potential for erosion and sediment delivery. These protections would support natural rates of recovery from the fire. The lower 1.5 miles of the streamside 4-wheel drive road up Cummings Creek on the Forest, was obliterated as part of BAER work in fall 2005, and eliminated drivable access to several miles of stream otherwise highly vulnerable to surface erosion from future recreational vehicle use, which would have cumulative benefits to substrate conditions in spawning and rearing habitat in Cummings Creek, supporting recovery of the local population.

Noxious weeds - Ongoing control of known populations would continue, using herbicide and manual methods in areas of infestation. Only manual methods are used in RHCAs. Use of chemicals outside of RHCAs would not create cumulative risk of chemical contamination of fish habitat or indirect effects to bull trout, due to distance from the drainage network. Control of noxious weeds wherever found in the affected subwatersheds would promote recovery of native desirable vegetation which generally possesses greater ability to control soil erosion than do noxious weeds such as yellow star thistle, the primary species of concern in uplands burned by the fire, which would help to restore sediment delivery rates from uplands to pre-fire levels, and indirectly support recovery of local bull trout populations in Hixon and Cummings Creek.

Hixon Creek culvert – This culvert would be removed, fully restoring passage in Hixon Creek in its present location to natural conditions for both the near and long-term, which would facilitate recolonization of the upper reaches in the near term and help to restore the local bull trout population. Monitoring of channel responses after culvert removal may identify a need for further restoration action to maintain passage and/or spawning habitat.

Riparian plantings – Riparian planting of several thousand shrubs and trees in Cummings and Hixon Creeks would accelerate redevelopment of stream shade and reduce the timespan for restoration of lower water temperatures suitable for bull trout. Faster recovery of stream temperatures would act synergistically to increase the habitat value of predicted increases in large wood and pools in Hixon and Cummings creeks. Replanting along these streams would also accelerate long-term recovery of bank-stabilizing vegetation, leading to reduced rates of streambank erosion and reduced amounts of fine sediment accumulation in the streambeds of these two creeks. Faster habitat recovery to pre-fire or better conditions would help recover local bull trout populations faster than otherwise by reducing the length of time that spawning and rearing success are impacted by fire-generated fine sediments and temperature problems, particularly once removal of Hixon Creek culvert has been completed and passage concerns with this culvert have been eliminated.

State Salvage Harvest - State logging operations on the Tucannon River and Cummings Creek are conditioned by provisions of the Endangered Species Act, which ensure that Designated Critical Habitat for Columbia River bull trout is not adversely modified or destroyed and that adverse effects to bull trout, if any, would be minimized.

State logging operations 200-feet from Cummings Creek and the Tucannon River are unlikely to cumulatively affect bull trout or Critical Habitat to any significant degree in either of these streams, in terms of effects to water chemistry, temperature or fish passage, given Best Management Practices and mitigations in place.

State riparian no-cut management zones of 200 feet adjacent to the Tucannon River and Cummings Creek would also allow for large wood inputs to these channels through natural processes. These inputs would be additive to benefits currently provided by the 40 trees that were felled on state lands into Cummings Creek following the fire, but input levels may be lower than without state harvest, including danger tree management, which would allow the bottom (largest) portions of danger trees to be removed by the contractor. Bull trout in Cummings Creek especially would already be challenged by long-term alterations in habitat conditions, and recovery may be inhibited to a minor degree by effects of state management on wood recruitment rates. Reduced recruitment rates for pool-forming large wood in Tucannon River and Cummings Creek may affect rearing and migratory/wintering bull trout by providing less cover and fewer areas with lower water velocity for resting.

Sediment loading of Tucannon River from state logging activity is likely to be negligible, for reasons previously given, and incremental sediment loading of Cummings Creek is also likely to be small given Best Management Practices, no-cut management zones and logging systems employed. In a high-gradient channel like Cummings Creek (>5 percent), most fine sediments delivered to the channel are likely to be flushed downstream quickly to the river. Bull trout spawning and rearing success in Cummings Creek may be affected by sediment generated by state logging to a minor degree, but the effects are likely to be indistinguishable from effects of the fire which would have a much larger ongoing impact on bull trout in Cummings Creek.

These actions are unlikely to affect other habitat parameters previously considered in this document in any way that would significantly affect bull trout in either the migratory corridor provided by Tucannon River, or in spawning and rearing habitat provided by Cummings Creek.

Grazing – Pomeroy Allotment –The current allotment affected by the fire, is under a permit that allows one permittee to run 83 cow/calf pairs on an annual basis from June 10 to October 10 on three pastures Abels, Lower Pataha, and Upper Pataha. This is a continuation of grazing management over the past 10 years, previously discussed in the Affected Environment section with regard to fish habitat conditions in Pataha Headwaters subwatershed. Grazing would not be authorized for the first year post-fire to allow time for BAER seedings to establish, residual forage species to recover vigor and soils to stabilize. Grazing would not be restored to the allotment in year two or later unless an interdisciplinary review of observational survey plots results in a finding that resumption of this grazing activity would be appropriate. Based on effects of well-managed grazing on fish habitat in Pataha Creek and Cummings Creek in the decade prior to the fire, it is unlikely that the effects of this activity, once resumed, would add cumulatively to the combined effects from School Fire on substrate conditions or pool frequencies as a result of soil erosion or streambank trampling, or that this activity would have detrimental effects on recovery of stream shade, large wood or water temperatures. Grazing would not be expected to chemically degrade water quality since livestock would not access fishbearing stream reaches in the Upper Tucannon and Pataha watersheds. Resumption of grazing the headwaters of Cummings Creek in the Pomeroy allotment is therefore not expected to cumulatively affect the local bull trout population in Cummings Creek.

Determination:
Alternative A "May Affect" Columbia River bull trout or its Designated Critical habitat through ongoing effects of the School Fire, natural recovery processes, and cumulative effects of past, present, and future activities in the Cummings Creek and Little Tucannon subwatersheds. Effects are within the range of effects discussed in literature on post-fire salvage (see literature citations for Fisheries). Effects of past, present, and reasonably foreseeable emergency actions (BAER activities) in the affected watersheds have already been consulted with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service. Reasonably foreseeable non-emergency federal actions will be consulted separately as they are further developed and analyzed in greater detail.

Direct/Indirect Effects-Snake River Spring Chinook salmon - Alternative A:

The wild Snake River Spring/summer Chinook salmon population in Upper Tucannon watershed may be affected by the fire for years, perhaps decades by habitat changes in Tucannon River between Panjab and Tumalum Creek confluences that result directly or indirectly from the fire. These reaches are characterized by naturally depositional gradients and are the most productive reaches in terms of spawning and rearing for salmon. They will likely experience increases in cobble embeddedness and proportions of fine sediment until upper drainages are finally emptied of whatever fire-generated sediments are delivered to the stream network within the first 2-3 years post-fire. Depletion of fire-generated sediments from upper drainages may take years to decades. Accumulations of fine sediment in the Tucannon River below Panjab are likely to reduce both spawning and rearing success for Tucannon River salmon, particularly once cobble embeddedness levels exceed 25-50 percent (Chapman and McLeod 1998; McDonald et al. 1991). Tappel and Bjornn (1983) found that, similar to bull trout, Chinook salmon embryo survival to emergence declined sharply at levels above 30 percent fine sediment in the streambed. Productivity is likely to remain depressed due to deteriorated substrate conditions until these fire-generated sediments are finally transported downstream of Tumalum Creek confluence and embeddedness levels drop below 25 percent once more, and/or percent fines drop to 30 percent or less.

In the long-term, as fire-generated pulses of fine sediment move through and substrate conditions improve, net gains in habitat complexity from the fire may result, relative to pre-fire conditions, depending upon the extent to which stable pieces of large wood are recruited to the river over the next 5-15 years. Net recruitment is possible, particularly in the section of channel between Big Four Lake and Rainbow Lake downstream of the Forest boundary, the section where the majority of moderate and high-mortality fire occurred within the potential recruitment zone for large wood along the river. Net accumulations of large wood would likely trigger consonant increases in pool frequencies and improved spawning gravel availability, all of which would contribute to improved productivity of the salmon population in the long-term through improved spawning and rearing success.

Table 3-28 is summary of direct and indirect effects on indicators to Snake River Spring Chinook salmon streams.

Table 3-28 Alternative A - Direct and Indirect Effects on Indicators for effects to Snake River Spring Chinook salmon streams and recovery of Critical Habitat in affected subwatersheds of Upper Tucannon and Upper Pataha Watersheds

Indicator	Related Recovery Limiting Factor**	Potential Direction of Change*
		Little Tucannon Subwatershed (mainstem Tucannon R.)
Large Wood	HD	I
Pools	HD, HQ	V
Substrate/Sediment	S, HQ	I
Passage	P	NC
Temperature	NL	NC
Water Chemistry (industrial chemicals)	NL	NC

*Increase, Variable, Decrease, No Change.
Temperature, **Sediment, Key **H**abitat **Q**uantity, **H**abitat **D**iversity, **P**assage, Non-**L**imiting.

Cumulative Effects-Chinook salmon - Alternative A:

Past Actions: Chinook salmon within Little Tucannon sub watershed have been cumulatively impacted indirectly by past management activities on NFS lands as well as on state and privately owned lands in the Upper Tucannon watershed which have cumulatively impacted their habitat. Those past management activities have included road construction and management, riparian and upland timber harvest, wildfire suppression and post-fire Burned Area Emergency Response (BAER) actions. The population has also been affected by the presence and operation of two hatcheries operating in Tucannon River. Cumulative effects of these historic and recent activities on Chinook salmon in the School Fire area are reviewed in the Affected Environment section of this report.

Ongoing and Reasonably Foreseeable Actions: This section of the effects analysis focuses on those activities currently ongoing or expected to occur within 5 years post-fire with potential to affect current Chinook salmon populations in the Tucannon River relative to post-fire conditions and trends previously discussed.

Dispersed Recreation-Ongoing activities such as dispersed camping, hunting, sightseeing, etc. occurs year-round in the Upper Tucannon. Public firewood gathering and snowmobile use will continue to occur, with limited effects to Chinook salmon in the Tucannon River. Firewood cutting within 300 feet of perennial streams is not allowed on the Umatilla National Forest, which helps maintain sources for large wood recruitment and pool development, and use of ground-disturbing heavy equipment by firewood cutters for log skidding is prohibited which minimizes potential for erosion and sediment delivery. These protections provide for natural rates of recovery from the fire.

Noxious weeds-Effects would be the same as discussed for bull trout. To the extent that reduced upland erosion translates to reduced sediment delivery to Cummings Creek, Hixon Creek, the Tucannon and Little Tucannon Rivers, spawning and rearing steelhead would benefit.

Grubb Creek culverts: These culverts would be removed, reducing the risk of significant road and ditch erosion in the event either culvert plugged, particularly the culvert in the ditchline, which would provide long-term benefits to the main Tucannon population as well as to the local population in Grubb creek as it recolonizes the stream. Removal of the upper in-channel culvert would improve access in Grubb Creek to the maximum upper limit of potential fish occupancy, for both the near and long-term, which would facilitate full potential occupancy by sculpin in the long-term.

State Salvage Harvest: Cumulative effects are the same as discussed for bull trout. These actions are unlikely to affect other habitat parameters previously considered in this document in any way that would significantly affect Chinook salmon spawning or rearing success in the Tucannon River.

Riparian plantings of several thousand shrubs and trees in Cummings, Hixon, and Grubb Creeks would accelerate long-term recovery of bank-stabilizing vegetation, leading to reduced rates of streambank erosion and reduced amounts of fine sediment accumulation in the streambeds of these three creeks. Faster habitat recovery to pre-fire or better conditions would help recover Chinook spawning and rearing habitat in the mainstem Tucannon faster than otherwise by reducing the length of time that spawning and rearing success are impacted by fire-generated fine sediments.

Grazing – Pomeroy Allotment **–** Cumulative effects are the same as discussed for bull trout. Salmon in the Tucannon River would not be affected by resumption of grazing on the Pomeroy Allotment under the conditions described.

Determination:
Alternative A “May Affect” Snake River Spring/Summer Chinook Salmon or its Designated Critical habitat through ongoing effects of the School Fire, natural recovery processes, and cumulative effects of past, present and future activities in the Cummings Creek and Little Tucannon subwatersheds. Effects are within the range of effects discussed in literature on post-fire salvage (see literature citations for Fisheries). Effects of past and present actions and reasonably foreseeable emergency actions (BAER activities) in the affected Watersheds have already been consulted with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service. Future non-emergency federal actions will be consulted separately as they are further developed and analyzed in greater detail.

Direct/Indirect Effects-Snake River steelhead (MIS) - Alternative A:

The wild Snake River steelhead population in the Upper Tucannon watershed may be affected by the fire for years, perhaps decades by habitat changes in the Tucannon River between Panjab and Tumalum Creek confluences, and/or in Cummings Creek between the river and Forest boundary, that result directly or indirectly from the fire. These reaches are characterized by naturally depositional gradients and are the most productive reaches in terms of spawning and rearing for salmon. They will likely experience increases in cobble embeddedness and proportions of fine sediment until upper drainages are finally emptied of whatever fire-generated sediments are delivered to the stream network within the first 2-3 years post-fire. Depletion of fire-generated sediments from upper drainages may take years to decades. Accumulations of fine sediment in the Tucannon River below Panjab, and/or in Cummings Creek below the Forest boundary, are likely to reduce both spawning and rearing success for Tucannon River steelhead, particularly once cobble embeddedness levels exceed 25-50 percent (Chapman and McLeod 1998; McDonald et al. 1991). Steelhead have been shown to be more sensitive to fine sediment levels than Chinook salmon (Tappel and Bjornn 1983) or bull trout (Shephard et al. 1984), both of which only show sharp declines in embryo survival to emergence when fine sediment levels exceed 30 percent fine sediment in the streambed. Spawning success is likely to remain depressed due to deteriorated substrate conditions until these fire-generated sediments are finally transported downstream of the Forest boundary and embeddedness levels drop below 25 percent and/or percent fines drop to less than 30 percent. Rearing success is also likely to be impacted as sediment levels increase in Cummings Creek below the Forest, and impacted for even longer as sediment levels rise in the Tucannon River downstream of the Forest boundary. Summer temperatures in lower Cummings Creek may become excessive with loss of stream shade, reducing value of this habitat for steelhead rearing until shade is reestablished. Temperatures in rearing areas of the Tucannon below the forest boundary may be relatively less volatile than in Cummings Creek for an extended period of time.

In the long-term, as fire-generated pulses of fine sediment move through and substrate conditions improve, net gains in habitat complexity from the fire may result, relative to pre-fire conditions, depending upon the extent to which stable pieces of large wood are recruited to the river and lower Cummings Creek over the next 5-15 years. Fire effects in the Little Tucannon River were so limited that no changes are likely to occur that would be attributable to the fire in that drainage. Net recruitment of large wood is possible, particularly in the section of the mainstem Tucannon River between Big Four Lake and Rainbow Lake downstream of the Forest boundary, and in the section of Cummings Creek below the Forest. These were the sections where the majority of moderate and high-severity fire and high mortality occurred within the potential recruitment zone for large wood in reaches most used for spawning and rearing by steelhead in the Upper Tucannon watershed. Net accumulations of large wood would likely trigger consonant increases in pool frequencies and improved spawning gravel availability, all of which would contribute to improved productivity of the steelhead population in the long-term through improved spawning and rearing success.

Table 3-29 is a summary of direct and indirect effects on indicators to Snake River summer steelhead streams.

Table 3-29 Alternative A - Direct and Indirect Effects on Indicators for effects to Snake River summer steelhead streams and recovery of Critical Habitat in affected subwatersheds of Upper Tucannon and Upper Pataha Watersheds

Indicator	Related Recovery Limiting Factor***	Potential Direction of Change (by affected subwatershed)**	
		Little Tucannon (Tucannon River/ Little Tucannon R.*)****	**Cummings**
Large Wood	HD	I/I	I
Pools	HD, HQ	V/V	V
Temperature	T	NC/I	I
Sediment/ Substrate	S	I	I
Fish Passage	P	NC/D	NC
Water chemistry (Industrial chemicals)	NL	NC/NC	NC

[a]No Critical Habitat present in Little Tucannon River.
**Increase, Variable, Decrease, No Change
*****T**emperature, **S**ediment, **H**abitat **Q**uantity, **H**abitat **D**iversity, **P**assage, **W**ater Chemistry. **N**on-**L**imiting
****Limiting Factors in Recovery Plan only apply to mainstem Tucannon River.

Cumulative Effects-Snake River steelhead (MIS) - Alternative A:

Past Actions: Steelhead within the Little Tucannon, Tumalum, Pataha and Cummings Creek subwatersheds have been cumulatively impacted indirectly by past management activities on NFS lands as well as on state and privately owned lands in the Upper Tucannon and Pataha watersheds which have cumulatively impacted their habitat. Those past management activities have included road construction and management, riparian and upland timber harvest, wildfire suppression and post-fire Burned Area Emergency Response (BAER) actions

Ongoing and Reasonably Foreseeable Actions: This section of the Effects Analysis focuses on those activities currently ongoing or expected to occur within 5 years post-fire with potential to affect current steelhead populations in the Tucannon River, Little Tucannon River, Hixon and Cummings creeks relative to post-fire conditions and trends previously discussed.

Dispersed Recreation**-** Effects would be the same as discussed for bull trout.

Noxious weeds**-** Effects would be the same as discussed for bull trout. To the extent that reduced upland erosion translates to reduced sediment delivery to Cummings Creek, Hixon Creek, the Tucannon and Little Tucannon Rivers, spawning and rearing steelhead would benefit, particularly in Cummings Creek and Tucannon River.

Grubb Creek culverts: Effects would be the same as discussed for Chinook salmon.

State Salvage Harvest: Effects would be the same as discussed for bull trout. These actions are unlikely to affect other habitat parameters previously considered in this document in any way that would significantly affect steelhead spawning or rearing success in the Tucannon River.

Grazing – Pomeroy Allotment **–** Effects would be the same as discussed for bull trout. Steelhead in the Tucannon River would not be affected by resumption of grazing on the Pomeroy allotment under the conditions described.

Determination:

Alternative A "May Affect" Snake River summer steelhead or their Designated Critical habitat through ongoing effects of the School Fire, natural recovery processes and cumulative effects of past, present, and future activities in the Cummings Creek and Little Tucannon subwatersheds. Effects of past, present actions, and reasonably foreseeable emergency actions (BAER activities) in the affected watersheds have already been consulted with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service. Future non-emergency federal actions will be consulted separately as they are further developed and analyzed in greater detail.

Direct/Indirect Effects-redband trout (MIS) - Alternative A:

The redband trout population in the Upper Tucannon watershed may be somewhat affected by the fire for years, particularly by changes in Cummings Creek, Hixon, Grubb, Tumalum and Pataha creeks that result directly or indirectly from the fire. Because Hixon, Grubb and Tumalum supported smaller populations, temporary loss or partial loss of these populations as a direct impact of the fire is not expected to be significant to the larger metapopulation, given that robust local populations remain in large upstream areas unburned by the fire, in Pataha Creek where no mortality occurred, and given that some fish remained in less severely burned reaches of Cummings, Hixon and most likely Pataha Creek as well. The capacity for resident progeny to arise from anadromous parents, and the capacity for resident anadromous pairings, also buffers the impacted resident populations with potential for recolonization to be supported by the anadromous component of the O. mykiss population in the Upper Tucannon watershed. As other post-fire recolonizatin studies have shown (Rieman and Clayton 1997), redband populations may rebound within 2-3-years post-fire, though post-fire flooding may retard recolonization and population rebound.

Fire-generated sediments may be delivered to the severely burned tributaries and to non-fishbearing tributaries upsteam within the first 2-3 years post-fire. Depletion of fire-generated sediments from these upper drainages may take years to decades. Steelhead have been shown to be more sensitive to fine sediment levels than Chinook salmon (Tappel and Bjornn 1983) or bull trout (Shephard et al. 1984), both of which only show sharp declines in embryo survival to emergence when fine sediment levels exceed 30 percent fine sediment in the streambed. Presuming that the resident O. mykiss life history is equally sensitive to fine sediment levels, redband trout spawning success is likely to remain depressed in the severely burned tributaries until embeddedness levels drop below 25 percent and/or percent fines drop to less than 30 percent. Rearing success is also likely to be impacted as sediment levels increase in Cummings Creek below the Forest. Summer temperatures in lower Cummings Creek may become excessive with loss of stream shade, reducing value of this habitat for redband rearing until shade is reestablished.

In the long-term, as fire-generated pulses of fine sediment move through and substrate conditions improve, net gains in habitat complexity from the fire may result, relative to pre-fire conditions, depending upon the extent to which stable pieces of large wood are recruited to Cummings, Hixon, Grubb, Tumalum, and Pataha Creeks over the next 5-15 years. Fire effects in the Little Tucannon River were so limited that no changes are likely to occur that would be attributable to the fire in that drainage. Net recruitment of large wood is possible in all the tributaries excepting Little Tucannon River, owing to the high mortality that occurred in all these smaller drainages within the potential recruitment zones for large wood. Net accumulations of large wood would likely trigger consonant increases in pool frequencies and improved spawning gravel availability, all of which would contribute to improved productivity of these redband trout populations in the long-term through improved spawning and rearing success.

Table 3-30 is a summary of direct and indirect effects on indicators to redband trout/juvenile steelhead streams.

Table 3-30 Alternative A - Direct and Indirect Effects on Indicators for effects to redband trout/ juvenile steelhead streams in affected subwatersheds of the Upper Tucannon and Upper Pataha Watersheds

Indicator	Related Recovery Limiting Factor***	Indicator Potential Direction of Change (by affected subwatershed)**			
		Little Tucannon (Tucannon River/ and Tribs)****	Cummings	Tumalum*	Pataha Headwaters*
Large Wood	HD	I/I	I	I	I
Pools	HD, HQ	V/V	V	V	V
Temperature	T	NC/I	I	N	N
Sediment/ Substrate	S	I	I	I	I
Fish Passage	P	NC/D (Hixon)	NC	NC	NC
Water chemistry (Industrial chemicals)	NL	NC/NC	NC	NC	NC

*No steelhead present due to barriers downstream
**Increase, Variable, Decrease, No Change
***Temperature, **S**ediment, **H**abitat **Q**uantity, **H**abitat **D**iversity, **P**assage, **W**ater Chemistry. **N**on-**L**imiting
****Limiting Factors in Recovery Plan only apply to mainstem Tucannon River.

Cumulative Effects-redband trout (MIS) - Alternative A:

Past Actions: Redband trout within the Little Tucannon, Tumalum, Pataha, and Cummings Creek subwatersheds have been cumulatively impacted indirectly by past management activities on NFS lands as well as on state and privately owned lands in the Upper Tucannon and Pataha watersheds which have cumulatively impacted their habitat. Those past management activities have included road construction and management, riparian and upland timber harvest, wildfire suppression and post-fire Burned Area Emergency Response (BAER) actions

Ongoing and Reasonably Foreseeable Actions: This section of the Effects Analysis focuses on those activities currently ongoing or expected to occur within 5 years post-fire with potential to affect current redband trout populations in the Tucannon River, Little Tucannon River, Hixon, Grubb, Tumalum, and Cummings Creeks relative to post-fire conditions and trends previously discussed.

Dispersed Recreation- Effects would be the same as discussed for bull trout.

Noxious weeds- Effects would be the same as discussed for bull trout. To the extent that reduced upland erosion translates to reduced sediment delivery to Cummings Creek, Hixon Creek, the Little Tucannon Rivers, spawning and rearing redband trout would benefit, particularly in Cummings Creek and Pataha Creek.

Grubb Creek culverts: Effects would be the same as discussed for Chinook salmon. Removal of the upper in-channel culvert would improve access in Grubb Creek to the maximum upper limit of potential fish occupancy, for both the near and long-term, which would facilitate full potential occupancy by juvenile O. mykiss in the long-term.

State Salvage Harvest: State logging operations 200-feet from the Tucannon River and Cummings Creek are unlikely to cumulatively affect redband trout to any significant degree, in terms of water chemistry, temperature or fish passage, given the Best Management Practices and mitigations in place.

State riparian no-cut management zones of 200 feet adjacent to the Tucannon River and Cummings Creek will allow for large wood inputs through natural processes, but input levels may be lower than without state harvest, including danger tree management, which will allow the bottom (largest) portions of danger trees to be removed by the contractor. Harvest of the outer 2/3 of the potential recruitment zone along Tumalum Creek could retard recovery of pool habitat in the intermittent section of channel by removing potential large wood that would otherwise be available to create pools, store fine sediment and indirectly help restore surface flows. To the extent that fresh inputs of large wood accumulate from the no-cut zones along Tumalum, Pataha and Cummings Creek, they will help to store and sort sediments delivered from upstream reaches, improving retention and availability of spawning gravels and larger substrates which will improve both spawning and rearing habitat in the long-term. Private land harvest along Pataha Creek and its tributaries below the Forest, would have similar effects to state harvest in Cummings Creek.

Incremental sediment loading of Cummings, Pataha and Tumalum creeks from logging may occur, primarily due to non-functioning, severely burned riparian zones where most of the sediment-filtering structure was lost in the fire. Best Management Practices, no-cut management zones and logging systems employed will minimize soil disturbance, reducing the soil available for overland mobilization relative to other methods that might be used. In high-gradient channels like Cummings Creek (>5 percent), most fine sediments delivered to the channel are likely to be flushed downstream quickly to the river where they may accumulate. In Tumalum, fine sediments may be captured among coarser substrates and help seal the bottom of the channel, which could help prolong surface flows in the spring. In Pataha Creek, where gradients are moderate, fine sediments delivered to the channel in excess of the channels capacity for transport, may increase behind obstructions and spawning and rearing habitat may deteriorate below the forest for a short while. Overall, redband spawning and rearing success in these streams may be affected by sediment generated by state logging to a minor degree and for an extended period, but the effects are likely to be indistinguishable from effects of the fire which will likely have a much larger ongoing impact on redband populations, particularly in Cummings, Hixon, Grubb, and Tumalum creeks. In the long-term, as accumulated fine sediment loads are transported from the drainages, redband trout throughout these drainages are likely to experienced improved habitat conditions in terms of wood, pools, gravel storage resulting from riparian management zones from which wood can be recruited. Water temperatures will take longer to recover from high mortality and loss of stream shade in stream bottoms. Depending on the extent and duration of increases in temperature, productivity of redband trout in terms of spawning and rearing success and population growth may be more or less affected until temperatures recover.

Grazing – Pomeroy Allotment **–** Effects would be the same as discussed for bull trout. Redband trout would not be affected by resumption of grazing on the Pomeroy Allotment under the conditions described.

Determination:

Alternative A "May Impact" interior redband/rainbow trout individuals or habitat through ongoing effects of the School Fire, natural recovery processes and cumulative effects of past, present, and future activities in the Cummings Creek, Tumalum, Pataha Headwaters and Little Tucannon subwatersheds. Effects are within the range of effects discussed in literature on post-fire salvage (see literature citations for Fisheries). These effects are Not Likely to Result in a Trend toward Federal Listing, since they are expected to result in long-term beneficial or near-neutral effects to redband trout and their habitat. Many of the local populations and spawning and rearing habitat in the Upper Tucannon and Pataha Creek watersheds were not affected by the School Fire and minimally affected at worst by activities analyzed in this report. These populations serve as a reservoir providing resilience to the redband trout metapopulation in the Tucannon subbasin. Effects of future federal actions will be analyzed in greater detail as they are further developed.

Direct/Indirect Effects-margined sculpin - Alternative A:

The population of margined sculpin in Cummings Creek likely functioned in the role of a "satellite" population to the main population in the Tucannon River (Li et al. 1995), given its natural rarity in Cummings Creek, the majority of which (on-Forest) is located in the Willow Springs Roadless Area. Based on pre-fire surveys in 2005 by the state (WDFW 2005), sculpin were categorized as "rare" in Cummings Creek, "uncommon" to absent in tributaries from Panjab Creek upstream, and "uncommon" to absent in the Tucannon River above Sheep Creek in the uppermost sections of the river, but "common" in the river below Sheep Creek. These relative abundances correspond to habitat preferences described by Lonzarich (1993) for this species, specifically preferences for low gradients, water deeper than 13 inches and gravel substrate sizes all of which characterize the river below Panjab Creek, but which are much less characteristic of Cummings or Grubb creeks. No pre-fire surveys were done in Grubb Creek in 2005, but given proximity to the river and characteristic steep gradients and substrate sizes, sculpin in Grubb Creek were likely numerically "rare" and likely functioned as a "satellite" population supported by the larger river population. Habitat in Pataha Creek is somewhat less suitable than the river based on these characteristics but given the relative distance between the River and habitat on-Forest, this population may interact with the river population in terms of a metapopulation-type dynamic (Li et al. 1995), despite its relative rarity in the drainage.

The tiny sculpin populations in Cummings and Grubb Creeks will be directly and indirectly affected for a generation (2-3 years) or more, in part due to direct mortality in Grubb and Cummings creeks that occurred during the fire. The few individuals that may have survived will be slow to repopulate these creeks. Sculpins are far less naturally mobile than salmonids and are likely slow to expand into unoccupied marginal habitat such as Cummings and Grubb creeks, especially expansions that would require moving up steep gradients that challenge their weaker swimming abilities. A study in North Carolina of distance movement by mottled sculpin (*Cottus bairdi*), a related species, noted some of the lowest movement rates of any recorded for stream fishes, averaging less than 15 meters a season, and generally less than 2 meters within a 45-day period, which were substantially lower movement distances and rates than for the relatively few other benthic species previously studied in this respect (Petty and Grossman 2004). Sculpin in Pataha Creek may not experience any measurable impacts from the fire unless sediment loads increase measurably in or downstream of severely burned reaches below the Forest, but enough relatively unimpacted habitat remains upstream that the Pataha population is expected to persist and may respond positively to long-term habitat changes, particularly if fresh wood inputs create more low-gradient pools and increase gravel storage.

Mottled sculpin (*Cottus bairdii*) reach maturity at 2-3 years of age (Baxter and Simon, 1970), and margined sculpin are estimated to reach maturity within the same time frames. Significantly concentrated influxes of ash and fine sediment delivered to streams could add to total suspended solids to a degree that would be detrimental to fish exposed to such concentrations in the water column, particularly any survivors in Grubb or Cummings creeks. Fish kills have been recorded 1-2 years after wildfires, due to toxic slurries of ash and fine sediment delivered to the stream network by overland flow during post-fire storms (Rinne 1996, Rieman and Clayton, 1997; Bozek and Young 1994). Grubb and Cummings creeks are potentially at risk for such slurry flows within the next 2-3 years until ground cover is re-established and soil-water content subsides with new uptake by recovering vegetation. Post-fire flooding has been demonstrated to depopulate streams, and has been shown to result in significantly reduced salmonid populations for as long as 11 years post-fire in the southwest (Rinne and Jacoby 2005).

Increased sediment loads may limit recolonization in Grubb and Cummings creeks through direct mortality or indirectly by means of reduced productivity, but would be less critical to long-term viability of margined sculpin in the Tucannon subbasin compared to other potential impacts from the fire. Sculpin in the mainstem Tucannon would not likely be exposed to toxic slurries of ash and fine sediment due to larger volumes of water available to dilute slurries delivered from tributaries, however long-term increases in sediment loading in the mainstem Tucannon where the core population resides, may well impact the most important sculpin habitat in the Tucannon and Pataha watersheds and could significantly reduce spawning and rearing success for margined sculpin in the Tucannon subbasin as a whole for generations.

Regardless of sediment-related survival issues or recolonization rates, Cummings and Grubb creeks have lost significant amounts of shade and may be exposed to supercooling ($<1^{o}C$) and/or chronic development of anchor ice for 20 years or more, which could potentially reduce winter survival even after depopulated reaches are recolonized. Sculpin which attempt to overwinter in reaches where most shade has been lost may be unable to travel as extensively in winter as salmonids to find less adverse winter habitat conditions (Jacober et al. 1998) in more habitable reaches of Cummings, Grubb Creek or in the Tucannon River when necessary. Substantial increases in summer-fall temperatures and potential implications of winter exposure may reduce spawning and rearing success for several generations in Cummings Creek and Grubb Creek even after the species repopulates the drainages, since diurnal fluctuations in water temperatures especially are unlikely to fully recover until reinitiated stands achieve sufficient height and density to restore stream shade to pre-fire levels.

Cumulative Effects-margined sculpin - Alternative A:

Past Actions: Margined sculpin habitat within the Little Tucannon, Cummings Creek and Pataha Headwaters subwatersheds has been cumulatively impacted by past management activities on NFS lands as well as on state and privately owned lands within the subwatersheds. Those past management activities have included livestock grazing on the Pomeroy Allotment, road construction and management, riparian and upland timber harvest, wildfire suppression and post-fire Burned Area Emergency Response (BAER) actions. The cumulative effects of these historic and recent activities on margined sculpin populations in the School Fire area are reviewed in the Affected Environment section of this report.

Ongoing and Reasonably Foreseeable Actions: This section of the effects analysis focuses on those activities currently ongoing or expected to occur within 5 years post-fire with potential to affect margined sculpin populations in Cummings, Pataha and Grubb Creeks, and/or the Tucannon River relative to post-fire conditions and trends previously discussed.

Dispersed Recreation-Effects would be the same as discussed for bull trout.

Noxious weeds- Effects would be the same as discussed for bull trout. Reduced upland erosion would help to restore sediment delivery rates from uplands to pre-fire levels, and indirectly support recovery of local sculpin populations in Grubb, Pataha and Cummings creeks, and ultimately the core population in the Tucannon River.

Grubb Creek culverts: Effects would be the same as discussed for Chinook salmon.

Riparian plantings of several thousand shrubs and trees in Cummings and Grubb creeks will accelerate redevelopment of stream shade and reduce the timespan for restoration of winter water temperatures suitable for margined sculpin. Faster recovery of stream temperatures will act synergistically to increase the habitat value of predicted increases in large wood and pools in Grubb and Cummings creeks. Replanting along these streams will also accelerate long-term recovery of bank-stabilizing vegetation, leading to reduced rates of streambank erosion and reduced amounts of fine sediment accumulation in the streambeds of these two creeks. Faster habitat recovery to pre-fire or better conditions would help recover local margined sculpin populations faster than otherwise by reducing the length of time that spawning and rearing success are impacted by fire-generated fine sediments and temperature problems, accelerating the rate at which the species increases density and distribution, particularly in Cummings Creek.

State Salvage Harvest: Effects would be the same as discussed for bull trout. These actions are unlikely to affect other habitat parameters previously considered in this document in any way that would significantly affect margined sculpin in either the Tucannon River, or in spawning and rearing habitat provided by Cummings Creek.

Grazing – Pomeroy Allotment – Effects would be the same as discussed for bull trout. Resumption of grazing the headwaters of Cummings Creek or upper slopes of Pataha Creek in the Pomeroy Allotment is not expected to cumulatively affect the local margined sculpin population in either creek, and would have no effect on habitat conditions in the Tucannon River or in Grubb Creek.

Determination:

Alternative A "May Impact" margined sculpin individuals or habitat through ongoing effects of the School Fire, natural recovery processes and cumulative effects of past and present activities in the Cummings Creek, Pataha Headwaters and Little Tucannon subwatersheds. Effects are within the range of effects discussed in literature on post-fire salvage (see literature citations for Fisheries). Cumulative effects of future management activities are Not Likely to Result in a Trend toward Federal Listing, since they are expected to result in long-term beneficial or near-neutral effects to sculpin and sculpin habitat. Effects of future federal actions will be analyzed in greater detail as they are further developed.

Effects Common to Action Alternatives (B and C)

In the effects analysis of action alternatives, design features and management requirements (Table 2-3) described in Chapter 2 are considered integral non-optional components of each action alternative. Effects of each action alternative are based on the assumption that design features and mitigations would be fully implemented as described, and are evaluated relative to current post-fire habitat and species population conditions discussed previously.

Direct/Indirect Effects – Large Wood Frequencies – Alternatives B and C:

Planned mitigations would leave RHCAs unsalvaged, and where danger trees in RHCAs must be cut, they would be left in place to provide for large wood replacement needs. These provisions would allow for natural rates and patterns of large wood recruitment and retention in both fish-bearing channels and in smaller non-fishbearing channels upstream. The results would be similar to effects discussed under the No Action alternative in that a short-term pulse of fire-killed large wood would be recruited to provide hiding cover, store sediment and promote pool formation at natural rates associated with passive recovery processes in the four affected subwatersheds.

Cumulative Effects – Large Wood Frequencies - Alternatives B and C:

Land management activities conducted through fall 2005 and their relation to current or future fish habitat conditions in the School Fire area have been discussed previously-including pre-fire grazing on the Pomeroy Allotment, timber management over the past 40 plus years, BAER activities, wildfire suppression and road management activities. This discussion focuses on those activities currently ongoing or expected to occur within 5 years post-fire.

Cumulative effects on large wood frequencies from either action alternative, when considered with other ongoing and reasonably foreseeable actions, would be similar to Cumulative Effects expected to occur in association with the No Action alternative.

Direct/Indirect Effects – Pools - Alternatives B and C:

Effects would likely be similar to what could occur under the No Action alternative. Sediment delivery under the two action alternatives is expected to be slightly higher in years 3 and 4, relative to background potentials under the No Action. Because the level of potential sediment input would be so slight, and the duration of the increase would be limited to 1-2 years, the additive effects from either alternative are expected to have no significant impact on pool formation or maintenance above those created by natural recovery processes.

Cumulative Effects – Pools - Alternatives B and C:

Land management activities conducted through fall 2005 and their relation to current or future fish habitat conditions in the School Fire area have been discussed previously-including pre-fire grazing on the Pomeroy allotment, timber management over the past, BAER activities, wildfire suppression and road management activities. This discussion focuses on those activities currently ongoing or expected to occur within 5 years post-fire.

Cumulative effects on pool frequencies from either action alternative, when considered with other ongoing and reasonably foreseeable actions, would be similar to cumulative effects expected to occur in association with the No Action alternative.

Direct/Indirect Effects Passage Barriers- Alternatives B and C:
Effects would likely be similar to what could occur under the No Action alternative. RHCA buffers remain in place and would not be affected by salvage or follow-up treatments. Debris slides carry the greatest risk of creating sudden inputs of mixed material that could plug a culvert inlet. None of the management activities considered would increase the risk of instability of potential source areas.

Cumulative Effects – Passage Barriers - Alternatives B and C:
Land management activities conducted through fall 2005 and their relation to current or future fish habitat conditions in the School Fire area have been discussed previously-including pre-fire grazing on the Pomeroy allotment, timber management over the past, BAER activities, wildfire suppression and road management activities. This discussion focuses on those activities currently ongoing or expected to occur within 5 years post-fire.

Cumulative effects on fish passage from either action alternative, when considered with other ongoing and reasonably foreseeable actions, would be similar to cumulative effects expected to occur in association with the No Action alternative.

Direct/Indirect Effects - Temperature and Stream Shade - Alternatives B and C:
Effects would be similar to the No Action alternative, in that only insignificant amounts of stream shade are likely to be removed in the short-term as a consequence of danger tree felling. In the long-term, stream shade and water temperatures would be influenced most by gradual loss of shade provided by dead trees as they fall. Residual trees would provide limited stream shade, and recovery would be dependent on the rate at which riparian forest cover regrows, in terms of density and height.

Cumulative Effects – Temperature and Stream Shade - Alternatives B and C:
Land management activities conducted through fall 2005 and their relation to current or future fish habitat conditions in the School Fire area have been discussed previously-including pre-fire grazing on the Pomeroy allotment, timber management over the past, BAER activities, wildfire suppression and road management activities. This discussion focuses on those activities currently ongoing or expected to occur within 5 years post-fire.

Cumulative effects to shade and water temperatures from either action alternative, when considered with other ongoing and reasonably foreseeable actions would be similar to cumulative effects expected to occur in association with the No Action alternative.

Direct/Indirect Effects Chemical Contaminants - Alternatives B and C:
Application rates for dust abatement chemicals are likely to be in the range of 26 milligrams MgCl/Liter of water, applied at a rate of 1.34 liters per square yard (Bolander and Yamada 1999). It would likely be applied 1 or 2 times more as follow-up during salvage sale operations when heavy haul traffic would be expected on the two mile section of road adjacent to the Tucannon and Little Tucannon Rivers above Camp Wooten. Any follow-up applications during the project would be applied at 1/3 to 1/2 the application rate applied initially. Magnesium chloride is one of the most common chemicals used for dust

abatement on the Umatilla NF. It is highly soluble and would readily dissociate into magnesium and chloride ions. Under drying conditions, magnesium chloride draws moisture deeply and tightly into the road bed as surface moisture levels decline, creating a much harder running surface less likely to erode from haul traffic.

Chloride ions become quite mobile under conditions of surface runoff, but riparian and upland plant communities adjacent to the road above Camp Wooten, located at the base of Hixon Creek, are still reasonably intact following the fire and would capture most if not all of any chlorides mobilized off the road and total dissolved solids in the rivers would not likely increase in any detectable way as a result, due both to infiltration of runoff and vegetative uptake but also due to dilution factors if any chlorides actually entered the river. Concentrations of total dissolved solids, defined as chlorides and sulfates per EPA (1986), once in the river, would be quickly diluted to levels well below concentrations (922 mg/L.) documented as creating chronic toxicity effects for salmonids, based on in-house toxicology studies conducted by EPA with rainbow trout (EPA, 1988). Rainbow trout in that study experienced 97 percent survival at 622 mg/L, of chlorides and experienced essentially no weight loss (Spehar 1987).

Best Management Practices including avoidance of fuel storage and refueling within 300 feet of the Tucannon River, and requirements for a spill plan and containment berms and rapid-response spill containment materials at fuel storage sites would minimize the risk to fish habitat from fuel spills. While an accident could occur during helicopter aerial operations that would result in a fuel spill that could directly affect fish habitat, such an incident is unlikely and would be mitigated by the state-required Spill Containment and Control plan. The effects of a fuel spill during either ground-based or aerial operations would likely be short-term due to advance planning and preparation for the possibility of such an incident, which would facilitate rapid cleanup and control of the majority of released fluids.

No chemicals would be applied to unpaved road surfaces anywhere on NFS lands within the School fire area for dust abatement in the absence of expected heavy timber haul traffic. Dust levels from routine road use along the Tucannon River and elsewhere would remain at levels normally experienced during summer months. Typically only water is used for general dust abatement on NFS lands within the affected subwatersheds.

Cumulative Effects – Chemical Contaminants - Alternatives B and C:

Land management activities conducted through fall 2005 and their relation to current or future fish habitat conditions in the School Fire area have been discussed previously-including pre-fire grazing on the Pomeroy allotment, timber management over the past, BAER activities, wildfire suppression and road management activities. This discussion focuses on those activities currently ongoing or expected to occur within 5 years post-fire.

Cumulative effects of chemical contaminants from either action alternative, when considered with other ongoing and reasonably foreseeable actions, would be similar to cumulative effects expected to occur in association with the No Action alternative.

Summary of Effects Common to Alternatives B and C:

As recommended by Dunham et al. (2003), both action alternatives, by virtue of project design, together with post-fire BAER and suppression rehabilitation actions which have already taken place, along with reasonably foreseeable actions associated with the alternatives, would be managed to speed recovery following School Fire and related suppression actions and would at minimum maintain near-natural rates of recovery as required by PACFISH. Design criteria (Table 2-3) and mitigations would ensure that the potential supply of large wood for natural processes to operate would result in pool formation, and properly functioning sediment storage and routing processes throughout the two affected watersheds, and would ensure that water chemistry is not likely to be detrimentally altered. Riparian plantings would accelerate recovery of stream shade and help bring water temperatures back into ranges suitable for salmonids, including bull trout.

Near-natural rates of recovery for pool frequencies would be maintained through use of design criteria (Table 2-3) and mitigations to ensure that erosion and sedimentation attributable to management actions would not add measurably to sediment loads or passage problems resulting from post- fire hydrologic interactions with the road system. Within the foreseeable future following implementation of either action alternative, chronic sediment sources would be reduced through decommissioning of unauthorized roads, resulting in long-term net reductions in anthropogenic sediment delivery to the stream network.

Alternative B – Proposed Action

Direct and Indirect Effects - Substrate Conditions – Alternative B:

The following discussion is based on the effects analysis discussed in the Hydrology/Water Quality section. Soil-disturbing consequences of School Fire Salvage Recovery project activities would potentially somewhat increase erosion from roads and hillslopes combined relative to background rates during the third and fourth years post-fire. During the first two years, when the watershed would be most vulnerable to high-intensity rainstorms and sediment delivery from hillslopes and roads combined, aggregate effects of Alternative B on a recovering landscape would be slightly lower relative to background rates, primarily due to increased soil-protecting cover from lop-and-scatter fuels treatments and logging slash. Years 3 and 4 together would potentially create a small additive pulse of erosion relative to the No Action, but the cumulative increase would still be less than 3 percent higher than would occur under the No Action.

In year 5, the effects of Alternative B would be slightly lower than background but due to model sensitivity, would essentially be no different than background rates. In aggregate over 5 years time, the potential total soil erosion from Alternative B, hillslope and road sources combined, would be less than 0.3 percent higher than background levels associated with the No Action alternative, and would be considered no different than background due to model sensitivity. The potential for increased short-term sediment delivery to the stream network in years 3 and 4 under Alternative B would be no higher than the increase in erosion potential, and increases would most likely occur in association with severely burned hillslopes and road crossings in locations previously discussed in the No Action alternative. In the long-term, 5 years and beyond, chronic erosion rates and potential for sediment delivery from Alternative B would continue at rates marginally lower than the No Action due to decommissioning of 6 miles of pre-existing unauthorized roads in year 4, with funding for decommissioning made possible by their temporary use with the sale. The unauthorized roads to be decommissioned are located primarily in the Pataha Headwaters subwatershed, the remainder in Cummings subwatershed.

Decommissioning of unauthorized roads with the sale would not result in a net reduction in soil erosion in the short-term (first 4 years post-fire), but would marginally contribute to long-term (5 years +) reductions in watershed erosion and indirectly slightly reduce potential sediment delivery to Pataha and Cummings creeks for the long-term by reducing above-background rates of sediment delivered to lower-order channels higher in the drainage network, and change may not be detectable, even in the long-term.

Magnesium chloride would be used to control dust and loss of roadbed aggregate on the few unpaved miles of main haul road along the Tucannon River above Camp Wooten, to reduce impacts from anticipated effects of heavy haul traffic. Magnesium chloride penetrates deep into the roadbed under drying conditions, and increases the cohesive strength of roadbed materials, reducing the potential for loss of aggregate and surface fines through dust and displacement by heavy haul traffic. Other Best Management Practices that would be applied throughout the project area include cessation of haul during excessively wet conditions that would promote accelerated erosion from vehicular traffic. These measures would minimize sediment delivery to the Tucannon River from log haul under this alternative.

Cumulative Effects - Substrate Conditions - Alternative B:
Land management activities conducted through fall 2005 and their relation to current or future fish habitat conditions in the School Fire area have been discussed previously-including pre-fire grazing on the Pomeroy allotment, timber management over the past , BAER activities, wildfire suppression and road management activities. This discussion focuses on those activities currently ongoing or expected to occur within 5 years post-fire.

Ongoing and reasonably foreseeable future actions considered under Alternative A would create similar cumulative effects to substrate when considered with Alternative B. Additional cumulative effects under this alternative would come from decommissioning of an additional 13 miles of unauthorized roads, for a total reduction of 19 miles of unauthorized roads decommissioned within 5 years post-fire.

The majority of these additional miles would essentially be equally distributed among the Little Tucannon, Cummings, and Pataha Headwaters subwatersheds, with a minor amount in Tumalum subwatershed. This would be in addition to 6 miles of existing unauthorized roads in Cummings (1 mile) and Pataha Headwaters (5 miles) subwatersheds which would be decommissioned following use by the School project. Headwaters Pataha (8 miles total), Little Tucannon, and Cummings subwatersheds (4.4 miles each) are the most affected by these chronic sediment sources, and fishbearing streams in these subwatersheds would benefit accordingly from long-term net reductions in erosion and road-related sediment delivery relative to pre-fire conditions. Tumalum subwatershed would also benefit from a net reduction of 2 miles decommissioning. The remainder of the decommissioning would be distributed among other subwatersheds affected by the fire and would reduce erosion and sediment delivery to a minor degree in those drainages.

Direct benefits to fish habitat are most likely to result from decommissioning of the two unauthorized roads which go directly up Grubb and Hixon Creeks in the Little Tucannon subwatershed, while more indirect benefits to fish habitat elsewhere are likely to come from decommissioning other unauthorized roads in the fire area and net improvements to the subwatersheds as a whole. Net long-term benefits from decommissioning these additional miles of unauthorized roads could be achieved as soon as the third year post-fire if decommissioning begins within that 3-year period when erosion rates from the fire and School Fire Salvage Recovery project activities would concurrently be dropping back to pre-fire rates. Net reductions in long-term erosion and sediment delivery in the watersheds would be greater under Alternative B than if Alternative A were implemented, assuming that obliterations would be accomplished within the same timeframes. Reductions in direct and indirect sediment delivery from the road network to fishbearing reaches could be expected in proportion to the net reduction in the road network, with proportionate long-term cumulative benefits to substrate conditions and pool frequencies from Alternatives B as compared to Alternative A.

Alternative C

Direct/Indirect Effects - Substrate Conditions – Alternative C:
The following discussion is based on the effects analysis discussed in the Hydrology/Water Quality section. Soil-disturbing consequences of School Fire Salvage Recovery project activities would

potentially somewhat increase erosion from roads and hillslopes combined relative to background rates during the third and fourth years post-fire. During the first two years, when the watershed would be most vulnerable to high-intensity rainstorms and sediment delivery from hillslopes and roads combined, aggregate effects of Alternative C on a recovering landscape would be slightly lower relative to background rates, primarily due to increased soil-protecting cover from lop-and-scatter fuels treatments and logging slash. Years 3 and 4 would potentially create a small additive pulse of erosion relative to the No Action, but the 2-year increase would still be less than 2 percent higher than would occur under the No Action, and would be slightly less than generated under Alternative B.

In year 5, the effects of Alternative C would be slightly lower than Alternative A-No Action, and slightly higher than under Alternative B, but due to model sensitivity, would essentially be no different than either of the other alternatives. In aggregate over 5 years time, the potential total soil erosion from Alternative C, hillslope and road sources combined, would be far less than 0.1 percent lower than erosion levels associated with the No Action alternative, and would be considered no different than levels generated under either the No Action or Alternative B due to model sensitivity. The potential for increased short-term sediment delivery to the stream network in years 3 and 4 under Alternative C would be no higher than the increase in erosion potential, and increases would most likely occur in association with severely burned hillslopes and road crossings in locations previously discussed in the No Action alternative. In the long-term, 5 years and beyond, erosion rates and potential for sediment delivery from Alternative C would continue at rates marginally lower than the No Action alternative due to decommissioning of 4 miles of pre-existing unauthorized roads in year 4, with funding for decommissioning made possible by their temporary use with the sale. The unauthorized roads to be decommissioned are located primarily in the Pataha Headwaters subwatershed, the remainder in Cummings subwatershed.

Decommissioning of unauthorized roads with the sale would not result in a net reduction in soil erosion in the short-term (first 4 years post-fire), but would marginally contribute to long-term (5 years +) reductions in watershed erosion and indirectly slightly reduce potential sediment delivery to Pataha and Cummings Creeks for the long-term. The reduction in chronic long-term erosion accomplished by this decommissioning is most likely to reduce above-background rates of sediment delivered via lower-order channels higher in the drainage network, and change may not be detectable, even in the long-term.

Magnesium chloride would be used to control dust and loss of roadbed aggregate on the few unpaved miles of main haul road along the Tucannon River above Camp Wooten, to reduce impacts from anticipated effects of heavy haul traffic. Magnesium chloride penetrates deep into the roadbed under drying conditions, and increases the cohesive strength of roadbed materials, reducing the potential for loss of aggregate and surface fines through dust and displacement by heavy haul traffic. Other Best Management Practices that would be applied throughout the project area include cessation of haul during excessively wet conditions that would promote accelerated erosion from vehicular traffic.

Cumulative Effects – Substrate Conditions - Alternative C:

Land management activities conducted through fall 2005 and their relation to current or future fish habitat conditions in the School Fire area have been discussed previously-including pre-fire grazing on the Pomeroy allotment, timber management over the past, BAER activities, wildfire suppression and road management activities. This discussion focuses on those activities currently ongoing or expected to occur within 5 years post-fire.

Ongoing and reasonably foreseeable future actions considered under Alternative A-No Action, would create similar cumulative effects to substrate when considered with Alternative C. Additional cumulative effects under this alternative would come from decommissioning of an additional 16 miles of unauthorized roads, for a total of approximately 20 miles of unauthorized roads decommissioned within 5 years post-fire.

Of the additional 16 unauthorized miles, the majority would be located in Pataha Headwaters subwatershed, with the remainder primarily distributed equitably between the Cummings and Little Tucannon subwatersheds. These would be in addition to the 4 miles of existing unauthorized roads in the Cummings (1 mile) and Headwaters Pataha subwatersheds (3 miles) which would be used and decommissioned with the School project. The Headwaters Pataha (8 miles total), Cummings (4 miles total) and Little Tucannon subwatersheds (4 miles total) are the most affected by these unauthorized chronic sediment sources, and would benefit accordingly from long-term net reductions in erosion and road-related sediment delivery relative to pre-fire conditions. Tumalum subwatershed would also benefit from a net reduction of two miles decommissioning. The remainder of the decommissioning would be distributed among other subwatersheds affected by the fire and would reduce erosion and sediment delivery to a minor degree in those drainages.

Net long-term benefits from decommissioning these additional miles of unauthorized roads could be achieved as soon as the third year post-fire if decommissioning begins within that 3-year period when erosion rates from the fire and School Fire Salvage Recovery project activities would concurrently be dropping back to pre-fire rates. Net reductions in long-term erosion and sediment delivery from the watersheds would be no greater under Alternative C than if Alternative B were implemented, assuming that obliterations would be accomplished within the same timeframes. Reductions in direct and indirect sediment delivery from the road network to fishbearing reaches could be expected in proportion to the net reduction in the road network, with proportionate long-term cumulative benefits to substrate conditions and pool frequencies from Alternatives B and C compared to Alternative A.

Cumulative Effects to Fish Species –Alternatives B and C

Based on effects to the selected indicators from the action alternatives (B and C), direct, indirect and cumulative effects of both action alternatives are expected to have minimal additive effects on bull trout, Snake River Chinook salmon, Snake River summer steelhead, redband trout or margined sculpin. Cumulative effects of road obliterations would particularly benefit bull trout, redband trout, steelhead and margined sculpin in the Cummings Creek subwatershed, and redband trout and margined sculpin in Pataha Creek, through sediment reduction. Cumulative effects of ongoing riparian plantings would benefit bull trout, steelhead, redband trout and margined sculpin wherever they are present in Cummings, Hixon, Grubb and Tumalum Creeks primarily by accelerating recovery of shade and water temperatures, and secondarily accelerating development of a future supply of large wood for the long-term. Chinook salmon, steelhead and margined sculpin would most benefit from actions that cumulatively reduce sediment delivery to the Tucannon River from various points in the watershed, including post-fire BAER activities already completed and some yet to be accomplished in the next year.

West Patit Fire Project is located in West Patit Creek subwatershed of the Touchet River watershed and constitutes a prescribed fire project on approximately 1,600 acres (analysis area is 2,400 acres T9N, R41E, Sections 4-9 and 17-18). It is proposed to reduce existing ground fuel and ladder fuels and improve forage. Burning would occur in late fall or late winter/early spring. Existing roads would be used. There would be no ignition in RHCAs - fire would be allowed to back downhill into these areas. Backing fire in RHCAs typically are low-severity fires with flame lengths of 2 feet or less, and prescriptions typically plan for no more than 10 percent bare mineral soil exposed. The effects of such prescriptions are not expected to measurably affect soil erosion or sediment delivery, large wood frequencies, water temperatures, or any other parameters considered in this analysis.

The cumulative effects of this activity on fish and fish habitat in the Upper Tucannon and Pataha Creek Watersheds, when added to the effects of the School Fire, ongoing natural recovery, effects from planned activities proposed with either action alternative of the School Fire Salvage Recovery project, and other ongoing and foreseeable actions, are expected to be unmeasurable, and have no effect on species or habitat present in the Upper Tucannon River or Pataha Creek watersheds. It May Impact individuals or habitat for redband trout in West Patit Creek, but would not likely result in a Trend toward Listing for this species.

The project would have No Effect on Mid-Columbia steelhead or Designated Critical Habitat which are present in the West Patit Creek subwatershed, approximately 3 miles downstream from the Forest boundary. The project would have No Impact on margined sculpin, which are not known to be present in the West Patit Creek subwatershed, and would have No Effect on Columbia River bull trout or Snake River spring Chinook salmon, or their Designated Critical Habitats, none of which are present in the West Patit Creek subwatershed.

Summary:

The following Threatened and Sensitive species and Designated Critical Habitats are documented (D) as occurring on the Umatilla National Forest, and are documented as specifically present in the Upper Tucannon and/or Pataha Creek Watersheds in the subwatersheds affected by the School Fire and Proposed School Fire Recovery EIS:

- Snake River Spring Chinook Salmon (*Oncorhynchus tschawytcha*) (T)
- Snake River summer steelhead (*Oncorhynchus mykiss)* (T)
- Columbia River bull trout (*Salvelinus confluentus*) (T)
- Interior Redband/Rainbow trout (*Oncorhynchus mykiss*) (S)
- Margined sculpin (*Cottus marginatus*) (S)

- Designated Critical Habitat for Snake River spring Chinook Salmon
- Designated Critical Habitat for Snake River summer steelhead
- Designated Critical Habitat for Columbia River bull trout

The primary criterion for evaluating potential effects to listed species and Designated Critical Habitat in a Biological Evaluation, is whether any of the action alternatives May Affect a listed species or Critical Habitat. A finding of May Affect triggers further analysis through a Biological Assessment of the Preferred Alternative for the EIS,

The two criteria for evaluating potential effects to sensitive species are:

- Would implementation of any of the alternatives result in the loss of viability or distribution throughout the analysis area of the sensitive species; or

- Would implementation of any of the alternatives move sensitive species toward federal listing under the ESA?

Summary of Findings for Listed Species and Designated Critical Habitats:

Both action alternatives (B and C) would implement land disturbing actions in subwatersheds where listed and sensitive species and designated critical habitats are present. Both action alternative (B and C) May Affect listed species and designated critical habitats in the affected subwatersheds and effects are within the range of effects discussed in literature on post-fire salvage (see literature citations in Fisheries).

The majority of effects would come from ongoing state and private actions and from foreseeable federal actions. Neither of the action alternatives is expected to significantly add to effects of the School Fire and ongoing recovery processes. The preferred alternative (Alternative B) would be analyzed in greater detail through a Biological Assessment and National Marine Fisheries Service and U.S. Fish and Wildlife Service would both be consulted on effects to listed species and designated critical habitats based on the preferred alternative. Foreseeable federal actions would be consulted as they are further developed and effects analyzed in greater detail.

The fire combined with natural recovery processes would create their own independent effects on listed species and critical habitat through natural recovery processes triggered by the School Fire, whether the No Action alternative is selected, or one of the action alternatives (B and C). As Dunham et al. (2003) noted, large fires may pose little threat to populations which can still express the full species' range of life histories and remain connected to a range of habitats. Long-term changes may benefit multiple native species within a landscape when viewed at larger spatial scales and longer time intervals (Reeves et al. 1995). Disturbances, particularly episodic ones, create a dynamic mosaic of habitats in time and space, enabling and encouraging species adaptations in terms of multiple life history strategies and phenotypes within watersheds, which has been shown to be effective for persistence and resiliency of salmonid populations in dynamic environments prone to episodic disturbance (Reeves et al. 1998; Dunham et al. 2003; Rieman et al. 2003). Bull trout have been shown to recolonize tributary streams following severe wildfires in Idaho within a year, whether through return via migratory corridors of adult migratory bull trout absent from the impacted streams at the time of the fire, or through smaller-scale influxes of redband trout from nearby reaches where limited impacts occurred (Rieman and Clayton 1997).

At the same time, recovery rates have also been observed to operate slowly for anadromous/fluvial species oriented to natal streams, such as bull trout, steelhead and Chinook salmon, species which become reproductive at larger body sizes (>20cm) as in bull trout, redband trout, steelhead and Chinook salmon, and for species with limited home ranges, of which margined sculpin are likely a representative species, given the limited movements documented by Petty and Grossman (2004) for mottled sculpins. Recovery of fish populations even from pulse-type disturbances such as that epitomized by the School Fire and ongoing natural recovery processes, is likely to proceed most quickly where source populations for recolonization are close by and movement is unrestricted by barriers (Detenbeck et al. 1992). Additional biological evaluations for these species would be initiated at the time reasonably foreseeable federal projects are proposed and developed in further detail.

Summary of Findings for Essential Fish Habitat under the Magnuson-Stevens Act:

The Tucannon River Subbasin has been designated as Essential Fish Habitat (EFH) for spring Chinook salmon pursuant to Section 305(b) of the Magnuson-Stevens Fishery Conservation Act. The predicted two-year increase in erosion by the Hydrologist's analysis, under both alternatives, may potentially result in a corresponding increase in sediment delivery to the Tucannon River. Such an increase in sediment may affect spring chinook salmon EFH. Consultation on effects to EFH from the preferred alternative will be conducted in tandem with ESA Section 7 consultation with the National Marine Fisheries Service.

Summary of Findings for Sensitive Species:

Effects to sensitive species are expected under both the action alternatives relative to the No Action alternative, as described previously. The majority of effects would come from ongoing state and private actions and from foreseeable federal actions. Neither of the action alternatives is expected to significantly add to effects of the School Fire and ongoing recovery processes. Effects to fish habitat of both Alternative B and Alternative C in the affected subwatersheds would be within the range of effects discussed in literature on post-fire salvage (see literature citations for Fisheries). Both action alternatives

May Impact Margined Sculpin and Interior Redband trout individuals, but are Not Likely to Result in a Trend Toward Federal Listing under the Endangered Species Act.

The No Action alternative would impose its own independent effects on Sensitive Species through natural recovery processes triggered by the School Fire. As Dunham et al. (2003) noted, large fires may pose little threat to populations which can still express the full species' range of life histories and remain connected to a range of habitats. Long-term changes may benefit multiple native species within a landscape when viewed at larger spatial scales and longer time intervals (Reeves et al 1995). Disturbances, particularly episodic ones, create a dynamic mosaic of habitats in time and space, enabling and encouraging species adaptations in terms of multiple life history strategies and phenotypes within watersheds, which has been shown to be effective for persistence and resiliency of salmonid populations in dynamic environments prone to episodic disturbance (Reeves et al. 1998, Dunham et al. 2003), Rieman et al. (2003). Redband trout have been shown to recolonize tributary streams following severe wildfires in Idaho within a year, through influxes of redband trout from nearby reaches where limited impacts occurred (Rieman and Clayton 1997). At the same time, recovery rates have also been observed to operate slowly for species with limited home ranges (Detenbeck et al. 1992), of which margined sculpin are likely a representative species, given the limited movements documented by Petty and Grossman (2004) for mottled sculpins. Recovery of fish populations even from pulse-type disturbances such as that epitomized by the School Fire and ongoing natural recovery processes is likely to proceed most quickly where source populations for recolonization are close by, and movement is unrestricted by barriers (Detenbeck et al. 1992), as is the case with the core population in the Tucannon River relative to Cummings Creek,. Additional biological evaluations would be initiated at the time reasonably foreseeable federal projects are proposed and developed in further detail.

VEGETATION

SCALE OF ANALYSIS

The area analyzed for forest vegetation includes all National Forest System (NFS) lands contained within the School Fire perimeter. Private, state, and other non-NFS lands were excluded from the analysis area, even if they occur within the fire perimeter. The forest vegetation analysis area includes approximately 28,000 acres of NFS lands.

Based on Forest Plan direction, the National Forest Management Act, administrative policy letters issued by the Pacific Northwest Regional Forester, and other sources the desired future condition for forest vegetation is: Forestland areas deforested by the School Fire will have appropriate forest cover established as soon as is practicable (Goodman 2002).

Effects will be measured using forestland condition, characterized using species composition, forest structure and tree density, and will be assessed for two time periods: 10 years post-fire (when the salvage harvest and tree planting proposed actions will have been completed), and 50 years post-fire.

AFFECTED ENVIRONMENT

Affected environment is defined as that portion of the School Fire Salvage Recovery analysis area that could potentially be affected by either of the forest vegetation treatments included in the proposed action: salvage timber harvest and tree planting.

A National Forest Management Act analysis (see Appendix E) characterizes existing vegetation conditions for all National Forest System (NFS) acreage in the School Fire analysis area (approximately 27,685 acres). This section describes forest vegetation conditions for NFS acreage in the School Fire Salvage Recovery analysis area that would potentially be affected by implementation of the action alternatives described in Chapter 2.

The most important factor influencing whether forestland would potentially be affected by implementing an action alternative is management direction from the Land and Resource Management Plan (Forest Plan) for the Umatilla National Forest (USDA Forest Service 1990a, 1990b).

Table 3-31 shows whether salvage timber harvest and tree planting are permitted activities, by the Forest Plan, for the ten management allocations occurring in the School Fire Salvage Recovery analysis area.

Table 3-31 Forest Plan Management Direction Summary For Forest Vegetation

Management Area Allocation	Percent of Area	Suitable Lands?	Timber Management	Salvage Harvest Permitted?	Tree Planting Permitted?
A4: Viewshed 2	3.0	Yes	Scheduled	Yes	Yes
A6: Developed Recreation	0.5	No	Nonscheduled	With conditions[2]	Yes
C1: Dedicated Old Growth	5.8	No	Nonscheduled	With conditions[3]	Yes
C3: Big Game Winter Range	30.1	Yes	Scheduled	Yes	Yes
C4: Wildlife Habitat	2.0	Yes	Scheduled	Yes	Yes
C5: Riparian (Fish/Wildlife)	2.5	Yes	Scheduled	Yes	Yes
C8: Grass-Tree Mosaic	8.8	No	Nonscheduled	With conditions[4]	Yes[6]
D2: Research Natural Area	0.2	No	Nonscheduled	No	No
E2: Timber and Big Game	47.2	Yes	Scheduled	Yes	Yes
PACFISH (RHCAs)	10.7[1]	No	Nonscheduled	With conditions[5]	Yes

Sources/Notes: "Management area allocations" are from the Umatilla NF Forest Plan (USDA Forest Service 1990a). The "percent of area" item shows the percentage of NFS lands in the School Fire analysis area by management allocation; the "suitable lands?" item shows whether capable forested lands in the management area are designated as suitable for timber production by the Forest Plan; the "timber management" item shows whether timber is managed on a scheduled basis; and the "salvage harvest permitted?" item shows whether salvage timber harvest is allowed by the management area direction.

[1] PACFISH is not mapped separately, so the "percent of area" value for PACFISH is also included in the percentages for other management allocations and the percentage values in this column will sum to more than 100%.

[2] Trees would be managed to meet recreation objectives and to reduce the risk of public injury from hazardous trees or vegetation.

[3] Fuelwood cutting, salvage harvest or the removal of any dead or down material would not be permitted unless the old-growth unit is lost as a result of catastrophic conditions.

[4] Under catastrophic conditions, timber may be salvaged and cover reestablished.

[5] When compatible with riparian management objectives, salvage harvest and fuelwood cutting is allowed following catastrophic events such as fire, flooding, volcanic, wind or insect damage.

[6] Timber management activities (harvest, reforestation, others) may be used only where analysis shows they are needed to achieve the objectives for big game habitat and for other wildlife species.

The analysis area for forest vegetation includes all National Forest System (NFS) lands contained within the School Fire perimeter; private, state and other non-NFS lands were excluded. This analysis area includes approximately 27,685 acres of NFS lands.

Affected environment is defined as that portion of the School Fire analysis area that could potentially be affected by the alternatives under consideration (CEQ 1992). For forest vegetation, the affected environment was defined using two activities from the proposed action: salvage timber harvest and tree planting. Table 3-32 summarizes the School Fire Salvage Recovery project affected environment for forest vegetation.

Table 3-32 Forest Vegetation Affected Environment For The School Fire Analysis Area (Acres)

Total NFS lands within the School Fire analysis area	27,685
Minus nonforested and nonvegetated lands[1]	7,185
Total forestland within the School Fire analysis area[2]	20,500
Minus forestland in D2 Forest Plan management area[3]	20
Minus forestland in Inventoried Roadless Area[4]	6,690
Forestland considered for salvage and planting	13,790
Minus forestland not selected for salvage harvest[5]	4,360
Forestland included in the proposed action (alternative B)	9,430
Minus proposed action not located in "black" areas	5,240
Forestland included in alternative C	4,190

[1] Nonforested and nonvegetated lands have biophysical settings (as controlled by climate, soil depth and other physical site factors) precluding development of a tree-dominated ecosystem. Nonforest areas are incapable of supporting tree canopy cover amounts of 10% or more.

[2] Forestland has biophysical settings (as controlled by climate, soil depth and other physical site factors) allowing development of a tree-dominated ecosystem. Forestland is capable of supporting tree canopy cover amounts of 10% or more.

[3] The Forest Plan does not permit salvage timber harvest or tree planting in management area D2 (see Table 3-1).

[4] The School Fire analysis area contains the Willow Springs inventoried roadless area; no forest vegetation activities are proposed within the Willow Springs roadless area.

[5] "Forestland not selected for salvage harvest" refers to situations where the timber volume per acre, proximity to roads, logging system constraints, and similar factors limited opportunities to recover economic value from dead and dying trees.

ENVIRONMENTAL CONSEQUENCES

The Context for Estimating Environmental Effects

The geographical context for estimating direct and indirect effects is National Forest System (NFS) lands within the forest vegetation affected environment, which varies by alternative (approximately 9,430 acres for Alternatives A and B; approximately 4,190 acres for Alternative C; Table 3-32).

The geographical context for estimating cumulative effects is total forestland within the School Fire Salvage Recovery analysis area (app. 20,500 acres; Table 3-32).

The temporal context for estimating effects is:

- The year 2004, immediately before the School Fire, to serve as a baseline for comparison purposes,
- The year 2015, when it is predicted that implementation of the salvage timber harvest and tree planting activities will have been completed for all affected areas, and
- The year 2055 – 50 years after the School Fire and 40 years after activity implementation – a reasonable timeframe for assessing trends in species composition, forest structure and tree density.

Appendix E provides detailed information about species composition, forest structure and tree density, including coding descriptions and analysis methodology for all three of these indicators.

Alternative A – No Action

If alternative A is selected for implementation, then these forest vegetation activities would occur on the proposed action affected environment:

- Salvage timber harvest: 0 acres;
- Tree planting: 0 acres;
- Natural reforestation: 9,430 acres (all areas would have natural reforestation).

Direct/Indirect Effects for Species Composition – Alternative A:

Alternative A uses natural reforestation to establish appropriate forest cover for the proposed action affected environment, instead of using the tree planting proposed action as is done for Alternatives B and C.

Selecting natural reforestation as the regeneration method for Alternative A is expected to influence how species composition develops for the proposed action affected environment; Table 3-33 shows estimated trends in species composition for Alternative A.

Table 3-33 Species Composition Trends For Alternative A Affected Environment (9,430 Acres)

	Pre-fire: 2004		Post-implementation: 2015		Future: 2055	
Cover Type	**Acres**	**Percent**	**Acres**	**Percent**	**Acres**	**Percent**
Douglas-fir	4,379	46	1,638	17	1,024	11
Grand fir	4,318	46	103	1	126	1
Lodgepole pine	39	< 1	4	< 1	1,802	19
Nonstocked*	16	< 1	6,663	71	0	0
Ponderosa pine	625	7	529	6	3,581	38
Subalpine fir	52	< 1	58	1	58	1
Western larch	1	< 1	437	5	2,840	30
Total	**9,430**	**100**	**9,430**	**100**	**9,430**	**100**

* Nonstocked refers to areas with low tree cover (<10% canopy cover); nonstocked areas are generally not completely devoid of trees.

Table 3-33 shows that the natural reforestation associated with Alternative A would establish a mix of species composition by the year 2055, and that near-term composition (2015) would be dominated by the nonstocked condition.

The amount of nonstocked area in 2015 is the primary composition difference between alternatives because Alternative A is estimated to have more of the nonstocked condition in 2015 (71 percent) than either Alternative B (53 percent; Table 3-41) or alternative C (47 percent; Table 3-44).

Direct/Indirect Effects for Forest Structure - Alternative A:

Selecting natural reforestation as the regeneration method for Alternative A is expected to influence how forest structure develops for the proposed action affected environment; Table 3-34 shows estimated trends in forest structure for Alternative A.

Table 3-34 Forest Structure Trends For Alternative A Affected Environment (9,430 Acres)

	Pre-fire: 2004		Post-implementation: 2015		Future: 2055	
Structure Class	**Acres**	**Percent**	**Acres**	**Percent**	**Acres**	**Percent**
Bare ground	0	0	0	0	0	0
Stand initiation	36	< 1	9,183	97	6,308	67
Stem exclusion	7,034	75	135	1	803	9
Understory reinitiation	192	2	6	< 1	952	10
Young forest, multistrata	1,063	11	0	0	0	0
Old forest, single stratum	890	9	107	1	98	1
Old forest, multistrata	217	2	0	0	1,269	14
Total	**9,430**	**100**	**9,430**	**100**	**9,430**	**100**

Table 3-34 shows that the natural reforestation associated with Alternative A would establish a mix of forest structure classes by the year 2055, and that the predominant structure class for both 2015 and 2055 would be stand initiation.

Although a substantial amount of stand initiation is expected immediately after a fire (2015), primarily because stand initiation represents the first stage of forest succession after a stand-replacing disturbance event, the amount of stand initiation still present in 2055 is greater than expected.

The amount of stand initiation in 2055 is the primary structure difference between alternatives because Alternative A is estimated to have much more of the stand initiation structure class in 2055 (67 percent) than either Alternative B (14 percent; Table 3-42) or alternative C (6 percent; Table 3-45).

For Alternative A, old forest structure would exist at relatively low levels in 2055 (Table 3-34). Although this result is not unexpected because old forest often requires more than 40-50 years to develop after a stand-replacing disturbance event, Alternative A would establish slightly less old forest in 2055 (15 percent for both old forest classes combined) than either Alternative B (21 percent; Table 3-42) or alternative C (18 percent; Table 3-45).

Direct/Indirect Effects for Tree Density - Alternative A:

Selecting natural reforestation as the regeneration method for Alternative A is expected to influence how tree density develops for the proposed action affected environment; Table 3-35 shows estimated trends in tree density for Alternative A.

Table 3-35 Tree Density Trends For Alternative A Affected Environment (9,430 Acres)

	Pre-fire: 2004		Post-implementation: 2015		Future: 2055	
Density Class	**Acres**	**Percent**	**Acres**	**Percent**	**Acres**	**Percent**
Low	2,273	24	9,349	99	8,605	91
Moderate	1,792	19	79	1	142	2
High	5,365	57	2	< 1	683	7
Total	**9,430**	**100**	**9,430**	**100**	**9,430**	**100**

Table 3-35 shows that the natural reforestation associated with Alternative A would establish a mix of tree density classes by the year 2055, and that the predominant density class for both 2015 and 2055 would be low.

Although a substantial amount of low tree density is expected immediately after a fire (99 percent in 2015), primarily because direct or indirect effects related to the wildfire caused many of the live trees to die, the amount of low tree density still present in 2055 is greater than expected.

The amount of low density in 2055 is the primary density difference between Alternatives because Alternative A is estimated to have substantially more of the low density class in 2055 (91 percent) than either Alternative B (55 percent; Table 3-43) or Alternative C (52 percent; Table 3-46).

Cumulative Effects - Alternative A:

Past and Present Actions -For National Forest System lands in the School Fire analysis area, it is estimated that approximately 18,000 acres of timber harvest, 2,300 acres of tree planting and 2,100 acres of noncommercial thinning occurred during the time period between 1950 and 2005 (Tables 3-36 and 3-37).

Note that the acreage figures in Tables 3-36 and 3-37 are not mutually exclusive; some acreage was affected more than once by the same activity (such as initial harvest during one timber sale entry and subsequent harvest on the same area in 10 or 20 years) or by different activities (such as noncommercial thinning occurring on the same area that had been planted 10 years earlier).

Table 3-36 Summary of Historical Timber Harvest Activity for the School Fire Analysis Area

Years	Acres	Method	Silviculture Prescriptions for the Area
1950-1959	2,257	Tractor	Regeneration harvest – partial removal
1960-1969	4,506 407 4,913	Tractor Cable Decade Total	Regeneration harvest – partial removal; Regen harvest – clearcutting
1970-1979	1,827 4,420 410 6,657	Tractor Cable Skyline Decade Total	Regeneration harvest – partial removal; Regen harvest – clearcutting; Thinning; Shelterwood (seed cut and preparation cut)
1980-1989	581 1,413	Tractor Cable	Regeneration harvest – partial removal; Regen harvest – clearcutting; Thinning; Shelterwood (seed cut and

Years	Acres	Method	Silviculture Prescriptions for the Area
	451 2,445	Skyline Decade Total	preparation cut)
1990-1999	341 78 207 391 647 1,664	Tractor Cable Skyline Helicopter Cut-to-length Decade Total	Regeneration harvest – partial removal; Regen harvest – clearcutting; Regen harvest, individual tree; Thinning; Shelterwood (seed cut and preparation cut)
2000-2005	73 6 79	Tractor Cable Decade Total	Regeneration harvest, selection, individual tree, thinning, shelterwood, sanitation
TOTAL	18,015	1950-2005 total	

Table 3-37 Summary of Historical Tree Planting and Noncommercial Thinning Activity for School Fire Salvage Recovery Analysis Area

Years	Tree Planting Acres	Noncommercial Thinning Acres
1950-1959	0	0
1960-1969	259	39
1970-1979	333	237
1980-1989	716	447
1990-1999	897	887
2000-2005	99	513
TOTAL	2,304	2,123

The first commercial timber harvest included in Table 3-36 was a mid-1950s partial-removal timber sale in the Cummings Creek area. This early sale removed the largest and most valuable trees from the overstory. By the mid 1960s, small clearcut sales were made in the Abels Ridge and Scoggin Ridge portions of the School Fire analysis area. These early timber sale areas, which supported vigorous stands of mixed conifers at the time of the School Fire, had been thinned several times since the early 1970s (Johnson 1995, USDA Forest Service 2002b).

Other timber sales followed in the late 1960s and the 1970s, including several in the Ruchert Spring and Meadow Creek portions of the School Fire analysis area. Beginning in the mid 1970s, several timber sales were designed to harvest tree mortality resulting from an extensive outbreak of Douglas-fir tussock moth (Johnson 1995, USDA Forest Service 2002b).

Table 3-37 shows that approximately 2,300 acres of tree planting occurred in the School Fire analysis area between 1950 and 2005. If selected, Alternative A would not contribute any additional tree planting to this past and recent or present amount.

Proposed and Reasonably Foreseeable Actions - When considering proposed and reasonably foreseeable future actions, the cumulative effects context for Alternative A is based on these reforestation assumptions:

- Tree planting within the proposed action affected environment: 0 acres;
- Reasonably foreseeable tree planting outside the affected environment: 4,130 acres;
- Total tree planting (affected environment plus reasonably foreseeable): 4,130 acres;
- Natural reforestation within the proposed action affected environment: 9,430 acres;
- Natural reforestation outside the affected environment: 6,940 acres;
- Total natural reforestation (inside and outside the affected environment): 16,370 acres;
- Total reforestation within the School Fire analysis area (planted plus natural): 20,500 acres.

Cumulative Effects for Species Composition – Alternative A:

Selecting natural reforestation as the regeneration method for Alternative A is expected to influence how species composition will develop for the entire School Fire analysis area; Table 3-38 shows estimated trends in species composition for Alternative A.

Table 3-38 Cumulative Effects Trends For Species Composition For Alternative A (20,500 Acres).

	Pre-fire: 2004		Post-implementation: 2015		Future: 2055	
Cover Type	**Acres**	**Percent**	**Acres**	**Percent**	**Acres**	**Percent**
Douglas-fir	8,904	43	3,106	15	1,909	9
Grand fir	8,079	39	467	2	532	3
Lodgepole pine	233	1	175	1	3,182	16
Nonstocked*	116	1	13,188	64	0	0
Ponderosa pine	1,926	9	2,304	11	8,996	44
Subalpine fir	132	1	124	1	124	1
Western larch	1,109	5	1,138	6	5,758	28
Total	20,500	100	20,500	100	20,500	100

* Nonstocked refers to areas with low tree cover (<10% canopy cover); nonstocked areas are generally not completely devoid of trees.

Table 3-38 shows how the natural reforestation associated with Alternative A (9,430 acres) would influence species composition for the entire School Fire Salvage Recovery analysis area. By the year 2055, ponderosa pine and western larch would be the two most predominant cover types; near-term composition (2015) would be dominated by the nonstocked condition.

When compared with the cumulative effects for other alternatives, Alternative A is estimated to have slightly more of the nonstocked condition in 2015 (64 percent) than for Alternatives B and C (56 percent Table 3-47).

Cumulative Effects for Forest Structure - Alternative A:

Selecting natural reforestation as the regeneration method for alternative A is expected to influence how forest structure will develop for the entire School Fire analysis area; Table 3-39shows estimated trends in species composition for Alternative A.

Table 3-39 Cumulative Effects Trends For Forest Structure For Alternative A (20,500 Acres)

	Pre-fire: 2004		Post-implementation: 2015		Future: 2055	
Structure Class	**Acres**	**Percent**	**Acres**	**Percent**	**Acres**	Percent
Bareground	100	1	0	0	0	0
Stand initiation	1,626	8	19,570	96	9,346	46
Stem exclusion	12,887	63	492	2	3,733	18
Understory reinitiation	1,167	6	83	< 1	4,260	21
Young forest, multistrata	1,583	8	0	0	0	0
Old forest, single stratum	2,242	11	346	2	291	1
Old forest, multistrata	895	4	9	< 1	2,871	14
Total	20,500	100	20,500	100	20,500	100

Table 3-39 shows how the natural reforestation associated with Alternative A (9,430 acres) would contribute to a future mix of forest structure classes for the entire School Fire analysis area. By the year 2055, it is predicted that the predominant structure class would be stand initiation (46 percent); near-term structure (2015) would be overwhelmingly dominated by stand initiation (96 percent).

Although a substantial amount of stand initiation is expected immediately after a fire (96 percent in 2015), primarily because stand initiation represents the first stage of forest succession after a stand-replacing disturbance event, the amount of stand initiation still present in 2055 is greater than expected.

The amount of stand initiation in 2055 is the primary cumulative effects difference between alternatives because Alternative A is estimated to have much more of the stand initiation structure class in 2055 (46 percent) than Alternatives B and C (21 percent; Table 3-48).

For Alternative A, old forest structure would exist at relatively low levels in 2055 (15 percent for both classes combined). Although that result is not unexpected because old forest often requires more than 40-50 years to develop after a stand-replacing disturbance event, Alternative A would contribute slightly less old forest in the School Fire analysis area in 2055 than for Alternatives B and C (18 percent; Table 3-48).

Cumulative Effects for Tree Density - Alternative A:

Selecting natural reforestation as the regeneration method for Alternative A is expected to influence how tree density will develop for the entire School Fire analysis area; Table 3-40 shows estimated trends in tree density for Alternative A.

Table 3-40 Cumulative Effects Trends For Tree Density for Alternative A (20,500 Acres)

	Pre-fire: 2004		Post-implementation: 2015		Future: 2055	
Density Class	**Acres**	**Percent**	**Acres**	**Percent**	**Acres**	**Percent**
Low	6,624	32	20,169	98	14,886	73
Moderate	3,227	16	239	1	1,012	5
High	10,648	52	92	< 1	4,602	23
Total	20,500	100	20,500	100	20,500	100

Table 3-40 shows that the natural reforestation associated with alternative A (9,430 acres) would contribute to a future mix of tree density classes for the entire School Fire analysis area. By the year 2055, it is predicted that the predominant situation would be low-density forest (73 percent of the analysis area); near-term density would be overwhelmingly dominated by the low-density class (98 percent).

Although a substantial amount of low tree density is expected immediately after a fire (98 percent in 2015), primarily because direct or indirect effects related to the School Fire caused many of the live trees to die, the amount of low tree density is predicted to drop somewhat by 2055 (to 73 percent).

The amount of low tree density is the primary density difference between alternatives because Alternative A is estimated to have substantially more of the low density class in 2055 (73 percent) than Alternatives B and C (56 percent; Table 3-49), and correspondingly more of the moderate and high tree density classes.

Alternative A would not implement any tree planting activity on NFS lands in the School Fire Salvage Recovery analysis area, there is no opportunity to use artificial reforestation practices to hasten the return of desirable ranges of species composition, forest structure and tree density.

Note that "desirable ranges" is defined as ranges of composition, structure and density that meet established land and resource management objectives (e.g., desired future conditions) for an area; these ranges are provided as historical ranges of variability in Appendix E.

Since alternative A would not implement any additional timber harvest or tree planting activity on National Forest System (NFS) lands, there are no cumulative effects for the NFS portion of the School Fire Salvage Recovery analysis area that are specifically related to these silvicultural activities.

Alternative B – Proposed Action

Direct/Indirect Effects – Alternative B:

If alternative B is selected for implementation, then these forest vegetation activities would occur on its affected environment (see Appendix A for maps):

- Salvage timber harvest: 9,430 acres;
- Tree planting: 9,430 acres;
- Natural reforestation: 0 acres.

Salvage timber harvest is not expected to have direct or indirect effects on species composition, forest structure or tree density because these indicators are derived (calculated) using live trees and the salvage harvest activity would affect dead and dying trees only.

Direct/Indirect Effects for Species Composition - Alternative B:

Selecting tree planting as the regeneration method for Alternative B is expected to influence how species composition develops for the Alternative B affected environment; Table 3-41 shows estimated trends in species composition for Alternative B.

Table 3-41 Species Composition Trends For Alternative B Affected Environment (9,430 Acres)

	Pre-fire: 2004		Post-implementation: 2015		Future: 2055	
Cover Type	**Acres**	**Percent**	**Acres**	**Percent**	**Acres**	Percent
Douglas-fir	4,379	46	2,417	26	827	9
Grand fir	4,318	46	535	6	178	2
Lodgepole pine	39	< 1	4	< 1	4	< 1
Nonstocked*	16	< 1	5,026	53	0	0
Ponderosa pine	625	7	1,198	13	6,754	72
Subalpine fir	52	1	58	1	58	1
Western larch	1	< 1	194	2	1,609	17
Total	9,430	100	9,430	100	9,430	100

* Nonstocked refers to areas with low tree cover (<10% canopy cover); nonstocked areas are generally not completely devoid of trees.

Table 3-41 shows that the tree planting associated with Alternative B would establish a mix of species composition by the year 2055 with ponderosa pine being the predominant cover type (72 percent), and that the nonstocked condition comprises a majority of the near-term composition (53 percent of the area in 2015).

The amount of nonstocked area in 2015 is the primary composition difference between Alternatives because Alternative B is estimated to have less of the nonstocked condition in 2015 (53 percent) than Alternative A (71 percent; Table 3-33). Alternative B has slightly more nonstocked area in 2015 than the other action Alternative (47 percent for Alternative C; see Table 3-44).

Direct/Indirect Effects for Forest Structure - Alternative B:

Selecting tree planting as the regeneration method for Alternative B is expected to influence how forest structure develops for the Alternative B affected environment; Table 3-42 shows estimated trends in forest structure for Alternative B.

Table 3-42 Forest Structure Trends for Alternative B Affected Environment (9,430 Acres)

	Pre-fire: 2004		Post-implementation: 2015		Future: 2055	
Structure Class	**Acres**	**Percent**	**Acres**	**Percent**	**Acres**	**Percent**
Bare ground	0	0	0	0	0	0
Stand initiation	36	< 1	9,082	96	1,279	14
Stem exclusion	7,034	75	235	3	2,690	29
Understory reinitiation	192	2	6	< 1	3,514	37
Young forest, multistrata	1,063	11	0	0	0	0
Old forest, single stratum	890	9	107	1	98	1
Old forest, multistrata	217	2	0	0	1,848	20
Total	9,430	100	9,430	100	9,430	100

Table 3-42 shows that the tree planting associated with Alternative B would establish a relatively well-distributed mix of forest structure classes by the year 2055, and that "more complex" (multi-layered) forest structure would be well represented by then (specifically, the understory reinitiation and old forest multistrata classes).

Although a substantial amount of stand initiation is expected immediately after a fire (96 percent in 2015), primarily because stand initiation represents the first stage of forest succession after a stand-replacing disturbance event, the amount of stand initiation present in 2055 is low (14 percent) and this result is expected if forest development processes are functioning properly to move stand initiation into other structural classes.

The amount of stand initiation is the primary structure difference between Alternatives because Alternative B is estimated to have much less of the stand initiation structure class in 2055 (14 percent) than Alternative A (67 percent; Table 3-34). Alternative B has more stand initiation in 2055 than the other action Alternative (6 percent for Alternative C; Table 3-45).

Direct/Indirect Effects for Tree Density - Alternative B:

Selecting tree planting as the regeneration method for Alternative B is expected to influence how tree density develops for the Alternative B affected environment; Table 3-43 shows estimated trends in tree density for Alternative B.

Table 3-43 Tree Density Trends for Alternative B Affected Environment (9,430 Acres)

	Pre-fire: 2004		Post-implementation: 2015		Future: 2055	
Density Class	**Acres**	**Percent**	**Acres**	**Percent**	**Acres**	**Percent**
Low	2,273	24	9,349	99	5,171	55
Moderate	1,792	19	79	1	581	6
High	5,365	57	2	< 1	3,678	39
Total	9,430	100	9,430	100	9,430	100

Table 3-43 shows that the tree planting associated with Alternative B would establish a mix of tree density classes by the year 2055, and that the predominant density class for both 2015 and 2055 would be low.

Although a substantial amount of low tree density is expected immediately after a fire (99 percent in 2015), primarily because direct or indirect effects related to the School Fire caused many of the live trees to die, the amount of low tree density is predicted to drop substantially by 2055 (to 55 percent).

The amount of low tree density is the primary density difference between Alternatives because Alternative B is predicted to have substantially less of the low density class in 2055 (55 percent) than Alternative A (91 percent Table 3-35), and correspondingly more of the moderate and high tree density classes. Alternative B has slightly more of the low-density class in 2055 than Alternative C (52 percent Table 3-46).

Alternative C

Direct/Indirect Effects – Alternative C:

If Alternative C is selected for implementation, then these forest vegetation activities would occur on its affected environment (see Appendix A for maps):

- Salvage timber harvest: 4,190 acres;
- Tree planting: 4,190 acres;
- Natural reforestation: 0 acres.

Salvage timber harvest is not expected to have direct or indirect effects on species composition, forest structure or tree density because these indicators are derived (calculated) using live trees and the salvage harvest activity would affect dead and dying trees only.

Direct/Indirect Effects for Species Composition - Alternative C

Selecting tree planting as the regeneration method for Alternative C is expected to influence how species composition develops for the Alternative C affected environment; Table 3-44 shows estimated trends in species composition for Alternative C.

Table 3-44 Species Composition Trends For Alternative C Affected Environment (4,190 Acres)

	Pre-fire: 2004		Post-implementation: 2015		Future: 2055	
Cover Type	**Acres**	**Percent**	**Acres**	**Percent**	**Acres**	**Percent**
Douglas-fir	2,441	58	1,454	35	472	11
Grand fir	1,433	34	97	2	20	1
Lodgepole pine	3	< 1	3	< 1	3	< 1
Nonstocked*	0	0	1,984	47	0	0
Ponderosa pine	313	8	583	14	2,672	64
Subalpine fir	0	0	0	0	0	0
Western larch	0	0	70	2	1,022	24
Total	4,190	100	4,190	100	4,190	100

* Nonstocked refers to areas with low tree cover (<10% canopy cover); nonstocked areas are generally not completely devoid of trees.

Table 3-41 shows that the tree planting associated with Alternative C would establish a mix of species composition by the year 2055 with ponderosa pine being the predominant cover type (64 percent), and that the nonstocked condition comprises a majority of the near-term composition (47 percent of the area in 2015).

The amount of nonstocked area in 2015 is the primary composition difference between Alternatives because Alternative C is estimated to have less of the nonstocked condition in 2015 (47 percent) than Alternative A (71 percent; Table 3-33) or Alternative B (53 percent; Table 3-41).

Direct/Indirect Effects for Forest Structure - Alternative C

Selecting tree planting as the regeneration method for Alternative C is expected to influence how forest structure develops for the Alternative C affected environment; Table 3-45 shows estimated trends in forest structure for Alternative C.

Table 3-45 Forest Structure Trends for Alternative C Affected Environment (4,190 Acres)

	Pre-fire: 2004		Post-implementation: 2015		Future: 2055	
Structure Class	**Acres**	**Percent**	**Acres**	**Percent**	**Acres**	**Percent**
Bare ground	0	0	0	0	0	0
Stand initiation	9	< 1	4,077	97	246	6
Stem exclusion	3,296	79	86	2	1,327	32
Understory reinitiation	147	4	0	0	1,868	45
Young forest, multistrata	371	9	0	0	0	0
Old forest, single stratum	243	6	26	1	20	1
Old forest, multistrata	125	3	0	0	730	17
Total	4,190	100	4,190	100	4,190	100

Table 3-45 shows that the tree planting associated with Alternative C would establish a relatively well-distributed mix of forest structure classes by the year 2055, and that “more complex” (multi-layered) forest structure would be well represented by then (specifically, the understory reinitiation and old forest multistrata classes).

Although a substantial amount of stand initiation is expected immediately after a fire (97 percent in 2015), primarily because stand initiation represents the first stage of forest succession after a stand-replacing disturbance event, the amount of stand initiation present in 2055 is very low (6 percent) and this result is expected if forest development processes are functioning properly to move stand initiation into other structural classes.
The amount of stand initiation is the primary structure difference between Alternatives because Alternative C is estimated to have much less of the stand initiation structure class in 2055 (6 percent) than Alternative A (67 percent; Table 3-34), and less stand initiation in 2055 than Alternative B (14 percent; Table 3-42).

Direct and Indirect Effects for Tree Density - Alternative C

Selecting tree planting as the regeneration method for Alternative C is expected to influence how tree density develops for the Alternative C affected environment; Table 3-46 shows estimated trends in tree density for Alternative C.

Table 3-46 Tree Density Trends for Alternative C Affected Environment (4,190 Acres)

	Pre-fire: 2004		Post-implementation: 2015		Future: 2055	
Density Class	**Acres**	**Percent**	**Acres**	**Percent**	**Acres**	**Percent**
Low	1,302	31	4,170	99	2,196	52
Moderate	832	20	20	1	372	9
High	2,056	49	0	0	1,622	39
Total	4,190	100	4,190	100	4,190	100

Table 3-46 shows that the tree planting associated with Alternative C would establish a mix of tree density classes by the year 2055, and that the predominant density class for both 2015 and 2055 would be low.

Although a substantial amount of low tree density is expected immediately after a fire (99 percent in 2015), primarily because direct or indirect effects related to the School Fire caused many of the live trees to die, the amount of low tree density is predicted to drop substantially by 2055 (to 52 percent).

The amount of low tree density is the primary density difference between Alternatives because Alternative C is estimated to have substantially less of the low density class in 2055 (52 percent) than Alternative A (91 percent; Table 3-35), and correspondingly more of the moderate and high tree density classes. Alternative B has slightly more of the low-density class in 2055 (55 percent; Table 3-43 than Alternative C.

Cumulative Effects Common to Action Alternatives (B and C)

Salvage timber harvest is not expected to have cumulative effects on species composition, forest structure or tree density because these indicators are derived (calculated) using live trees and the salvage harvest activity would affect dead and dying trees only.

Selecting tree planting as the regeneration method for Alternatives B and C is expected to influence how species composition, forest structure and tree density will develop for the entire School Fire analysis area.

Tree planting activities associated with Alternatives B and C are estimated to have cumulative effects on species composition, forest structure and tree density for the School Fire Salvage Recovery analysis area.

The cumulative effects context for Alternative B is based on these reforestation assumptions:

- Tree planting proposed action within the Alternative B affected environment: 9,430 acres;
- Reasonably foreseeable tree planting outside the affected environment: 4,130 acres;
- Total tree planting (affected environment plus reasonably foreseeable): 13,560 acres;
- Natural reforestation, or no reforestation need, outside the tree planting areas: 6,940 acres;
- Total reforestation within the School Fire analysis area: 20,500 acres.

The cumulative effects context for Alternative C is based on these reforestation assumptions:

- Tree planting proposed action within the Alternative C affected environment: 4,190 acres;
- Reasonably foreseeable tree planting outside the affected environment: 9,370 acres;
- Total tree planting (affected environment plus reasonably foreseeable): 13,560;
- Natural reforestation, or no reforestation need, outside the tree planting areas: 6,940 acres;
- Total reforestation within the School Fire analysis area: 20,500 acres.

These reforestation assumptions show that implementing either Alternative B or C would result in an identical outcome: establishing appropriate forest cover (the DFC) would occur using 13,560 acres of tree planting and 6,940 acres of natural reforestation.

This result occurred because the reasonably foreseeable tree planting associated with the School Fire Salvage Recovery Project results in the same amount of tree planting, regardless of which action alternative is selected for implementation.

Because reforestation amounts are the same for both action alternatives, the cumulative effects of Alternatives B and C on species composition, forest structure, and tree density are also expected to be the same, and they are discussed together.

Cumulative Effects for Species Composition - Alternatives B and C

Selecting tree planting as the regeneration method for Alternatives B and C is expected to influence how species composition would develop for the entire School Fire analysis area; Table 3-47 shows estimated cumulative effects trends for species composition.

Table 3-47 Cumulative Effects Trends for Species Composition For Alternatives B and C (20,500 Acres)

	Pre-fire: 2004		Post-implementation: 2015		Future: 2055	
Cover Type	**Acres**	**Percent**	**Acres**	**Percent**	**Acres**	**Percent**
Douglas-fir	8,904	43	3,885	19	1,712	8
Grand fir	8,079	39	899	4	584	3
Lodgepole pine	233	1	174	1	1,382	7
Nonstocked*	116	1	11,550	56	0	0
Ponderosa pine	1,926	9	2,973	15	12,173	59
Subalpine fir	132	1	124	1	124	1
Western larch	1,109	5	894	4	4,527	22
Total	20,500	100	20,500	100	20,500	100

Nonstocked refers to areas with low tree cover (<10% canopy cover); nonstocked areas are generally not completely devoid of trees.

Table 3-47 shows how the tree planting activity associated with Alternatives B and C (13,560 acres counting reasonably foreseeable future actions) would influence species composition for the entire School Fire analysis area. By the year 2055, ponderosa pine and western larch are estimated to be the predominant cover types; near-term composition would be dominated by the nonstocked condition (56 percent in 2015).
When compared with Alternative A – no action, Alternatives B and C are estimated to contribute slightly less of the nonstocked condition in 2015 (56 percent) than for Alternative A (64 percent; Table 3-38).

Cumulative Effects for Forest Structure - Alternatives B and C

Selecting tree planting as the regeneration method for Alternatives B and C is expected to influence how forest structure would develop for the entire School Fire analysis area; Table 3-48 shows estimated cumulative effects trends for forest structure.

Table 3-48 Cumulative Effects Trends For Forest Structure For Alternatives B and C (20,500 Acres)

	Pre-fire: 2004		Post-implementation: 2015		Future: 2055	
Structure Class	**Acres**	**Percent**	**Acres**	**Percent**	**Acres**	**Percent**
Bare ground	100	1	0	0	0	0
Stand initiation	1,626	8	19,469	95	4,311	21
Stem exclusion	12,887	63	593	3	5,623	27
Understory reinitiation	1,167	6	83	< 1	6,825	33
Young forest, multistrata	1,583	8	0	0	0	0
Old forest, single stratum	2,242	11	346	2	290	1
Old forest, multistrata	895	4	9	< 1	3,451	17
Total	20,500	100	20,500	100	20,500	100

Table 3-48 shows how the tree planting activity associated with Alternatives B and C (13,560 acres counting reasonably foreseeable future actions) would influence forest structure for the entire School Fire analysis area. By the year 2055, understory reinitiation and stem exclusion are estimated to be the predominant structure classes; near-term forest structure would be overwhelmingly dominated by the stand initiation condition (95 percent in 2015).

Although a substantial amount of stand initiation is expected immediately after a fire (95 percent in 2015), primarily because stand initiation represents the first stage of forest succession after a stand-replacing disturbance event, the amount of stand initiation present in 2055 is relatively low (21 percent) and this result is expected if forest development processes are functioning properly to move stand initiation into other structural classes.

When compared with the no-action Alternative, Alternatives B and C are estimated to contribute much less of the stand initiation structure class in 2055 (21 percent) than Alternative A (46 percent; Table 3-39).

Cumulative Effects for Tree Density - Alternatives B and C

Selecting tree planting as the regeneration method for Alternatives B and C is expected to influence how tree density will develop for the entire School Fire analysis area; Table 3-49 shows estimated cumulative effects trends for tree density.

Table 3-49 Cumulative Effect Trends for Tree Density for Alternatives B and C (20,500 acres)

	Pre-fire: 2004		Post-implementation: 2015		Future: 2055	
Density Class	**Acres**	**Percent**	**Acres**	**Percent**	**Acres**	**Percent**
Low	6,624	32	20,169	98	11,448	56
Moderate	3,227	16	239	1	1,451	7
High	10,648	52	92	< 1	7,601	37
Total	20,500	100	9,430	100	20,500	100

Table 3-49 shows how the tree planting activity associated with Alternatives B and C (13,560 acres counting reasonably foreseeable future actions) would influence tree density classes for the entire School Fire analysis area. By the year 2055, low tree density is estimated to be the predominant situation; near-term density would be overwhelmingly dominated by the low-density condition (98 percent).

Although a substantial amount of low tree density is expected immediately after a fire (98 percent in 2015), primarily because direct or indirect effects related to the School Fire caused many of the live trees to die, the amount of low tree density is predicted to drop by 2055 (to 56 percent).

The amount of low tree density is the primary cumulative effects difference between Alternatives because Alternatives B and C are estimated to have substantially less of the low density class in 2055 (56 percent) than Alternative A (73 percent; Table 3-40), and correspondingly more of the moderate and high tree density classes.

Summary of Cumulative Effects by All Alternatives

Tables 3-50 to 3-52 summarize estimated cumulative effects by alternative and by year. These tables also include estimated historical ranges of variability (HRV) approximating the midpoints of the “dry upland forestland” and “moist upland forestland” HRV ranges presented in Appendix E (note: the School Fire analysis area contains about the same amounts of dry upland forestland and moist upland forestland (Table E-4, Appendix E) so it was considered appropriate to use the midpoints from both sets of ranges for this section).

Table 3-50 Cumulative Effects Trends For Species Composition By Alternative and By Year (20,500 Acres)

	Alternative A		Alternatives B & C		Expected (HRV)
Cover Type	**2015 (%)**	**2055 (%)**	**2015 (%)**	**2055 (%)**	**Range: Percent**
Douglas-fir	15	9	19	8	10-25
Grand fir	2	3	4	3	5-20
Lodgepole pine	1	16	1	7	5-20
Nonstocked*	64	0	56	0	0-5
Ponderosa pine	11	44	15	59	10-70
Subalpine fir	1	1	1	1	0-10
Western larch	6	28	4	22	5-20
Total	100	100	100	100	

* Nonstocked refers to areas with low tree cover (<10% canopy cover); nonstocked areas are generally not completely devoid of trees.

Table 3-50 shows that all of the Alternatives would result in a well distributed mix of species composition by the year 2055, and that the percentages by cover type are generally close to what would be expected as approximated by using the historical range of variability concept.

Table 3-51 Cumulative Effects Trends For Forest Structure By Alternative and By Year (20,500 Acres)

	Alternative A		Alternatives B & C		Expected (HRV)
Structure Class	**2015 (%)**	**2055 (%)**	**2015 (%)**	**2055 (%)**	**Range: Percent**
Bare ground	0	0	0	0	0-5
Stand initiation	96	46	95	21	5-10
Stem exclusion	2	18	3	27	10-15
Understory reinitiation	< 1	21	< 1	33	5-15
Young forest, multistrata	0	0	0	0	15-50
Old forest, single stratum	2	1	2	1	5-35
Old forest, multistrata	< 1	14	< 1	17	10-20
Total	100	100	100	100	

Table 3-51 shows that all of the alternatives would result in a relatively well distributed mix of forest structure classes by the year 2055. The no-action Alternative, however, would have substantially more stand initiation present in 2055 than the action Alternatives, and both sets of Alternatives would have more stand initiation in 2055 than would be expected from the historical range of variability concept.

Table 3-52 Cumulative Effects Trends For Tree Density By Alternative and By Year (20,500 Acres)

	Alternative A		Alternatives B & C		Expected (HRV)
Density Class	**2015 (%)**	**2055 (%)**	**2015 (%)**	**2055 (%)**	**Range: Percent**
Low	98	73	98	56	30-60
Moderate	1	5	1	7	30-50
High	< 1	23	< 1	37	10-20
Total	100	100	100	100	

Table 3-52 shows that all of the Alternatives would result in a relatively well distributed mix of tree density classes by the year 2055. The no-action Alternative, however, would have substantially more low tree density present in 2055 than the action Alternatives, and both sets of Alternatives would have less of the moderate class and more of the high class than would be expected from the historical range of variability concept.

National Forest Management Act - Finding of Consistency:

All action alternatives would provide timber to help meet the demand for wood products and provide socioeconomic benefits to the American people. The action alternatives would recover timber volume and economic value from dead and dying trees, thereby contributing to a portion of the Forest Plan's allowable sale quantity (see Forest Plan (FP), Chapter 4).

The salvage timber harvest silvicultural activity is authorized by the National Forest Management Act of 1976 (P.L. 94-588), including its amendments to the Forest and Rangeland Renewable Resources Planning Act of 1974 (P.L. 93-378), as one permitted response to "natural uncharacteristic conditions such as fire, insect and disease attack, or windstorm" (Sec. 6, (g), (3), (F), (iv)).

The Umatilla National Forest Land and Resource Management Plan permits salvage timber harvest for nine of the ten management allocations occurring in the School Fire Salvage Recovery area. The Forest Plan does not permit salvage timber harvest for the D2-Reasearch Natural Area management allocation and no salvage harvest activity is proposed for lands allocated to that management area.

The National Forest Management Act of 1976 (P.L. 94-588), including its amendments to the Forest and Rangeland Renewable Resources Planning Act of 1974 (P.L. 93-378), states that when trees are cut to achieve timber production objectives, the cuttings shall be made in such a way that "there is assurance that such lands can be adequately restocked within 5 years after harvest" (P.L. 93-378, Sec. 6, (g), (3), (E), (ii)). The Forest Plan also includes this standard (see FP, page 4-70).

All of the proposed salvage timber harvest areas are also proposed for tree planting to ensure that they would be adequately restocked within 5 years after harvest.

The National Forest Management Act of 1976 (P.L. 94-588), including its amendments to the Forest and Rangeland Renewable Resources Planning Act of 1974 (P.L. 93-378) states that "it is the policy of the Congress that all forested lands in the National Forest System be maintained in appropriate forest cover with species of trees, degree of stocking, rate of growth, and conditions of stand designed to secure the maximum benefits of multiple use sustained yield management in accordance with land management plans."

Reforestation (tree planting) proposals would be consistent with National Forest Management Act requirements to maintain forested lands in appropriate forest cover, and with related Forest Plan goals, objectives, standards and guidelines (see FP, pages 4-70 to 4-74).

Implementation specifications for the tree planting activity would ensure that Forest Plan minimum stocking level standards (see Table 2-1, Chapter 2) are met. Reforestation activities are needed to help meet desired future condition goals from the Forest Plan (see FP, chapter 4).

FUELS

SCALE OF ANALYSIS

The analysis area is the School Fire Salvage Recovery project area. Information is limited to the National Forest System (NFS) land portion of the fire.

The indicators to be carried through the analysis for comparison purposes:

- Fuel Loading
    - Coarse Woody Debris (CWD) or large woody fuels is typically defined as dead standing and downed pieces larger than 3 inches in diameter (Brown et al. 2003, Harmon and others 1986), which corresponds to the size class that defines large woody fuel. Coarse woody debris is an important component in the structure and functioning of ecosystems. A dead tree, from the time it dies until it is fully decomposed, contributes to many ecological processes as a standing snag and fallen woody material lying on and in the soil.
- Resistance-to-Control

School Fire has created a dilemma for land managers: to decide where and how to manage fire-killed trees in the new developing forest in the School Fire area. Decisions about taking action come down to two questions: Where on the landscape should cutting and fuel treatment be undertaken and how much of what sized material should be removed? An important goal in dealing with these concerns is to manage toward quantities of accumulated downed woody material such that the risk of damage from a reburn is acceptable and benefits derived from coarse woody debris (CWD) can be realized (Brown 2003).

AFFECTED ENVIRONMENT

Natural Fire Regimes

A natural fire regime is a general classification of the role fire would play across a landscape in the absence of modern human mechanical intervention, but including the influence of aboriginal burning (Agee 1993, Brown 1995). Natural fire regimes describe the historic fire conditions under which vegetative communities evolve and are maintained. These represent the structure and composition of vegetation in a fire environment in the absence of human interaction. The high severity fire regimes were those in which the effect of a fire was usually a stand replacement event. The low severity fire regimes were those in which the typical fire was gentle to dominant vegetation across much of the area it burned, while moderate severity fire regimes had a complex mix of severity levels (Agee 1998).

Coarse scale definitions for natural (historic) fire regimes have been developed by Hardy et al. (2001) and Schmidt et al. (2002) and interpreted for fire and fuels management by Hann and Bunnell (2001). The five natural (historical) regimes are classified based on average number of years between fires (fire frequency) combined with the severity (amount of replacement) of the fire on the dominant overstory vegetation. These five natural fire regime groups are described in Table 3-53.

Table 3-53 Natural Fire Regime Groups

Fire Regime Group	Fire Return Frequency	Fire Intensity/Severity
I	0-35 years	Low to mixed severity (surface fires most common with less than 75 % of the overstory vegetation replaced)
II	0-35 years	High severity (stand replacement with greater than 75% of the dominant overstory replaced)
III	35-100+ years	Mixed (less than 75 % of the overstory vegetation replaced)
IV	35-100+ years	High severity (stand replacement with greater than 75% of the dominant overstory replaced)
V	>200 years	High severity (stand replacement with greater than 75% of the dominant overstory replaced)

School Fire Salvage Recovery project area is represented by Fire Regime I, II, and III. It is composed of 36 percent dry upland forest which is classified as Fire Regime I, and 38 percent of moist upland forest which is classified as Fire Regime III. The remaining 26 percent is mountain grasslands and are classified as Fire Regime II. Of the forested land within the analysis area 48 percent is Fire Regime I, and 52 percent is Fire Regime III. Table 3-54 lists the historic fire regime groups and Figure 3-3 (map) visually displays the fire regime groups for the School Fire Salvage Recovery project area.

Table 3-54 Fire Regime and Acres Within School Fire Analysis Area

Fire Regime	Acres	Percent
I	9,890	36
II	7,218	26
III	10,588	38
IV	0	0
V	0	0

Source/Notes: Summarized from the School Recovery vegetation database as developed from the vegetation database; acres and percents include National Forest System lands only. Fire regime classification based on Potential Vegetation Group.

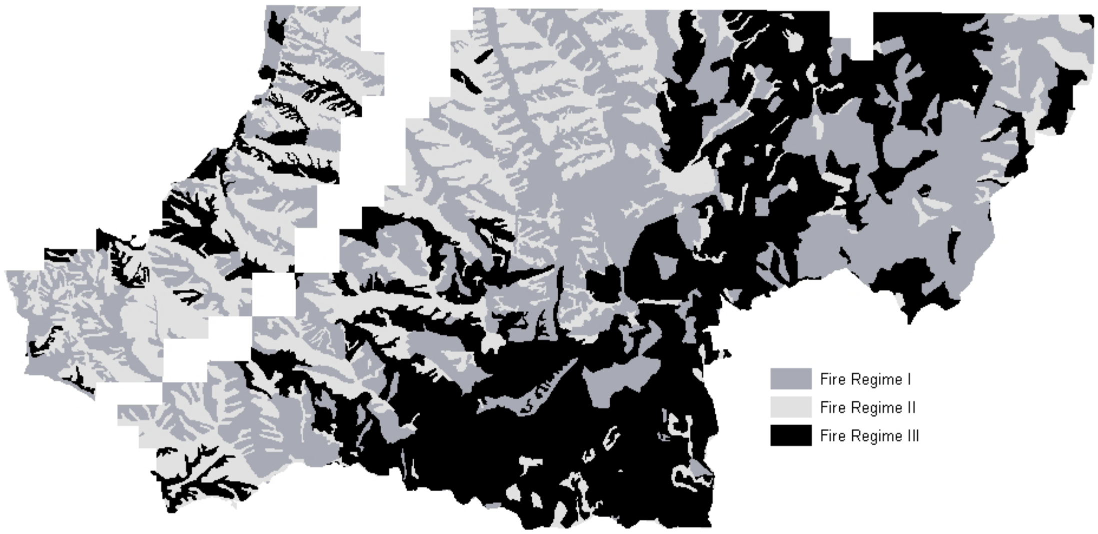
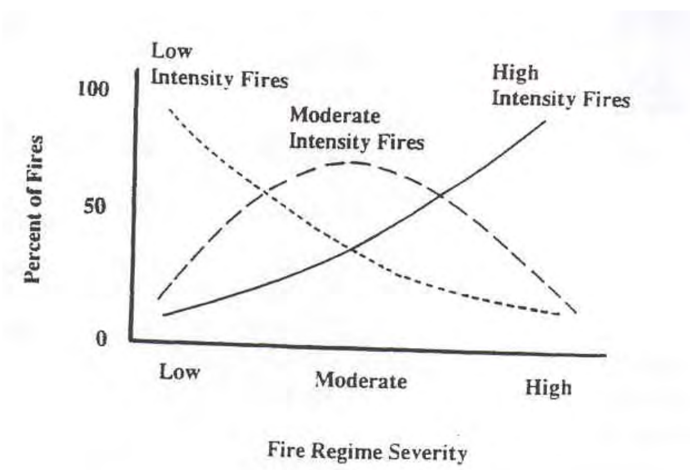


Figure 3-3 (map) Fire Regime classifications for National Forest System lands in the School Fire analysis area. Fire characterizes the historic fire regime (intensity and frequency) for an ecosystem. Fire Regime I and III are forested stands. Fire Regime II is grasslands.

Figure 3-4 below displays the historic fire intensity and associated effects by fire regime. Table 3-55 numerically describes the ranges of burn severity that would have historically been experienced by each fire regime.

Figure 3-4. Historic fire intensity and associated effects varied by fire regime.



Sources/Notes: Table from Agee 1998 (see Agee's Figure 1)

Table 3-55 Historical Range Of Variability Analysis For Predicted Burn severity

Historical Fire Regime	Predicted Burn severity Rating	Historical Range (%)
Low Severity (Fire Regime I)	Low	60-90
	Moderate	20-60
	High	10-20
Mixed Severity (Fire Regime III)	Low	20-60
	Moderate	50-70
	High	20-60
Sources/Notes: Historical percentages were derived from Agee (1998, see his figure 1).		

The landscape natural fire regime group of Fire Regime I and III corresponds well with the historic forest structures and species compositions of School Fire Salvage Recovery project area. Prior to organized suppression in the early twentieth century, frequent fires of varying intensities characterized the School Fire Recovery analysis area. For example, within the Tucannon drainage, Heyerdahl (1996) found the mean fire return interval to be approximately 24 years. These fires were usually low intensity surface fires, but when topography, fuels, and weather were aligned high intensity fire would develop. This resulted in a fire regime with a vegetative montage generally dominated by early seral, fire adapted, and fire resistant species. A large portion of the School Fire landscape experienced frequent fires of low severity fires that maintained open forest structures as well as mixed severity fires which created a mosaic of different age post-fire open forest, early to mid-seral forest structural stages, and shrub or herb dominated patches.

Fire regimes (characteristics of fire such as the intensity, frequency, season, size, and extent that create particular fire effects in a biogeographical region) can be altered by fire exclusion and land management practices. In the western United States, alteration of fire regimes by fire exclusion has been greatest in dry forests, primarily those dominated by ponderosa pine, Douglas-fir, or both (Graham 2004). School Fire Salvage Recovery project area is an excellent example of this scenario. Forested stands contained a high accumulation of flammable fuels as compared to fuel conditions prior to fire exclusion. Great changes had occurred within these stands that were historically characterized by high frequency, low intensity fires. Dense stands and forest structures had become common. These conditions with abundant surface and ladder fuels, and low canopy base heights readily facilitated the development of high intensity crown fire. During severe fire weather conditions of August 2005, changes in forest stands and a concurrent increase in down woody fuel loadings created a fire behavior shift from what would have been historically a fast moving, but low intensity surface and mixed severity fire to a fast moving, high intensity crown replacement and mixed severity fire.

The predominant burn severity category in the School Fire was high. High severity fire burned through 86 percent of the Fire Regime I area and 69 percent of the Fire Regime III area. The fire effects were severe enough to kill 75 percent or more of the trees in these stands. Moderate severity fire burned through 12 percent of the Fire Regime I area, and 20 percent of the Fire Regime III area killing between 31 percent and 74 percent of the trees. Low severity fire only occurred on 2 percent of the Fire Regime I area and 11 percent of the Fire Regime III area. Trees in these areas suffered less than 30 percent mortality. Table 3-56 characterizes burn severity experienced for Fire Regime I and Fire Regime III forested stands and compares it to the historic range of burn severity.

Table 3-56 Burn severity Experienced In Fire Regimes I And III Forested Stands In School Fire Salvage Recovery Project Area As Compared To The Historic Range

HISTORICAL FIRE REGIME	BURN SEVERITY RATING	HISTORICAL RANGE (%)	SCHOOL FIRE ACRES	SCHOOL FIRE (%)	INTERPRETATION
Low Severity (Fire Regime I)	Low	60-90	181	2	Well below HRV
	Moderate	20-60	1,220	12	Below HRV
	High	10-20	8,489	86	Well above HRV
Mixed Severity (Fire Regime III)	Low	20-60	1,137	11	Below HRV
	Moderate	50-70	2,108	20	Well below HRV
	High	20-60	7,343	69	Above HRV
Sources/Notes: Summarized from the School Fire vegetation database; acres include all NFS forested lands. Fire regime classification based on Potential Vegetation Group. Historical percentages were derived from Agee (1998, see his figure 1).					

Burn severity experienced in School Fire Salvage Recovery project area was well above the historical range of variability. Greater than historic density of trees, ladder fuel development, and ground fuel loadings were undoubtedly large contributors to this uncharacteristic fire event.

Fire Hazard

Fire hazard generally refers to the difficulty of controlling potential wildfire. It refers to the potential intensity or severity of a fire given a particular fuel source or fuel level. It is commonly determined by fire behavior characteristics such as rate-of-spread, intensity, torching, crowning, spotting, and fire persistence, and by resistance-to-control. Burn severity is considered to be an element of fire hazard for this analysis. Burn severity refers to the effects of fire on the ecosystem. It depends on fuel consumption and heat flux into all living components. Small and large downed woody fuels contribute differently to the various elements of fire hazard (Brown 2003). Amount, arrangement, and types of fuels determine the fuel model which describes the predicted fire behavior.

Fuel Loading

Small Woody Fuels

The influence of small woody fuels (3 inches and less in diameter) on spread rate and intensity of surface fires and associated torching and crowning is substantial and can be estimated using widely accepted fire behavior models (described below) (Andrews 1986; Finney 1998; Rothermel 1983; Scott and Reinhardt 2001).

Frequent surface fires that characterized the mixed conifer stands in School Fire Salvage Recovery project area had been effectively eliminated since the early 1900's. Hence, many stands had become dominated and overstocked by shade tolerant fir species. The amount of down woody debris on the ground was also higher than would be expected to occur in a natural fire regime. Quantities of down woody fuel that existed prior to 1900 can be reasonably inferred from pre-fire existing down woody fuel loads and knowledge of fire history and fuel consumption. It is reasonable to assume that the historic amount of down woody fuel would have been less because of frequent fire occurrence and associated fuel consumption. Although fire both creates and consumes fuel (Brown 1995), fuel depletion would tend to be greater than fuel accretion in high frequency fire regime types such as the warm, dry ponderosa pine and Douglas-fir types (Brown 2003). Fuel loads likely varied throughout the landscape with many stands having little down woody material and a few stands having excessive accumulations.

Table 3-57 below displays pre-fire, current, and maximum desired small diameter (less than 3 inch diameter) fuel loading by fire regime.

Table 3-57 Estimated Average Pre-Fire, Current, and Desired Maximum Small Woody Fuel Loadings

Historical Fire Regime	Pre-fire <3 inch fuels (Tons/Acre)	Current <3 inch fuels (Tons/Acre)	Maximum Desired <3 inch fuels (Tons/Acre)
Low Severity (Fire Regime I)	6.2	1.7	3
Mixed Severity (Fire Regime III)	6.2	4.3	5

Sources/Notes: Pre-fire and current fuel loadings were determined using FVS-FFE. Original fuel load inputs into FVS were based on estimations using the Photo Series for Quantifying Natural Forest Residues in Common Vegetation Types of the Pacific Northwest (Maxwell and Ward 1980). Desired maximum small wood fuel loadings are based on predictions of ground fuel loadings that may have occurred under the natural fire regime (Brown 2003). Small woody fuel is in addition to adequate levels of CWD.

Fuel loadings were reduced during School Fire by varying amounts depending on the burn severity experienced by the stand. These reductions are generally summarized by severity ratings described below.

Low Burn severity: Areas with low burn severity experienced low to severe underburns, which resulted in low mortality of overstory trees. About 10 to 50 percent of the surface fuels (i.e., shrubs and grass) were consumed and 15 to 35 percent of the down woody fuels were consumed (dependent on size class, the smaller the fuels, the higher the consumption). Fire results were similar to an underburn.

Moderate Burn severity: These areas burned at varying degrees. Mixed severity created a mosaic of dead and green trees. Mortality of overstory trees ranged from 30 to 74 percent. Surface fuels were consumed in varying patterns. There was an average of reduction of 50 to 80 percent of the ground vegetation and 40 to 70 percent of existing down woody material. As fire-killed trees decompose and fall to the ground, fuel loadings will progressively increase over the next 30 years. Fuel loadings will vary on the landscape and will change over time. Future fuel loadings and potential fire intensity will be determined by fuel management treatments that are implemented on standing and down fuels.

High Burn severity: In the high severity areas, surface fuels were generally consumed by the fire. Many of these stands suffered at least 90 percent mortality. This resulted in many areas where little to no fine fuels remain with only scattered large woody fuels. There was an average down woody fuel reduction of 45 to 90 percent, depending on fuel size class. As fire-killed trees begin to fall, fuel loadings will increase tremendously over the next 10 to 30 years. Future fuel loadings and fire hazard will be determined by fuel management treatments that are implemented on standing and down fuels.

Coarse Woody Debris (CWD) – Large Woody Fuels

Coarse woody debris (CWD) is typically defined as dead standing and downed pieces larger than 3 inches in diameter (Harmon and others 1986), which corresponds to the size class that defines large woody fuel. Coarse woody debris is an important component in the structure and functioning of ecosystems. A dead tree, from the time it dies until it is fully decomposed, contributes to many ecological processes as a standing snag and fallen woody material lying on and in the soil.

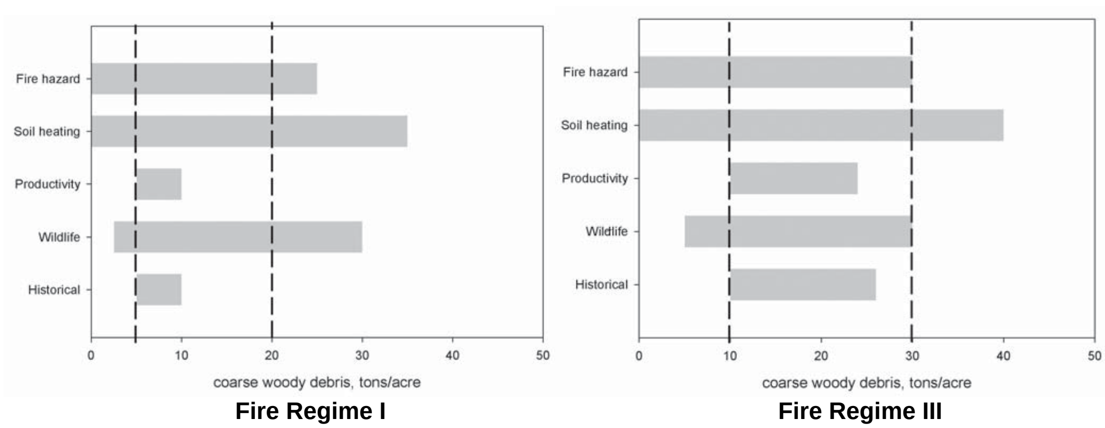
The amount of CWD that provides desirable biological benefits, without creating an unacceptable fire hazard or potential for high burn severity reburn, is an optimum quantity that can be useful for guiding management actions. To arrive at this optimum, various sources of information about the roles of CWD in the forest and its historical dynamics should be considered.

Brown (2003) integrated the various sources of information to identify an optimum range of CWD that provides an acceptable risk of fire hazard while providing benefits to soil and wildlife (see Figure 3-5). These ranges can be used to illustrate the effects of various management alternatives on CWD over long periods and can assist in attaining historical stand structures and large fuel accumulations using potential reburn severity as a basis for identifying optimum quantities of CWD.

Although quantitative information is limited, it does provide a good basis on which to plan. Consideration of positive and negative aspects indicates that the optimum quantity of CWD is about 5 to 20 tons per acre for Fire Regime I, and 10 to 30 tons per acre for Fire Regime III. The CWD optimum quantities(see Figure 3-5) for acceptable fire hazard are appropriate if small woody fuel loading are at or below desired levels (as defined above in Table 3-57).

Acceptable CWD for fire hazard is slightly less for the warm, dry sites because they occur in a more flammable fire environment where generally less soil organic materials are necessary for maintaining soil productivity.

Figure 3-5 Optimum ranges of coarse woody debris for providing acceptable risks of fire hazard and burn severity while providing desirable quantities for soil productivity, soil protection, and wildlife needs for Fire Regime I and Fire Regime III forest types. Dotted lines show a range that seems to best meet most resource needs: 5 to 20 tons per acre for the warm dry types and 10 to 30 tons per acre for other types.



Sources/Notes: Figure derived from Brown 2003 (see Brown's Figure 2). Fire Regime I was assigned to warm, dry typed and Fire Regime II was applied to other types.

Interestingly, these historic quantities coincide with the average amounts of the pre-fire large woody debris estimated in the stands. This range probably represents the high end of pre-settlement conditions because fire occurrence and fuel consumption had already been reduced compared to the historical fire regime in those stands used to develop the guidelines. (Brown 2003)

Acceptable and historic ranges of CWD quantities were used to assign CWD classifications to all forested stands in the School Fire Salvage Recovery project area. Stands were classified as Below (below acceptable range), Historic (within acceptable range and historic range), High (within acceptable range but higher than historic range), and Above (above acceptable and historic range). Table 3-58 identifies pre-fire and current post-fire CWD classifications of all forested stands in the project area.

Table 3-58 Pre-Fire and Current CWD Classifications of All Forested Stands in School Fire Salvage Recovery Area

CWD Class	Pre-fire Acres	% Area	Post-fire Acres	% Area
Above	685	3%	0	0%
High	1,575	8%	335	2%
Historic	15,751	77%	9,385	46%
Below	2,467	12%	10,758	53%
Total	20,478	100%	20,478	100%

Source/Notes: Summarized from the School Recovery vegetation database as developed using FVS-FFE model Forest Vegetation Simulation with Fire and Fuels Extension, (USDA FS 2004h); acres and percents include National Forest System forested lands only.

Fuel Model

Fire Behavior Fuel Models describe how fire will burn (flame length and rate of spread) through particular wildland fuel types. There are 13 Fire Behavior Fuel Models, which are grouped into four major categories: grass, shrub, timber and slash. Definitions for each of the 13 fuel models come from Anderson (1982). The criteria are based on the fuels which will carry a fire. Each model yields flame length and rate-of-spread information for the purpose of fire behavior prediction and fire planning.

Before School Fire, historic forest composition data for the analysis area indicated that there had been a trend in species change over the past 70 years. For instance, in 1935, 80 percent of the total area supported ponderosa pine as the majority or plurality species, whereas currently, only 9 percent of the total area does. Douglas-fir and grand fir were not prominent enough in 1935 to describe any of the area, and yet in 2004, approximately 91 percent of the analysis area was dominated by Douglas-fir or grand fir (Powell 2005). Similar trends were also shown toward overstocking of stands and forest structural class changes from old forest single-stratum to multi-strata structural class.

Fuel models, in themselves, do not indicate potential for uncharacteristic wildfire behavior and effects, fire regime condition class, or departure from natural conditions. However, the combination of an indicator of departure from natural conditions along with fuel models can be of considerable value of determining if wildfire behavior and effects have departed from natural conditions. (Hahn and Strohm 2003)

Fuel models 1, 2, 5, 8, and 9 are fuel models which would have existed abundantly in this Fire Regime I and III dominated landscape. Fire behavior of these representative models (except, fuel model 8) is determined by accumulations of fine herbaceous fuels. Fires in these fuel models are not generally very intense because the surface fuel loadings are light. Fuel model 8 is representative of closed timber stand with little down woody fuel accumulations or herbaceous fuels.

As an example, fuel model 2 (open, grassy forest) would have been the most common fuel model in the natural regime of the analysis area. Historically, between 25 and 45 percent of the area would have been fuel model 2. Just prior to School Fire, fuel model 2 accounted for only 7 percent of the analysis area. This fuel model can have rapid rates of spread, but typically does not crown, have the potential for blowup fire behavior, have severe fire effects, throw mass fire brands, or spread long distances with spotting fire. Fuel model 2 still exist in scattered polygons, but transitioned to fuel models 8, 9, or 10 in most stands as the canopy closed. Prior to the School Fire, fuel model 10 dominated many areas of the fire area landscape. Fuel model 10 burns in the surface and ground fuels with a greater fire intensity than any other timber model. The dead down fuel include greater quantities of 3-inch or larger limbwood resulting from over maturity or natural events (or lack thereof) that create a large load of dead material on the forest floor. Crowning out, spotting, and torching of individual trees are frequent. Fire intensity is high. From a fire suppression and fuel hazard standpoint, this is the fuel model of most concern.

Many stands that historically were fuel model 8 or 9 progressed to fuel model 10 (which is the timber fuel model with the highest fire intensity) or had many large pockets of fuel model 10 throughout.

Some stands may not have changed enough to move into a different fuel model classification, but fire exclusion and the associated changes in stand condition had certainly increased the fire behavior potential.

Fuel model 8 (closed short needle single and multi-layer young forest without heavy ground fuels) in a moist or cold forest setting does not have high potential for ignition, spread, and crown fire. However, this fuel model is uncharacteristic in a forest setting that is subject to drought conditions, such as the School Fire Salvage Recovery project area. In this kind of setting this fuel model can exhibit extreme crown fire behavior and long distance spotting (1-2 miles). Fuel model 9 (closed long needle forest with litter-duff) can display even more extreme fire behavior than fuel model 8 in the dry forest setting. Fuel model 10 (closed forest with heavy ground and ladder fuels) typically displays the most extreme fire behavior and long distance spotting (Hahn and Strohm 2003).

In School Fire Salvage Recovery project area, changes in forest stands and the concurrent increase in down woody fuel loadings had caused a shift from the historic dominance of fuel models 2, 9, and 8 to the dominance of fuel models 10, 8, and 9. This resulted in fire behavior potential shift during severe fire weather conditions from what would have been historically fast moving, but low intensity mix and surface fires to the a fast moving, high intensity crown replacement fire. The vegetation-fuel conditions in the School Fire Salvage Recovery project area produced fuel model 10, 8, and 9 complexes that are associated with high departure and uncharacteristic fire behavior and severity.

Fuel models described below exist or historically existed in the project area. Fuel model and representative stand descriptions are intended to help clarify current ground fuel situations.

***Fuel Model 1*:** Fire carries through fine herbaceous fuels that are cured or nearly cured. Very little shrubs or timber is present. Grassland, savanna and stubble are commonly modeled. Fire is fast moving and low intensity.

***Fuel Model 2*:** Fuel is primarily fine herbaceous fuels, curing or dead. In addition, litter and stem wood from open shrub or timber overstory contribute. Open shrublands or pine stands are most commonly modeled. Fire is fast moving and low intensity.

***Fuel Model 5*:** Fuels consist mostly of litter cast by shrubs and the forbs in the understory. Green stands of deciduous shrubs are most commonly modeled.

***Fuel Model 8*:** Closed canopy stands of short-needle conifers or hardwoods that have leafed out support fire in the compact litter layer. This layer is mainly needles, leaves, and occasionally twigs because little undergrowth is present in the stand. Representative conifer types are white pine, lodgepole pine, spruce, fir and larch. Fires are generally slower moving, but under drought conditions and high fine fuel loadings, can be high intensity crown fires.

***Fuel Model 9*:** Describes fires that run through surface litter faster than fuel model 8 and have longer flame heights. Both long-needle conifer stands and hardwood stands are typical. Closed stands of long-needled pine like ponderosa pine are usually modeled.

***Fuel Model 10*:** Fire burns in the surface and ground fuels with greater fire intensity that the other timber litter models. Dead-down fuels include greater quantities of 3-inch or larger limbwood resulting from overmaturity or natural events that create a large load of dead material on the forest floor. Crowning out, spotting, and torching of individual trees are more frequent in this fuel situation, leading to potential fire control difficulties. Any forest type may be considered if heavy down material is present; examples are insect or disease ridden stands, windthrown stands, overmature situations with dead fall, and aged light thinning or partial-cut slash.

School Fire significantly changed arrangements of fuel models on the landscape within the fire area. For the short term (up to 15 years), those stands which experienced high severity fire, fuel models 1 and 2 will be the predominate fuel models. Stands which burned with moderate severity are expected to be compromised primarily of fuel model 8 or 9. Low severity burn areas are expected to maintain their previous fuel model, only with a reduced fuel loading. The progression of change in these fuel models over time will be dependent upon the fuel management actions that are implemented.

Resistance-To-Control

Resistance-to-control is the relative difficulty of constructing and holding a control line as affected by resistance to line construction and fire behavior. Resistance-to-control ratings can consider accessibility, slope, fuel model, fuel loading, and other factors. The rating that was used for this analysis is the rating that USDA Forest Service Pacific Southwest Region developed. This resistance-to-control rating scheme is based on difficulty of hand line construction and inventory of downed woody fuel loadings by size classes (Brown 2003). High and extreme resistance-to-control ratings were reached for the following fuel loadings (tons per acre) as depicted in Table 3-59.

Table 3-59 Resistance-To-Control Rating Scheme As Determined By USDA Forest Service Pacific Southwest Region

0 to 3 Inch Diameter Fuels (tons/acre)	3 to 10 Inch Diameter (tons/acre) High	Extreme
5	25	40
10	15	25
15	5	15
Sources/Notes: Table from Brown 2003		

Pre and post-fire fuel loads were used to assign each stand within the School Fire Salvage Recovery project area a resistance-to-control rating for pre-fire and current stand conditions. The results are displayed in Table 3-60.

Table 3-60 Resistance-To-Control Ratings by Percentage of Forested Stands for Pre-Fire, Post-Fire, and Predicted Future Conditions

Resistance to Control Rating	Pre-fire 2005		Post-Fire 2005		Future 2035	
	Acres	%	Acres	%	Acres	%
Extreme	155	1%	0	100%	7,004	34%
High	651	3%	0	0%	6,350	31%
Low to Moderate	19,652	96%	20,478	0%	7,124	35%
Sources/Notes: Summarized from the School Fire vegetation database and data created from FVS-FFE simulations; acres include all NFS forested lands.						

ENVIRONMENTAL CONSEQUENCES

Alternative A – No Action

Direct/Indirect Effects – Alternative A:

Fuel Loading

Departure from historical fire regimes resulted in alterations of key ecosystem components such as species composition, structural stage, stand age, canopy closure, and fuel loadings. The historical fire regime within School Fire Salvage Recovery project area had been altered. This alteration changed stand characteristics including the number of trees (more trees than historic) and fuel conditions (higher loadings than historic). This change had an affect on post-fire fuel conditions in School Fire Salvage Recovery area as well. There was more fuel in stands prior to the fire, so reasonably there would be more fuel to come down to the ground following the fire.

Small Dead Woody Fuels

If no fuel management is applied at this time, many forested stands would progress toward fuel loadings which exceed historical and desired ranges, including smaller size class fuels. Without treatment of the larger size fuels, fires would be high in severity and severely impact recovering vegetation and soils. It would be impossible to keep small woody debris from accumulating in excess by implementing periodic natural or prescribed fire on the landscape. Table 3-61 displays the current year post-fire (2005), year 2010 (5 years post-fire), year 2020 (15 years post -fire), and year 2035 (30 years post-fire) of small dead woody fuel loads if no fuels management is applied. The maximum desired small diameter (less than 3 inch diameter) fuel loading for Fire Regime I is 3 tons per acre and for Fire Regime III is 5 tons per acre.

Table 3-61 Alternative A - Predicted Average Current, 5 Years Post-Fire, 15 Years Post-Fire and 30 Years Post-Fire Small Woody Fuel Loadings

Historical Fire Regime	Current (2005) <3 inch fuels (Tons/Acre)	5 years post Fire (2010) <3 inch fuels (Tons/Acre)	15 years Post Fire (2020) <3 inch fuels (Tons/Acre)	30 years post fire (2035) <3 inch fuels (Tons/Acre)
Low Severity (Fire Regime I)	1.7	7.9	12.1	7.4
Mixed Severity (Fire Regime III)	4.3	8.6	11.4	5.2
Sources/Notes: Pre-fire and current fuel loadings were determined using FVS-FFE. Original fuel load inputs into FVS were based on estimations using the Photo Series for Quantifying Natural Forest Residues in Common Vegetation Types of the Pacific Northwest (Maxwell and Ward 1980). Desired loadings are based on predictions of ground fuel loadings that may have occurred under the natural fire regime.				

Coarse Woody Debris (CWD) - Large Woody Fuels

Future fire behavior and severity in the School Fire Salvage Recovery project area including potential of reburn would depend on a number of interacting factors including burn severity experienced during the School Fire, pre-fire vegetation, species adaptations to fire, environmental conditions, and elapsed time since the School Fire. Keeping these things in mind, some general statements about future fire behavior and severity during high to extreme burning conditions with low fuel moistures can be made: (Brown 2003).

0 to 10 Years after School Fire—High severity fire is unlikely because duff and downed woody fuels that support prolonged burning would be absent. Large woody fuels would still be accumulating through falldown and would not have decayed enough to support smoldering combustion. If salvage operations leave concentrations of small woody fuels, high severity burning could occur where the fuels are concentrated. This situation would be aggravated where stand-replacement fire did not consume foliage, thus allowing a layer of scorched needles to accumulate as surface fuel. Surviving on-site herbs and shrubs should dominate the recovering vegetation. Newly established trees that regenerate by producing seeds could be lost. Even seedlings of species having sprouting capability could die if their root systems are not well established.

10 to 30 Years after School Fire—Downed CWD would exhibit some decay and support a longer period of burning. A duff layer, however, would not be well established and would be unable to contribute to soil heating. Thus, high burn severity would primarily occur where large woody material was lying on or near the soil surface. High severity fire could be substantial where a large proportion of the soil surface was directly overlain by large woody material, which could accumulate from falldown of a large amount of tree basal area. A limited amount of conifer regeneration might be possible from young cone-bearing trees established onsite after the previous fire.

30 to 60 Years after School Fire—Large woody pieces would probably exhibit considerable decay, and a forest floor of litter and duff would be established to variable extent depending on the density of overstory conifers. Burnout of large woody pieces and duff is assisted by the interaction of these two components (Brown and others 1991). Higher severity burning than would typically occur during earlier periods is possible depending on extent of soil coverage by large woody pieces. If a conifer overstory exists, crowning coupled with burnout of duff could amplify the burn severity. Prescribed fire during this period could greatly reduce the severity of a reburn wildfire. However, a reburn involving optimum quantities of CWD 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.

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, its contribution is considerably greater, similar to fire in heavy slash. The contribution of large woody fuel to surface fire intensity is likely underestimated in fire behavior models that treat large woody pieces as smooth cylinders. An assumption of a smooth surface disregards the finely textured nature of bark-covered and weathered pieces.

Estimates of surface fuels were made for each using FVS-FFE, Forest Vegetation Simulation with Fire and Fuels Extension. The Fire and Fuels Extension to FVS simulates fuels dynamics and potential fire behavior over time and can be used to simulate and predict snag fall down rates, fuel loadings, parameters affecting fire behavior and fuels accumulation and decay. The decay and fall down rates of snags and fuels within the model vary depending on species, size class, and the current conditions of snags and logs. The simulated breaking and falling snags are added to the surface fuels where further decay modeling occurs. The falldown rates and subsequent fuel loading are important to model to compare effects of removing fuels and not removing fuels in future stand management. Modeling predicted fuel loads both small and large over time. Modeling was based on individual stand characteristics and on whether the stand experienced high, moderate, or low intensity fire. Standing fuels were not included in this summary.

Acceptable historic ranges of CWD quantities were used to assign CWD classifications to all forested stands in School Fire Salvage Recovery project area. Stands were classified as Below (below acceptable range), Historic (within acceptable range and historic range), High (within acceptable range but higher than historic range), and Above (above acceptable and historic range). Table 3-62 compares pre-fire and estimated 30-year post-fire CWD classifications.

Table 3-62 Alternative A - Pre-Fire and Estimated Future CWD Classifications of All Forested Stands in School Fire Salvage Recovery Project Area

CWD Class	Pre-fire Acres	% Area	30 yr. Post-fire Acres	% Area
Above	685	3%	16,238	79%
High	1,575	8%	991	5%
Historic	15,751	77%	1,005	5%
Below	2,467	12%	2,244	11%
Total	20,478	100%	20,478	100%

Source/Notes: Summarized from the School Recovery vegetation database as developed using FVS-FFE model Forest Vegetation Simulation with Fire and Fuels Extension, acres and percents include National Forest System forested lands only.

With nearly 80 percent of stands above the recommended range for CWD loadings without treatment, fuel loadings would be even more out of balance in 30 years than they were before the School Fire. Forgoing salvage timber harvest for dry-forest areas with an uncharacteristic amount of standing and down fuel would allow these high fuel loadings to accumulate and persist in over 16,000 acres of forested land within School Fire Salvage Recovery project area. High fuel loading, and the associated high potential for a second fire in the near future (reburn), was a relatively rare occurrence on dry-forest sites (fire regime 1) with a properly functioning fire regime (Agee 1993, 1998; Johnson and Miyanishi 2001).

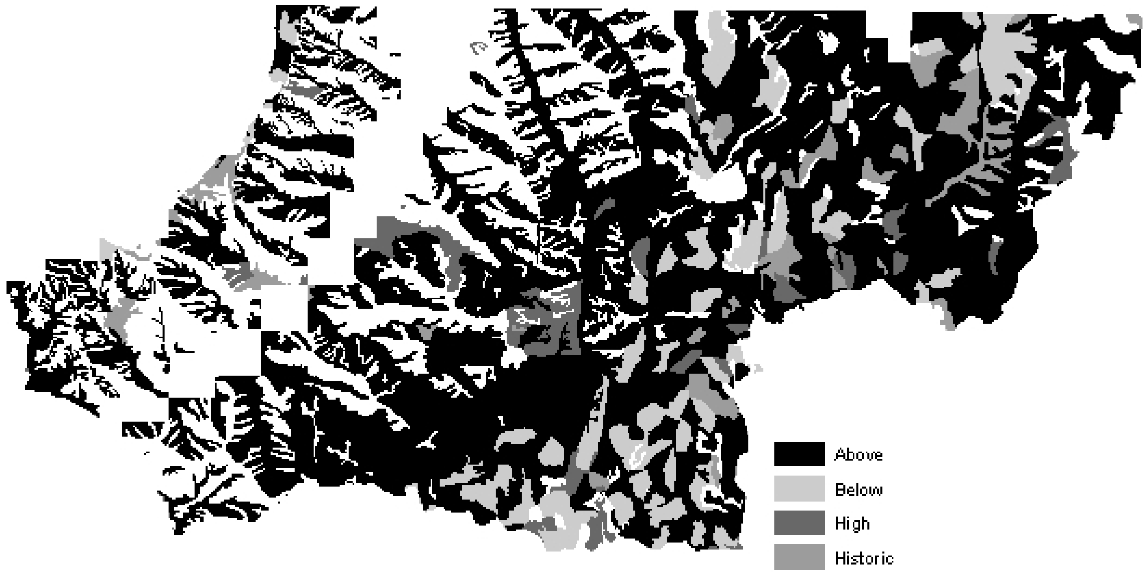


Figure 3-6 (map) Alternative A predicted future (year 2035) coarse woody debris classifications of all forested stands in National Forest System lands in the School Fire analysis area.

Implementing Alternative A would allow ground fuels to accumulate at an extremely high rate as dead and dying trees decompose and fall. As new vegetation begins to grow, the potential for these stands to succumb to a reburn wildfire would increase through time as stands experienced a peak ground fuel load and ground fire intensity in 35 to 40 years. Considerable uncertainty exists over effects of a possible reburn on soil productivity and vegetation succession. Although repeated fires have occurred as long as vegetation covered the landscape (Pyne 1982), the term "reburn" has specific meaning. Reburn results when falldown of the old burned forest contributes significantly to fire behavior and fire effects of the next fire (Brown 2003).

Severe fire intensity results from certain combinations of fuels, weather, and topography. Obviously, weather and topography cannot be controlled, but land managers can manipulate fuels and thereby influence fire behavior and burn severity. Uncharacteristically high fuel levels create the potential for fires that are uncharacteristically intense. If lower and mid-elevation ecosystems are to experience a disturbance regime similar to that which they are adapted, the fuels must first be reduced to keep fire effects within an historical range.

Forgoing salvage timber harvest would mean a delay in the progress of this area toward a sustainable structure and fuel loading. It is difficult, if not impossible, to ensure ecosystem sustainability in fire adapted ecosystems in the absence of periodic low intensity surface fires (USFS 1993). Without fuel treatments, such as the salvage timber harvest, it would be very difficult to periodically implement low intensity surface fires (natural or prescribed). Future fires would be high intensity with high stand mortality. As time passes, future forest stands would be at ever increasing risk of succumbing yet again to uncharacteristic wildfire.

Fuel Model

Prior to the School Fire, fuel model 10 had begun to dominate many areas of the fire area landscape. Fuel model 10 burns in the surface and ground fuels with a greater fire intensity than any other timber model. Dead, down fuel includes greater quantities of 3-inch or larger limbwood resulting from over-maturity or natural events (or lack thereof) that create a large load of dead material on the forest floor. Crowning out, spotting, and torching of individual trees are frequent. Fire intensity is high. From a fire suppression and fuel hazard standpoint, this is the fuel model of most concern.

Forgoing salvage harvest and other fuels treatments would allow fuel model 10 to eventually dominate many areas of the fire landscape. Many of the same stands that were fuel model 10 pre-fire would be on an expedited course to the same condition. Initially, fine fuels would be dominant carriers of fire (fuel model 1 or 2). But in time, understory stands would develop or new stands would initiate and dead trees, large limbs, small limbs, and branchwood would fall to the ground. Fuel loads would build rapidly over the next 20 to 30 years. By this time, many new densely growing forest stands with their concurrently increasing down woody fuel loadings would exist as a fuel model 10 where stands that historically were fuel model 2, 8, or 9 would have existed.

The way fire, both wildfire and prescribed fire, would burn through a stand is determined by fuel loading and arrangement. The proportion of trees which succumb to fire is determined by the way a fire burns through a stand. Therefore, fuel loadings have a direct effect on the proportion of trees which would survive a fire. Large fuels (greater than 3” diameter), which are a large component of fuel model 10, do not contribute greatly to fire spread, but they do contribute to burn severity. Implementing Alternative A would allow large dead and down woody fuel to significantly contribute to fire behavior and control. By not reducing the amount of large, dead and down woody debris, the potential for using wildland fire to keep fine dead fuels at a relatively low level is largely diminished.

Resistance-To-Control

Without the implementation of a salvage timber harvest and associated fuel reduction, the number of acres with excessive fuel loads reaches nearly 80 percent of the project area. As the number of acres with CWD loadings above the acceptable range increases, the number of acres of extreme and high resistance to control would also increase. Table 3-63 compares the future (year 2035) resistance to control ratings to the pre-fire resistance-to-control ratings.

Table 3-63 Alternative A – Resistance-To-Control Ratings By Percentage Of Forested Stands For Pre-Fire And Predicted Future Conditions

RESISTANCE-TO-CONTROL RATING	PRE-FIRE 2005		FUTURE 2035	
	ACRES	PERCENT	ACRES	PERCENT
Extreme	155	1%	7,004	34%
High	651	3%	6,350	31%
Moderate	19,652	96%	7,124	35%

Sources/Notes: Summarized from the School Fire vegetation database and data created from FVS-FFE simulations; acres include all NFS forested lands.

Not implementing a salvage timber harvest (or other types of fuel treatments) would result in numerous acres within School Fire Salvage Recovery project area developing fuel conditions that would make it extremely difficult to control a wildfire, more so than pre-School Fire conditions. School Fire destroyed many homes and private resources.

Cumulative Effects - Alternative A:
Salvage harvest treatments on private and state lands would have no effect on the fire hazard risk on National Forest land. However, they would reduce the resistance to control for potential future wildfires adjacent to the National Forest, thereby reducing the risk of newly developing stands potentially succumbing to high intensity wildfire.

In this alternative, the School Fire area would not be salvage harvested. Expensive, non-commercial fuel reduction methods would need to be used to progress the fire area toward acceptable large woody fuel loading. Future funding of high cost fuel reduction projects is uncertain. Without fuel treatments to remove the large woody fuels (before or after they accumulate), it would be difficult to periodically implement low intensity surface fires (natural or prescribed) within the School Fire Salvage Recovery project area. Without treatment, future fires in the School Fire project area would be high intensity with stand replacement levels of mortality.

Alternative B – Proposed Action

If Alternative B is implemented, 9,436 acres would be salvage harvested. Subsequent fuel treatments included with salvage harvest include lopping and scattering, yarding tops attached, jackpot burning, and slashing and broadcast burning. Fuel treatments were determined in an interdisciplinary fashion in order to minimize fire hazard risk, meet Forest Plan standards and guidelines for fuel loading, while ensuring that adequate quantities of down woody material would be retained for biological benefits of wildlife, soils, and ecosystem productivity. Monitoring would continue throughout project implementation to ensure these fuel objectives are being met. Fuel treatments would be adjusted as needed to prevent excessive accumulation of hazard fuels or unacceptable loss of adequate remaining coarse woody debris.

The use of salvage harvest and fuels treatments on areas of the School Fire Salvage Recovery project area would reduce future ground fuel loadings to what would more closely resemble the fuel loadings that existed under a natural fire regime. Alternative B treats nearly half of all forested acres within the fire area. This treatment would serve to make future stands more crown-fire safe and to reduce the potential for uncharacteristic high intensity wildfire. In the treated area the level and extent of negative impacts caused by future wildfire would be reduced, thus helping prevent widespread loss of large tracts of forest and wildlife habitat, minimizing damage to the forest floor and underlying soils, avoiding risks to human lives and property, and shortening the time for the landscape to recover.

Direct/Indirect Effects Alternative B:

Fuel Loading

Although fire hazard is not a part of the purpose and need, components of the School Fire projects were designed in part to: 1) shift fuel loads and fuel arrangements to conditions that reduce the likelihood of high intensity stand replacement fire occurring in the newly developing stands and on the still fragile soils and 2) to begin to adjust landscape fuel loads to levels that are conducive to the future use of wildland fire.

Treatments that reduce surface fuel loads have been shown to decrease fire behavior and severity (Graham et al. 1999) (Pollet and Omi 1999). Van Wagtendonk (1996) found in fire simulations that a reduction in fuel loads decreased subsequent fire behavior, increased fire line control possibilities and decreased fire suppression costs. Fire line construction rates increase with decreased fuel loads, decreased fuel loads means a lower resistance to control.

Small Woody Fuels

There are three types of fuels that affect fire behavior; fine fuels such as grass or forbs, small woody fuels less than three inches in diameter and large woody fuels greater than three inches in diameter. Fine fuels are the major contributors to fire spread, carrying the ignition and flaming front of a fire (Rothermel 1983). Without these fine fuels, many fires would not get large, although there are exceptions. However, eliminating fine fuels (litter, duff, and grasses) is neither possible nor desirable. Small woody fuels influence a fire's rate of spread and fire intensity, and small woody fuels lose their moisture faster, start easier and burn more readily (Agee 1993).

Under a frequent fire regime, it is possible to maintain fine fuels at lower levels and various patch sizes better than under a less frequent fire regime, but fine fuels would always exist. Aside from eliminating the fine fuels that contribute to fire spread, only the total amount and arrangement can be modified to benefit fire behavior and control efforts.

Salvage logging operation involves the creation of activity fuels (slash) which can increase fire behavior parameters such as rate of spread and flame length. However, treatment of slash would reduce fire behavior and fire intensity (Omi and Martinson 2002). Alternative B includes logging trees that are currently have green needles, but have only a low or moderate probability of surviving. Slash would be created in these stands. Where feasible, trees would be logged with tops attached. Where logging with tops attached is not feasible, branches and tops would be lopped and scattered and concentrations of slash would be jackpot burned when fuel loadings indicate that it is needed.

Table 3-64 tracks changes for Alternative B in average small woody fuel loads through time from current to 30 year post-fire conditions for all stands. Despite an increase in small woody fuels from salvage harvest (1 year post-fire), with the following fuel treatment and effects of salvage harvest treatment (but not considering any future prescribed fire treatments or wildland fire use) average small woody fuel loading would remain similar to fuel loadings in Alternative A (see Table 3-61).

Table 3-64 Alternative B - Predicted Average 1 Year Post-Fire, 2 Years Post-Fire, 5 Years Post-Fire, 15 Years Post-Fire, And 30 Years Post-Fire Small Woody Fuel Loadings

Historical Fire Regime	1 Year post-Fire <3 inch fuels (Tons/Acre)	2 Years post-Fire <3 inch fuels (Tons/Acre)	5 Years Post-Fire <3 inch fuels (Tons/Acre)	15 Years Post-Fire <3 inch fuels (Tons/Acre)	30 Years post-fire <3 inch fuels (Tons/Acre)
Low Severity (Fire Regime I)	8.4	3.9	6.9	12.1	7.1
Mixed Severity (Fire Regime III)	4.7	1.8	6.2	8.3	7.6

Sources/Notes: Small woody fuel loadings were determined using FVS-FFE. Original fuel load inputs into FVS were based on estimations using the Photo Series for Quantifying Natural Forest Residues in Common Vegetation Types of the Pacific Northwest (Maxwell and Ward 1980). Desired loadings are based on predictions of ground fuel loadings that may have occurred under the natural fire regime.

Salvage harvest and subsequent fuel treatments would allow School Fire Salvage Recovery landscape to progress toward fuel loadings within the desirable historical ranges, but only with future prescribed fire treatments. In 30 years, without prescribed fire treatment, small woody fuel loads would exceed desirable fuel loads by an average of 4 tons on dry sites and almost 3 tons on moister sites. Because salvage harvest would remove large woody debris to an acceptable level, prescribed fire or wildland fire could be successfully implemented. Thus, it would be possible to keep the small woody debris from accumulating in excess.

Coarse Woody Debris (CWD) - Large Woody Fuels

Large fuels (greater than 3” diameter) do not contribute greatly to fire spread but they do contribute to burn severity. Due to large dead and down woody fuel contributions to fire behavior and control, reducing the amount of large dead and down woody debris would increase the potential for using prescribed fire and in turn help keep fine fuel loads 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 large woody fuel is decayed and broken up its contribution is considerably greater, similar to fire in heavy slash. Contribution of large woody fuel to surface fire intensity is likely underestimated in fire behavior models that treat large woody pieces as smooth cylinders. An assumption of a smooth surface disregards the finely textured nature of bark-covered and weathered pieces.

One outcome of salvage harvest in Alternative B is the reduction of large woody fuels (CWD) and an alteration in the way wildfire and prescribed fire would burn through stands in the future. This change is identified by assigning CWD classifications based on Brown’s acceptable and historic ranges of CWD quantities. Stands were classified the same as described in Alternative A. Table 3-65 compares the stand classifications of Alternative A and B for the year 2035.

Table 3-65 Comparison of Alternative B Estimated CWD Classifications for Year 2035 Compared To Alternative A. For All Forested Stands In School Fire Salvage Recovery Project Area

CWD Class	Alt A Acres	% Area	Alt B Acres	% Area
Above	16,238	79%	8,153	40%
High	991	5%	839	4%
Historic	1,005	5%	6,300	31%
Below	2,244	11%	5,186	25%
Total	20,478	100%	20,478	100%

Source/Notes: Summarized from the School Recovery vegetation database as developed from the vegetation database; acres and percents include National Forest System forested lands only.

If Alternative B is implemented, there would be as shift from 79 percent of stands being above the acceptable coarse woody debris range to only 40 percent being above in the year 2035. After new stands have developed enough to resist fire, over 8,000 additional acres, as compared to Alternative A, would be able to be treated periodically with fire to maintain fuel loadings at historic levels.

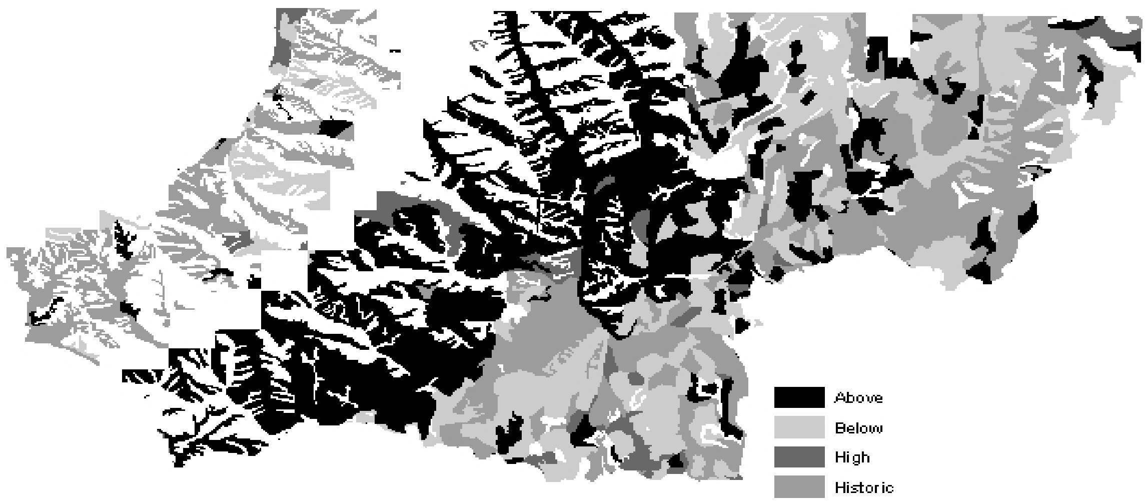


Figure 3-7 (map) Alternative B predicted future (year 2035) coarse woody debris classifications of all forested stands in National Forest System lands in the School Fire analysis area.

Implementing Alternative B would prevent excessive ground fuels from accumulating in at least 8,000 acres of forest as dead and dying trees decompose and fall. With no treatment, these same acres are expected to have fuel loadings which are above the acceptable range of CWD. Instead, with salvage harvest, fuels would be removed before they fall and while they are still of value, preventing the accumulation of excessive ground fuels as well as preventing undue costs of removing the material. As new vegetation develops, the potential for these stands to succumb to a high intensity stand replacement reburn wildfire would be minimized as fuel loadings are kept within an acceptable range with prescribed or natural fire.

Implementing salvage timber harvest would have the potential to increase the percentage of acres below the acceptable range from 11 percent in Alternative A to 25 percent in Alternative B (Table 3-65). This would be an increase of approximately 2,940 acres to the below acceptable range. However, of the acres showing as below acceptable range, 2,630 acres would have lop and scatter fuel treatments with tree tops left on the site. Tops would include, at minimum the bole of the tree from 9 inches in diameter to the top. There was a problem enabling FVS-FFE to account for these tops being left in the stand. These tops represent approximately 3.5 to 5 tons per acre of CWD. With the addition of this CWD from lopping and scattering and leaving tops in many areas, only 556 acres of the 2,630 acres of lop and scatter areas would actually be below the acceptable range for CWD. Hence, the increase in acres below acceptable range of CWD would more likely be 886 acres, which is an increase from 11percent of the stands in Alternative A, to 15 percent in Alternative B. It is also important to note that those acres below acceptable range would provide desirable quantities of CWD for all resources except soil productivity.

Implementing salvage timber harvest would mean moving this area toward an acceptable fuel loading. It is difficult, if not impossible, to ensure ecosystem sustainability in fire adapted ecosystems in the absence of periodic low intensity surface fires (USFS 1993). With fuel treatments, such as the salvage timber harvest, it would be possible to periodically implement low intensity surface fires (natural or prescribed) in large areas of School Fire Salvage Recovery project. Future fires in these areas will be low intensity with limited stand mortality.

Fuel Model

Fire Behavior Fuel Models describe how fire will burn (flame length, intensity, and rate of spread) through particular wildland fuel type. Prior to the School Fire, fuel model 10 had begun to dominate many areas of the fire area landscape. Fuel model 10 burns in the surface and ground fuels with a greater fire intensity than any other timber model. The dead, down fuel include greater quantities of 3-inch or larger limbwood resulting from over maturity or natural events (or lack thereof) that create a large load of dead material on the forest floor. Crowning out, spotting, and torching of individual trees are frequent, and fire intensity is high. From a fire suppression and fuel hazard standpoint, this is the fuel model of most concern.

Implementing salvage harvest and other fuels treatments would keep fuel model 10 from dominating a large portion of School Fire Salvage Recovery project area in the future. Instead of nearly 80 percent of forested stands, less than 40 percent of the project area would be on an expedited course to fuel model 10 conditions. Fuel loads would be within the acceptable range for burn severity in those areas that are salvage harvested or that have previously had fuels management. Prescribed fire or wildland fire treatments can be utilized to maintain these stands as they historically existed, as fuel model 2, 8, or 9.

The way fire (both wildfire and prescribed fire) would burn through a stand is determined by the fuel loading and arrangement. In his declaration, Jonathan Rhodes contends logging and fuel treatments are unlikely to reduce fire impacts due to their transient effects and a low probability of high severity fire (Rhodes 2004). Rhodes states, “There is a general agreement that even the most effective fuel treatments feasible have only a transitory effect on fuel levels and conditions. The effect of fuel treatment on fuel levels begins to diminish as soon as the treatments are completed…..available information generally indicates that fuel treatments no longer have an effect on potential fuels after about 20 years, in some areas the effect is negated still sooner” (Rhodes 2004). We agree and understand that salvage would not be permanent change and stands would require maintenance treatments to retain the fuels reduction benefits. Periodic underburns would be critical to maintain these post treatment stands.

Pollet and Omi’s findings indicate that fuel treatments do mitigate burn severity. Treatments provide a window of opportunity for effective fire suppression and protecting high value areas. Although topography and weather may play a more important role than fuels in governing fire behavior, topography and weather conditions cannot be realistically manipulated to reduce burn severity. Fuels are the leg of the fire environment triangle that land managers can change to achieve desire post-fire conditions. (Pollet and Omi 2002).

Resistance-To-Control

Implementing Alternative B would significantly decrease the number of acres with excessive fuel loads. As the number of acres with CWD loadings above the acceptable range decreases, the number of acres of extreme and high resistance-to-control would also decrease. Table 3-66 compares Alternative B's expected resistance-to-control ratings for year 2035 to the expected resistance-to control-ratings for Alternative A.

Table 3-66 Alternative B - Expected Future Resistance to Control Ratings by Acres and Percentage of Forested Stands As Compared To Alternative A

Resistance-to-Control Rating	Alternative A 2035		Alternative B 2035	
	Acres	%	Acres	%
Extreme	7,004	34%	3,468	17%
High	6,350	31%	3,190	16%
Moderate	7,124	35%	13,820	67%

Sources/Notes: Summarized from the School Fire vegetation database and data created from FVS-FFE simulations; acres include all NFS forested lands.

Implementing a salvage timber harvest (or other types of fuel treatments) would reduce the difficulty of controlling wildfires within the School Fire Salvage Recovery project area significantly as compared to the no fuel management option of Alternative A. With treatment, future resistance-to-control ratings of extreme and high drop from 65 percent of the forested stands to 33 percent. Many areas (approximately 6,700 acres) within the School Fire Salvage Recovery project area would be prevented from developing fuel conditions that would make it even more difficult to control a wildfire than pre-School Fire conditions presented. Even with salvage treatments in Alternative B, approximately 35 percent more stands would exhibit high to extreme resistance to control than pre-School Fire stand conditions. School Fire destroyed many homes and private resources. Implementing large scale fuel treatments such as the salvage harvest to modify fire behavior and increase our ability to control wildfires can help prevent or minimize the impacts of uncharacteristic fire events such as the School Fire.

Cumulative Effects – Alternative B:
Salvage harvest treatments on private and state lands would have no effect on the fire hazard risk on National Forest land. However, they would reduce the resistance-to-control for potential future wildfires adjacent to the National Forest, thereby reducing the risk of newly developing stands potentially succumbing to wildfire.

Other proposed and reasonably foreseeable future projects (reforestation, road decommissioning, culvert replacement, noxious weed control, grazing) would have no effect on fuel loadings or fire behavior. Road decommissioning would limit access to some areas which may inhibit efforts to contain future wildfires.

The inventoried roadless area in School Fire Salvage Recovery project area would not be salvage harvested. Expensive, non-commercial fuel reduction methods would be needed to advance the inventoried roadless area toward acceptable large woody fuel loading. Without fuel treatments, it would not be very difficult to periodically implement low intensity surface fires (natural or prescribed) in the roadless area. Without treatment of the large wood fuels, either standing or ground accumulations, future fires in this area have the potential to be high intensity with stand replacement levels of mortality.

Alternative C

If Alternative C is implemented, 4,188 acres would be salvage harvested. Subsequent fuel treatments included with the harvest include mostly lopping and scattering, but does include some yarding tops attached, jackpot burning, and slashing and broadcast burning. Fuel treatments were determined in an interdisciplinary fashion in order to minimize fire hazard risk, meet Forest Plan standards and guidelines for fuel loading, while ensuring that adequate quantities of down woody material would be retained for biological benefits of wildlife, soils, and ecosystem productivity. Monitoring would continue throughout project implementation to ensure these fuel objectives are being met. Fuel treatments would be adjusted as needed to prevent excessive accumulation of hazard fuels or unacceptable loss of adequate remaining coarse woody debris.

The use of salvage harvest and fuels treatments on areas of the School Fire Salvage Recovery project area would reduce future ground fuel loadings to that which would more closely resemble fuel loadings that existed under a natural fire regime. Alternative C treats fewer acres than Alternative B. These treatments would serve to make future stands in treated areas more crown-fire safe and reduce the potential for uncharacteristic high intensity wildfire. In treated areas the level and extent of negative impacts caused by future wildfire would be reduced, thus helping prevent widespread fire to large tracts of forest and wildlife, minimizing damage to the forest floor and underlying soils, avoiding risks to human lives and property, and shortening the time for the landscape to recover

Direct /Indirect Effects – Alternative C:

Fuel Loading

Small Woody Fuels

There are three types of fuels that affect fire behavior; fine fuels such as grass or forbs, small woody fuels less than three inches in diameter and large woody fuels greater than three inches in diameter Fine fuels are the major contributors to fire spread, carrying the ignition and flaming front of a fire (Rothermel 1983). Without these fine fuels, many fires would not get large, although there are exceptions. However, eliminating fine fuels (litter, duff, and grasses) is neither possible nor desirable. Small woody fuels influence a fire’s rate of spread and fire intensity, and small woody fuels lose their moisture faster, start easier and burn more readily (Agee 1993).

Under a frequent fire regime, it would be possible to maintain fine fuels at lower levels and various patch sizes better than under a less frequent fire regime, but fine fuels would always exist. Aside from eliminating the fine fuels that contribute to fire spread, only the total amount and arrangement can be modified to benefit fire behavior and control efforts.

Salvage logging operations would involve the creation of activity fuels (slash) which can increase fire behavior parameters such as rate of spread and flame length. Alternative C would create less slash because fewer acres are treated and most salvage harvest would occur in higher severity areas. In these high severity fire areas, much of the needles and small branchwood was consumed in the fire. (This was not accounted for in the FVS-FFE modeling). However, treatment of slash would reduce fire behavior and fire intensity (Omi and Martinson 2002). Where feasible, trees would be logged with tops attached. Where logging with tops attached is not feasible, branches and tops would be lopped and scattered and concentrations of slash would be jackpot burned when fuel loadings indicate that it is needed. Where needed for soil productivity, tops would be lopped and scattered and left on site.

Table 3-67 tracks the changes in average small woody fuel loads through time from current conditions to 30 years post-fire for all stands. Despite an increase in small woody fuels from the salvage harvest (1 year post fire), with the following fuel treatment and effects of the salvage harvest (but not considering future fire treatments) small woody fuel loading would remain similar to the fuel loading in Alternative A (Table 3-61).

Table 3-67 Alternative C - Predicted Average 1 Year Post-Fire, 2 Years Post-Fire, 5 Years Post-Fire, 15 Years Post-Fire, and 30 Years Post-Fire Small Woody Fuel Loadings

Historical Fire Regime	1 Year Post-Fire <3 inch fuels (Tons/Acre))	2 Years Post-Fire <3 inch fuels (Tons/Acre)	5 Years Post-Fire <3 inch fuels (Tons/Acre)	15 Years Post-Fire <3 inch fuels (Tons/Acre)	30 Years post-fire <3 inch fuels (Tons/Acre)
Low Severity (Fire Regime I)	4.0	1.7	7.0	10.0	6.9
Mixed Severity (Fire Regime III)	5.8	2.2	8.3	9.9	4.9

Sources/Notes: Small woody fuel loadings were determined using FVS-FFE. Original fuel load inputs into FVS were based on estimations using the Photo Series for Quantifying Natural Forest Residues in Common Vegetation Types of the Pacific Northwest (Maxwell and Ward 1980). Desired loadings are based on predictions of ground fuel loadings that may have occurred under the natural fire regime.

Salvage harvest and subsequent fuel treatments would allow some areas within the School Fire landscape to progress toward fuel loadings within the desirable historical ranges, but only with future prescribed fire treatments. In 30 years without fire treatment, small woody fuel loads would exceed desirable fuel loads by an average of 3.9 tons on Fire Regime I sites and nearly reach the maximum acceptable load of 5 tons on Fire Regime III sites. Because of the salvage harvest removing large woody debris to an acceptable level, prescribed fire or wildland fire use would be able to be effectively implemented. By implementing periodic natural or prescribed fire on the landscape it would be impossible to keep the small woody debris from accumulating in excess.

Coarse Woody Debris (CWD) - Large Woody Fuels

Large fuels (greater than 3" diameter) do not contribute greatly to fire spread but they do contribute to burn severity. Due to large dead and down woody fuel contributions to fire behavior and control, reducing the amount of large, dead and down woody debris would increase the potential for using prescribed fire, in turn; help keep the fine fuel load at a relatively low level.

One of the outcomes of salvage harvest is to reduce large woody fuels (CWD) and alter the way wildfire and prescribed fire would burn through a stand in the future. We can identify this change by assigning CWD classifications based Brown's acceptable and historic ranges of CWD quantities. Stands were classified the same as described in Alternative A. Table 3-68 compares the stand classifications of Alternative A and C for the year 2035.

Table 3-68 Comparison of Alternative C Estimated CWD Classifications for Year 2035 Compared to Alternative A for All Forested Stands in School Fire Salvage Recovery Project Area

CWD Class	Alt A Acres	% Area	Alt C Acres	% Area
Above	16,238	79%	11,825	58%
High	991	5%	845	4%
Historic	1,005	5%	3,594	18%
Below	2,244	11%	4,214	20%
Total	20,478	100%	20,478	100%

Source/Notes: Summarized from the School Recovery vegetation database as developed from the vegetation database; acres and percents include National Forest System forested lands only.

If Alternative C is implemented, there would be as shift from 79 percent of stands being above the acceptable coarse woody debris range to only 58 percent being above in the year 2035. After new stands had developed enough to resist fire, approximately 4,000 additional acres as compared to Alternative A would be able to be treated periodically with fire to keep fuel loadings maintained at historic levels.

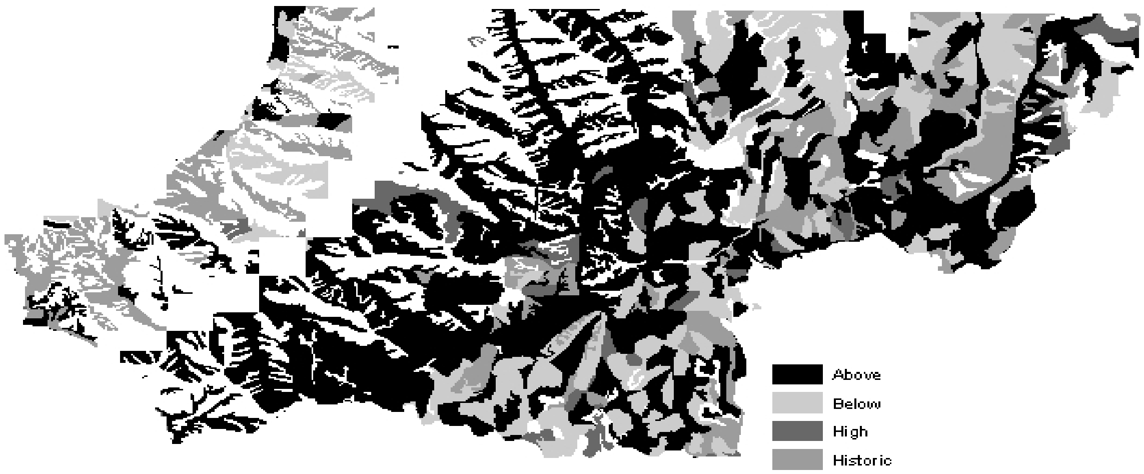


Figure 3-8 (map) Alternative C predicted future (year 2035) coarse woody debris classifications of all forested stands in National Forest System lands in the School Fire analysis area.

Implementing Alternative C would prevent excessive ground fuels from accumulating in at least 4,000 acres of forest as dead and dying trees decompose and fall. With no treatment, these same acres are expected to have fuel loadings which are above the acceptable range of CWD. Instead, with salvage harvest, fuels would be removed before they fall and still have some value, preventing the accumulation of excessive ground fuels as well as preventing undue costs of removing the material. As new vegetation develops, the potential for these stands to succumb to an uncharacteristic reburn could be minimized as fuel loadings are kept within an acceptable range with prescribed or natural fire.

Implementing salvage timber harvest with Alternative C would have the potential to increase the percentage of acres below the acceptable range from 11 percent in Alternative A to 20 percent in Alternative B. This would be an increase of approximately 1,970 acres to the below acceptable range. However, of the acres showing as below acceptable range, 1,726 acres would have lop and scatter fuel treatments with tree tops left on the site. Tops would include at minimum the bole of the tree from 9 inches in diameter to the top. There was a problem enabling FVS-FFE to account for these tops being left in the stand. These tops represent approximately between 3.5 to 5 tons per acre of CWD. With the addition of this CWD from lopping and scattering and leaving tops in many areas, only 150 acres of the 1,970 acres would actually be below the acceptable range for CWD. Hence, the increase in acres below acceptable range of CWD would more likely be 475 acres, which is an increase from 11 percent of the stands to 13 percent of the stands compared to the no treatment alternative. It is also important to note that those acres below acceptable range would provide desirable quantities of CWD for all resources except soil productivity.

Fuel Model

Implementing salvage harvest in Alternative C and other fuel treatments would keep fuel model 10 from dominating a large portion of School Fire Salvage Recovery project area in the future. Instead of nearly 80 percent of forested stands, less than 40 percent of the analysis area would be on an expedited course to fuel model 10 conditions. Fuel loads would be within the acceptable range for burn severity in areas that are salvaged harvested, or previously had fuels management. Prescribed fire treatments could be utilized to maintain these stands as they historically existed, as fuel model 2, 8, or 9.

Resistance-To-Control

Implementing Alternative C would decrease the number of acres with excessive fuel loads. As the number of acres with CWD loadings above the acceptable range decreases, it would follow that the number of acres of extreme and high resistance-to-control would also decrease. Table 3-69 compares Alternative C's expected resistance-to-control ratings for year 2035 to the expected resistance-to-control ratings for Alternative A.

Table 3-69 Alternative C - Expected Future Resistance To Control Ratings By Percentage Of Forested Stands As Compared To Alternative A

RESISTANCE TO CONTROL RATING	ALTERNATIVE A 2035		ALTERNATIVE C 2035	
	ACRES	%	ACRES	%
Extreme	7,004	34%	4,618	22%
High	6,350	31%	4,858	24%
Moderate	7,124	35%	11,002	54%

Sources/Notes: Summarized from the School Fire vegetation database and data created from FVS-FFE simulations; acres include all NFS forested lands.

Implementing a salvage timber harvest (or other types of fuel treatments) would reduce the difficulty of controlling wildfires within the School Fire Salvage Recovery project area compared to the no fuel management option of Alternative A. With treatments proposed in Alternative C, future resistance to control ratings of extreme and high drop from 65 percent of the forested stands to 46 percent. Although this is less than Alternative B, approximately 4,000 acres within the School Fire Salvage Recovery project area would be prevented from developing fuel conditions that would make it even more difficult to control a wildfire than pre-School Fire conditions presented.

Cumulative Effects – Alternative C:

Salvage harvest treatments on private and state lands would have no effect on the fire hazard risk on National Forest land. However, they would reduce the resistance to control for potential future wildfires adjacent to the National Forest, thereby reducing the risk of newly developing stands potentially succumbing to wildfire.

The other proposed and reasonably foreseeable future projects (reforestation, road decommissioning, culvert replace, noxious weed control, grazing) would have not effect on fuel loadings or fire behavior. Road decommissioning would limit access to some areas which may inhibit efforts to contain future wildfires.

In this alternative, many areas of School Fire Salvage Recovery project area would not be salvage harvested. Expensive, non-commercial fuel reduction methods would need to be used to advance these areas toward a future acceptable large woody fuel loading. Without fuel treatments to remove the large woody fuels (before or after they accumulate), it would be very difficult to periodically implement low intensity surface fires (natural or prescribed) in the roadless area. Without treatment, future fires in these areas would be high intensity with stand replacement levels of mortality.

Comparison of Alternatives

Fuel Loading

Coarse Woody Debris (CWD) - Large Woody Fuels

The acceptable and historic ranges of CWD quantities (Browne 2003) were used to assign CWD classifications to all forested stands in the School Fire Salvage Recovery project area. Stands were classified as Below (below acceptable range), Historic (within acceptable range and historic range), High (within acceptable range but higher than historic range), and Above (above acceptable and historic range)

The amount of CWD that provides desirable biological benefits, without creating an unacceptable fire hazard or potential for high burn severity reburn, is an optimum quantity that can be useful for guiding management actions. To arrive at this optimum, various sources of information about the roles of CWD in the forest and its historical dynamics were considered.

Table 3-70 is a comparison of expected CWD classifications for the year 2035 for each alternative. The table can be used to track changes the alternatives would have on uncharacteristic fuel loads and fire behavior.

Table 3-70 Comparison of Alternatives of Estimated Coarse Woody Debris Classifications for Year 2035 for All Forested Stands in School Fire Salvage Recovery Project Area

CWD Class Tons/Acre	Alt A Acres	% Area	Alt B Acres	% Area	Alt C Acres	% Area
Above	16,238	79%	8,153	40%	11,825	58%
High	991	5%	839	4%	845	4%
Historic	1,005	5%	6,300	31%	3,594	18%
Below	2,244	11%	5,186	25%	4,214	20%
Total	20,478	100%	20,478	100%	20,478	100%

If Alternative B is implemented, there would be as shift from 79 percent of stands being above the acceptable coarse woody debris range to only 40 percent being above in the year 2035. After new stands have developed enough to resist fire, over 8,000 additional acres as compared to Alternative A would be able to be treated periodically with prescribed fire maintain fuel loadings at historic levels. Implementing Alternative C would leave 11,825 acres in the condition that would result in being above the acceptable range for coarse woody debris, as compared to 8,153 in Alternative B. However, it would shift the percentage of stands in the above acceptable range from 79 percent in Alternative A to only 58 percent in Alternative C.

Resistance-To-Control

Table 3-71 compares the future resistance-to-control for each alternative. The implementation of alternatives which decrease the number of acres with excessive fuel loads would also decrease the number of acres with extreme and high resistance to control.

Table 3-71 Comparison of Alternatives of Expected Future Resistance-To-Control Ratings by Percentage of Forested Stands

RESISTANCE-TO-CONTROL RATING	ALTERNATIVE A 2035		ALTERNATIVE B 2035		ALTERNATIVE C 2035	
	ACRES	PERCENT	ACRES	PERCENT	ACRES	PERCENT
Extreme	7,004	34%	3,468	17%	4,618	22%
High	6,350	31%	3,190	16%	4,858	24%
Moderate	7,124	35%	13,820	67%	11,002	54%
Sources/Notes: Summarized from the School Fire vegetation database and data created from FVS-FFE simulations; acres include all NFS forested lands.						

Implementing Alternative B would significantly reduce the difficulty of controlling wildfires within the School Fire Salvage Recovery project area significantly compared to the no fuel management option of Alternative A, and reduced treatment of Alternative C. With treatments designed in Alternative B, future resistance-to-control ratings of extreme and high drop from 65 percent of the forested stands to 33 percent. Many areas (approximately 6,700 acres) within School Fire Salvage Recovery area would be prevented from developing fuel conditions that would make it even more difficult to control a wildfire than pre-School Fire conditions presented. School Fire destroyed many homes and private resources. Fuel management techniques such as salvage harvest used to modify fire behavior can increase the ability to control wildfires and help prevent or minimize the impacts of large scale, high intensity fire events such as the School Fire.

Finding of Consistency:

Implementation of either of the action alternatives (B or C) would remain consistent with the goals and objectives, and standards and guidelines of the Forest Plan. Appropriate management response to wildfires would continue throughout the project area and project implementation, and into the future. Low intensity prescribed fire (jackpot and broadcast burning) would be utilized to treat activity generated fuels as needed to reduce fire hazard risk. No potential opportunities to implement future fuels treatment, prescribed fire projects, or wildland fire use would be eliminated.

NOXIOUS WEEDS

SCALE OF ANALYSIS

Region 6 of the Forest Service has just released the Record of Decision for the Pacific Northwest Region Invasive Plant Program Final Environmental Impact Statement on preventing and managing invasive plants (FEIS 2005). This document amends the Umatilla National Forest Land and Resource Management Plan with new management directions. The portions applicable to the School Fire Salvage Recovery project area are detailed in Chapter 2, Table 2-3 Design Features and Management Requirements. These standards will apply to activities beginning March 1, 2006 (ROD 2005).

The terms invasive plant species, noxious weeds, and weeds are used interchangeably in this document to refer to those non-native plant species that are of environmental concern and whose control is addressed as a land management priority at national, regional and local levels (Forest Service Manual 2080, R6 FEIS 2005, Umatilla Land and Resource Management Plan (LRMP) 1990).

Measurement of the relative effects of the School Fire Salvage Recovery project on noxious weeds is based on the number of acres at high risk of new infestation by noxious weeds due to spread or establishment of new populations. Risk acres are calculated from a combination of the amount of ground disturbance projected for each alternative and proximity of the ground disturbing activities to known weed infestations. Ground disturbing activities include salvage acres by logging system, miles of road used, acres and type of fuel treatment, and acres of reforestation. The area analyzed is larger than project area. It includes the designated inventoried roadless area as well as proposed units, and also includes nonforest Service acreage in the Tucannon River corridor from the northern Forest boundary to the mouth of Panjab Creek, for a total of approximately 30,000 acres.

Willow Springs inventoried roadless area is included in this analysis for the following reasons. It contains ten small documented noxious weed populations, three in areas that burned at high severity. Before the fire, approximately a third of the ground was classified in nonforest plant association groups (PAGs). These occur primarily on steep, south-facing slopes that support bunchgrass communities susceptible to yellow starthistle infestation, even without further disturbance. Any increase in weeds on adjacent harvest units increases the threat to susceptible roadless areas, and conversely, any unchecked weed spread within the inventoried roadless area heightens the chance of invasion on nearby roaded ground.

The Tucannon River corridor is included because it contains a large cluster of documented weed populations within the burned area, because it gets high use (which equates with high spread risk), and because much of it is being logged by the state which also increases spread risk. It provides a potential seed source to the susceptible grassland communities mentioned above, as well as to contiguous logging units on NFS lands.

AFFECTED ENVIRONMENT

Invasion of an area by noxious weeds is known to be facilitated by ground disturbance, loss of plant cover, disruption of functioning native plant communities, and the presence of a weed seed source (Keeley 2004; R6 FEIS 2005). As an agent of disturbance to both vegetation and soils, fire alone can trigger the spread of invasive plants, and it can act in concert with other sources of vegetation and soil disruption to increase the proliferation of weed population (Keeley 2001; Milberg and Lamont 1995).

The fire itself has created conditions conducive to noxious weed establishment by providing, over a large area, an increase in light availability and open ground with reduced competition from other plant species. A post-burn flush of available soil nitrogen increases the opportunity for weeds to flourish (Brooks and Pyke 2001). Weed seed is present at numerous sites within the burn, and additional disturbance of the soil surface is the only factor that could further enhance the opportunity for infestation.

It should be noted, when addressing the spread of invasive plant species, that it is impossible to accurately predict spread rates or exact locations of expanding weed populations. It is, however, possible to assess the relative spread risk of various activities based on the degree of ground disturbance involved, and the proximity of existing weed populations that act as seed sources.

Information currently in the forest-wide noxious weed inventory database shows fourteen invasive species occurring singly or in combination at 104 sites on NFS lands within the project area, for a total of 694 infested acres. An additional fifteenth species of concern has not been inventoried, but occurs in the Tucannon River corridor, mostly co-occupying acres that are known to support several of the other invasives.

Twenty-four of the known sites were inventoried in 2004, an increase of more than 20 percent over previously known sites. These "new" sites total 218 acres. Some of these sites represent re-infestation, by different species, of sites already analyzed and treated for a previous species. Replacement of primary noxious weed species by secondary ones under a treatment regime illustrates the principle of re-infestation of treated sites when prevention measures such as re-vegetation with desired species are not promptly undertaken.

Twenty-six sites in the Tucannon River corridor on state and private lands have been treated over time by both the Forest Service and state, and most of those infestations have been well controlled or eliminated. Toadflax, an especially resistant species, has appeared on several of those sites as a secondary invader.

Of the total 104 sites within the project area, only 41 have been cleared for treatment under the 1995 Forest-wide Noxious Weed EA (1995).

In order to address the threat of noxious weed spread in the aftermath of the burn, the Burned Area Emergency Response (BAER) report addressed the presence of invasive plant species at a landscape scale: there exist "extensive noxious weed and non-native plant populations on private and state lands, [and] pioneer populations on the Umatilla NF"(Burned Area Report 2500-8, 2005). Seeding of the highest risk areas with native species was done as a combined emergency measure to help prevent both erosion and noxious weed spread in areas of high severity burn. However, the extent of seeding was small (1,759 acres) in comparison to the total of more than 50,000 acres burned. High severity burn areas (over 6,000 acres) that have lost all soil protection are most susceptible to establishment of invasive species, although moderate severity areas (over 25,000 acres) also have an increased risk where native plant communities have been damaged.

To prevent seed dispersal by intact noxious species populations immediately after the fire, approximately 25 acres were hand treated by cutting and removing seed heads of knapweeds in the Tucannon River corridor.

Documented Species

Weed species documented within the project area are described briefly below. They are listed in the order of relative concern for invasiveness.

Yellow starthistle (*Centaurea solstitialis*): - Yellow starthistle is an aggressive winter annual closely related to knapweeds and is common on roadsides and waste edges of agricultural fields and rangelands throughout southeastern Washington. Population expansion of this species has been likened to wildfire because it can occur so quickly. The species moves most rapidly into disturbed ground that has already lost native plant communities, and from that foothold it can also invade intact communities. There are 10 inventoried occurrences of starthistle in the analysis area, covering a total of 90 acres. Most of the known sites are in the Tucannon River corridor or otherwise near roads where they are easily treated. Of greater concern are four populations located on ridges or steep slopes above the Tucannon. These infestations are not large, but have difficult access and are not easy to monitor or to treat. Primary agents of spread for these remote populations are wildlife, especially bighorn sheep that prefer the steep slopes where these infestations occur.

Knapweeds, including **Spotted knapweed** (*Centaurea biebersteinii*) and **Diffuse knapweed** (*Centaurea diffusa*): **-** These two species of knapweed are considered together as their growth habits and habitat preferences are so similar. Both are biennial or short-lived perennials that quickly colonize disturbed ground such as roadsides, gravel pits, campsites, and riparian gravel bars. They are intolerant of shade, but can colonize open areas, including intact native plant communities. They are by far the most widespread and abundant of the invasive species occurring in the analysis area, with combined totals of 90 known sites covering 616 acres. Seventeen of the 23 sites of spotted knapweed were inventoried for the first time in 2004, indicating that this species has recently been expanding in extent. All of the known sites of spotted knapweed are associated with road prisms, making them accessible for treatment; however, for the newly inventoried sites that have not been NEPA-cleared for treatment, hand-pulling currently is the only control option.

Toadflax, including both **Dalmatian toadflax** (*Linaria dalmatica)* and **Butter-and-eggs** (*Linaria vulgaris*): **-** These two species of *Linaria* are considered together as their growth habits and habitat preferences are so similar. Toadflax has been reported from only 7 sites, yet occurs over 131 acres. All but one toadflax site are in the Tucannon River corridor. Both species prefer well drained to gravelly soils, through which they spread by extensive underground root systems. They reproduce both by seed and by sprouting from buds on the roots. Because of their waxy leaves and deep root systems these plants are difficult to control with herbicides. Their capacity to re-sprout from root remnants also makes control by hand-pulling or mechanical means impractical.

Sulfur cinquefoil (*Potentilla recta*): **-** Sulfur cinquefoil is a long-lived perennial that closely resembles one of the local native cinquefoils, *Potentilla glandulosa*. A recent assessment of sulfur cinquefoil includes the following facts: the plant has a broad ecological amplitude, and is expanding rapidly in its distribution and extent in the inland northwest; it tends to appear first in disturbed and waste areas such as roadsides and abandoned fields along with other non-native species; it out-competes even most invasives over time, including knapweeds and yellow starthistle; it has also been found invading undisturbed native plant communities (Rice 1999). Sulfur cinquefoil is scattered along the roadsides in the Tucannon River corridor, and dominates the open ground around the Tucannon Guard Station. It has not been inventoried, so its acreage is not known. It co-occurs with several other noxious weeds on many, but perhaps not all, of the roadside sites.

St. Johnswort (*Hypericum perforatum*): **-** St. Johnswort is similar to toadflax in its plant structure and capacity to reproduce both vegetatively and by seed. It follows disturbance and thrives mostly in open grasslands, meadows and forest openings created by logging or fires. It also grows well in road corridors due to the combination of high light availability and disturbed ground. Populations can explode on burned ground as “heat seems to stimulate germination in St. Johnswort seed, and researchers have observed flushes of St. Johnswort seedlings following fire” (Zouhar, 2004). It is responsive to application of some herbicides, and endemic levels of a predatory beetle apparently create fluctuations in local plant population levels on a recurring basis (Karl Urban, personal communication). There are 14 inventoried occurrences of this species covering 67 acres within the analysis area. Most sites are less than 4 acres, with one of 7 acres, and a large one of 40 acres along the roads at the mouth of the Little Tucannon.

Scotch thistle (*Onopordum acanthium*): **-** Scotch thistle is a large biennial (up to 12 feet tall) that is common around the margins of agricultural land, heavily grazed pastures, and waste areas of eastern Washington. It is aggressive, spreading quickly, and in favorable soils, forming thickets too dense to walk through. It is easily controlled in the rosette stage with herbicides or mechanical uprooting. All five of the documented populations within the analysis area are along roads, and they total 90 acres. The three largest sites, each over 20 acres, co-occur with populations of knapweeds and other noxious species.

Houndstongue (*Cynoglossum officinale*): **-** Houndstongue is a European biennial that forms a rosette in its first year of growth, and flowers and sets seed the second year. It prefers disturbed ground such as roadsides and landings, but spreads into un-roaded areas by attachment of its bur-like seeds to wildlife and livestock. The three inventoried sites of houndstongue cover 50 acres, with one 44 acre site co-occurring with knapweed.

Meadow hawkweed (*Hieracium caespitosum*): **-** Meadow hawkweed is a small, yellow-flowered, rhizomatous perennial that looks similar to native hawkweed species. This invasive from Europe seems to thrive on disturbed sites and poor soils where there is adequate moisture – in cool or cold moist plant associations in the Blue Mountains. It spreads by creeping rhizomes, as well as by seed production, and can invade roadside openings and poor meadows to the exclusion of most other species. It may be allelopathic, releasing into the soil toxic substances that inhibit the growth of other plants (Wilson & Callihan 1999). The small population found on a roadside near the Stevens Ridge seed orchard is the first site of this species on the Umatilla NF, and as a new invader, could be quickly eradicated with herbicide. The species is not easily controlled by hand or mechanical means, which tend to spread it. The site is less than a tenth of an acre (although the GIS weed layer shows the polygon as nearly half an acre), and had fewer than 100 plants when first reported in 2004.

Tansy ragwort (*Senecio jacobea*): **-** Tansy ragwort is a short-lived perennial plant in the sunflower family that is toxic to grazing animals. Long common west of the Cascades, it is becoming an increasing problem in inland areas that receive 16 inches or more of annual precipitation (Coombs 1999). Like most of the exotic invasives that are designated as noxious weeds, it thrives in open areas with disturbed ground such as roadsides and in moister plant communities that have lost their native species and structure. There are only two sites recorded in the analysis area, one along the well-used 40 road and the other at the end of a spur road at the head of Tumalum Creek. Together these sites encompass a total of 3 acres.

Whitetop (*Cardaria draba*): **-** Whitetop is a long-lived perennial species that spreads underground by vigorous rhizomes, besides producing new plants from seed. It generally prefers moist sites, and is most common in hay pastures and croplands. It is sometimes introduced to Forest Service lands in hay fed to horses at dispersed camp sites. There is one inventoried population of about 5 acres on a slope west of the 42 Road near Iron Springs.

Canada thistle (*Cirsium arvense*): - Canada thistle is a common and widespread weed that prefers somewhat moist habitats. It is rhizomatous and spreads underground, as well as by production of seeds capable of long range dispersal by wind. In wet meadows and riparian areas it can form dense infestations that exclude all other plant species; however, it thrives in many other habitats as well. Because it is so widespread, Canada thistle can be difficult and costly to control. Within the analysis area most of the acreage of this species occurs in the Tucannon River corridor and along roads, although two small sites are recorded in the upper reaches of Cummings Creek a quarter mile from the nearest road. Fourteen occurrences cover a total of 139 acres.

Scotch broom (*Cytisus scoparius*): - Scotch broom is a woody shrub that can grow up to 10 feet under moist conditions. It is a common pest west of the Cascades where it has proven difficult to control. It occasionally gets established along roadsides in the Blue Mountains, but it grows with far less vigor than on the Westside. It is most effectively eradicated by pulling the shrubs, roots and all. One site has been inventoried on about 2½ acres on the east side of the 47 Road opposite the mouth of Hixon Creek.

Bull thistle (*Cirsium vulgare*): - Bull thistle is taprooted biennial thistle, forming a rosette during its first growing season, and bolting to flower and seed in its second year. It is widespread on disturbed ground. It is an early invader of recently logged or burned areas, but usually dies out after several years with increasing competition from other species, especially any shade producers. It is seldom treated because of the short term nature of infestations. Ten acres have been inventoried on four sites, two of them along roads and two on upper Cummings Creek.

The following table lists the number of sites and acres of invasive species found within School Fire Boundary

Table 3-72 Invasive Species Extent within School Fire Boundary

Common Name	Species	Inventoried Sites	Acres
Yellow starthistle	*Centaurea solstitialis*	10	90
Diffuse knapweed	*Centaurea diffusa*	67	396
Spotted knapweed	*Centaurea biebersteinii*	23	220
Dalmatian toadflax	*Linaria dalmatica*	6	122
Butter-and-eggs	*Linaria vulgaris*	1	9
Sulfur cinquefoil	*Potentilla recta*	multiple	unknown
St. Johnswort	*Hypericum perforatum*	14	67
Scotch thistle	*Onopordum acanthium*	5	90
Houndstongue	*Cynoglossum officinale*	3	50
Meadow hawkweed	*Hieracium caespitosum*	1	.1
Tansy ragwort	*Senecio jacobea*	2	3
Whitetop	*Cardaria draba*	1	5
Canada thistle	*Cirsium arvense*	14	139
Scotch broom	*Cytisus scoparius*	1	.5
Bull thistle	*Cirsium vulgare*	4	10

ENVIRONMENTAL CONSEQUENCES

A series of assumptions is documented in this analysis that allows calculation of the number of acres at high risk of weed spread, depending on the activities and the location of activities in relation to existing weed populations. The underlying premise is that areas closest to existing infestations and undergoing the most soil disturbance would be at the highest risk of supporting future weed spread. To model this effect, "buffer" areas of high risk are calculated around known sites, and their widths are greater as the related activity increases in disturbance potential. Thus a forwarder unit that includes an existing weed site is assumed to be at high risk for an area 1,000 feet from the known weeds, whereas ground that burned at medium severity and has no management activities planned is considered at high risk for an area only 100 feet from a known infestation.

Because there is such uncertainty in predicting both location and timing of invasive species spread, this model is useful primarily in assessing the relative impacts of proposed levels of activity on future weed infestations. The purpose is not to predict the actual number of acres that may become infested, but is to show the comparative risk of the different activities and alternatives. It should be noted that the combination of existing roads and high severity burn account for nearly 75 percent of the acres at high risk even under the most active proposed harvest scenario.

Both action alternatives (B and C) include activities that would increase suitable habitat for invasive plants. The potential for weed establishment within each alternative is relative to the amount of disturbance, especially the amount and type of logging systems proposed. The greater the area disturbed, the more suitable habitat is created for weeds, and the greater the risk of their establishment and spread. Both action alternatives also include design features (Chapter 2, Table 2-3) to help minimize ground disturbance, limit introduction and transport of weed seed, avoid selected activities in known areas of infestation, reduce disturbance to existing native vegetation, and restore native ground cover as soon as possible after harvest activities are complete.

Sites that have been NEPA cleared for chemical treatment can be treated most effectively and earliest in the growing season. Other sites can be treated manually, and this may need to occur later in the season to be most effective. Hand pulling (a preferred method, especially for knapweed reduction) is best accomplished after the plants start to bolt to flower, and because their growth is weather dependent, timing of manual treatments can be variable. Other types of manual treatment that proved both effective and efficient, such as grubbing, clipping, or flaming with hand-held torches may allow greater flexibility in treatment timing.

Alternative A – No Action

Direct /Indirect Effects – Alternative A:

The No Action alternative would not create any further human-caused ground disturbance in the School Fire Salvage Recovery project area.

The spread of invasive plants from currently existing populations and off-forest seed sources would potentially increase due to the exposure of bare ground by the fire itself. While most of the existing individual weed sites are not large, adjacent seed sources are potentially huge. Agricultural and state lands to the north of the NFS boundary are heavily infested with yellow starthistle stands, and the species grows densely along highways and many of the county roads that lead to the Umatilla NF. Prevailing winds over the burned area tend to blow from south to north, so airborne dispersal of seed onto the fire area may not be great. Animal and vehicle vectors will likely be the primary means of seed introduction into the project area.

“Regeneration after disturbance is closely tied to the soil seedbank, and if a fire degrades the native seedbank, invasive species can be favored” (R6 Weed EIS 2005). Areas that burned at high severity are most at risk for reduction of the native species that can successfully compete with noxious weeds, although regions of lower severity fire can still be susceptible if weed seed is present, especially if additional soil and vegetation disturbance occurs.

Assumptions for calculating the acreages of direct and indirect effects for this alternative include the following:

- Acreage that is in the inventoried roadless area and more than 1,000 feet from a known weed population and from the Forest boundary is considered at low risk for weed spread if it supported forest vegetation before the fire. Also at low risk are any forested plant association group (PAG) acres that burned at low severity and that are more than 1,000 feet from a known weed population as well as from the Forest boundary. Areas within 1,000 feet of the Forest boundary cannot be considered at low risk due to the widespread presence of yellow starthistle on neighboring state and private lands, as mentioned above. Bunchgrass communities, mapped as nonforest PAGs, are not included as low risk because of their general susceptibility to encroachment by yellowstar thistle.

- Acres at high risk for weed spread include those within 100 feet of an active road or of a known population of a noxious weed. In addition, any acreage burned at high severity that is also within 500 feet of a known weed population is considered high risk.

- Acreage at medium risk for weed spread includes any areas within the project perimeter that are not included in the high or low categories.

- Roads have been identified as a primary vector for weed invasion in the current published literature reviewed in the white paper on causal mechanisms of noxious weed spread (Kimberling et al. 2004). Forest-wide, the presence of roads is the primary factor predisposing a given area to weed infestation (UMA Road Analysis 2002). The large number of roads on federal, state and private land within the School Fire Salvage Recovery project area will continue to be a factor in the introduction and spread of invasive plants. Only ten of the documented weed populations within the analysis area are not beside a road.

- Roadside areas known to be at high risk for invasive plant spread are calculated as those within 100 feet of any system roads, and are included in direct and indirect effects calculations in Table 3-73

Table 3-73 Alternative A - Acres at Risk of Invasive Weed Spread

Risk Level	Acres
Low	8,945
Medium	17,660
High	3,410

Cumulative Effects – Alternative A:

Assumptions for calculating cumulative effects for this alternative include the following:

Acres at low risk are the same as those shown in Table 3-73, above.

Acres at high risk include all those considered high risk due to indirect and direct effects in Table 3-73, above, plus the following:

- State logging acres in the Tucannon River corridor that are within 300 feet of a known weed population but outside the 100 foot road buffer (190 acres),

and less the following:

- any high severity burn areas within 500 feet of a known weed population that were seeded and/or mulched as part of the BAER treatments (90 acres).

Acres at a medium level of risk include all those within the project perimeter that do not fall into the high or low categories.

Total acres at high risk due to cumulative effects for Alternative A are 3,510.

Along the Tucannon River corridor the State of Washington plans to log approximately 2,000 burned acres that include numerous documented weed populations and that adjoin several logging units planned for NFS salvage. While all of the harvesting in this area (both state and Forest Service) is to be done by helicopter, there would be a combination of some soil disturbance and a further decrease in shade and cover as the standing tree boles are removed. Activities in the river corridor are of particular concern due to the combination of multiple existing infestations of several aggressive invasives (yellowstar thistle, knapweeds, Dalmatian toadflax), the proximity to off-forest populations of weeds on agricultural lands, and the prevalence of vectors, including wintering populations of elk and bighorn sheep, and frequent use of the river road by vehicles.

As noted in the Affected Environment section, Burned Area Emergency Response (BAER) efforts included the hand pulling of approximately 25 acres of knapweeds in Tucannon River corridor to prevent the immediate inoculation of newly burned ground with fresh weed seed. Within the analysis area, approximately 1,550 NFS acres that burned at high severity were aerially seeded with native grasses to help prevent noxious weed spread and reduce erosion. Although this comprises less than 6 percent of the burned acres, it includes about 44 percent of the high severity burn acres. Just over 90 acres of the seeded high severity burn were at high risk due to proximity to known weed sites.

A study by Schoennagel and Waller (1999) has shown that while intense fire can facilitate weed invasion, seeding can help to mitigate this effect. They also showed that the use of non-native grasses subsequently has negative impacts on the regeneration of the native plant communities. Since this BAER effort used only locally-sourced bunchgrasses, the mitigating effects of seeding a large proportion of the severely burned ground to thwart noxious weed establishment would not be offset by detriments to native communities.

Longer-term BAER work includes monitoring of the burned area for weed spread for up to three years after the fire to allow for early detection of new and enlarging populations. Treatment options will remain limited until the new Forest-wide Invasive Plant EIS can be implemented.

The following past, present, and reasonably foreseeable future actions were considered, but for reasons cited did not alter the calculations of acreages in the high and low risk categories for weed spread.

- No harvest units logged within the past five years are in the vicinity of known weed populations, so past harvest activities do not contribute to acreage at high risk.

- None of the local wildfires since 1960 have occurred close to known weed populations, so they do not contribute to acreage at high risk.

- No recent fuels treatments have been carried out within the project boundary in the vicinity of known weed populations, so do not contribute to acreage at high risk.

- A Forest Service prescribed fire project is currently under analysis that would treat approximately 1,600 acres in the West Patit Creek drainage at the northwest corner of the School Fire. Although it is in a separate watershed, it includes slopes and ridgetops adjoining the logging units in the Tucannon River corridor, and it incorporates two populations of yellowstar thistle and one of diffuse knapweed. Both sites are NEPA cleared, and have been treated. As long as existing weed populations are avoided during burning, and adjacent grassland plant communities are burned at low intensity, this project would not put any additional acres at high risk for spread by invasives.

- Over 70 percent of the analysis area is included in active pastures of the Pomeroy Cattle and Horse (C & H) Allotment. Of the 21,225 pasture acres, only about 14,400 are actively grazed under current management. About 4 percent of the grazed acres are in areas of high severity burn, and another 19 percent in moderate severity. This means about 25 percent of the actively grazed range within the analysis area burned hot enough to disrupt native plant communities (Johnson 1998). Use of 14,400 acres by 83 cow/calf pairs constitutes a relatively light grazing regime, and is not expected to change the risk category of any identifiable acres to a calculable degree, provided forage recovery is monitored and grazing is re-introduced only when ground vegetation has rebounded from the impacts of the fire.

Native grasses that have burned can take five or more years to regain their pre-burn vigor and extent of cover, depending on burn severity. Local studies (Johnson 1998) have shown that moderate to severe burns tend to reduce the percentage of desirable native bunchgrasses on a site, while encouraging annual bromes (and may permanently preclude re-establishment of the natives). Light severity burns often have the reverse effect of invigorating the bunchgrasses while reducing the annuals, provided the annuals were not a large proportion of the pre-fire plant community. Hotter fires lower the vigor of surviving perennial cover species thus increasing vulnerability to noxious weed establishment. It is important to rest burned pastures to reduce the risk of weed spread during this period of decreased competitive capacity by the native species.

The following items may increase the potential for invasive plant species establishment and spread. However, acreage placed at high risk from these activities is speculative, so is not evaluated numerically.

- Larger vehicles traveling away from roadbeds can actually increase potential weed habitat by disturbing and/or compacting soils, and by damaging and weakening existing vegetation. They can also carry and disperse weed seed wherever they go. While system roads are mapped, and can be efficiently patrolled for detection and treatment of associated weed populations, any infestations along unauthorized user-built roads are less likely to be rapidly found and treated. Acreage where this may be occurring is unknown.

- The use of OHVs away from designated roadbeds or trails raises especial concern for invasive species spread. While OHVs cause less ground disturbance than larger vehicles such as pick-ups, they can access more varied terrain. If used for unauthorized cross-country travel they can act as wide-ranging seed dispersal vectors, potentially introducing weed infestations into remote and seldom-frequented sites. The amount of unauthorized land use by vehicles is unknown, but it is apparent that at least some such use occurs in portions of the project area, increasing the risk of spreading invasive species to remote spots where they are not easily detected or treated (Defenders of Wildlife 2002).

- Wildlife contributes to invasive species spread by the same two basic mechanisms as cattle and vehicles: by disturbing the soil to produce the habitat that favors weed establishment, and by transporting seed across the landscape to those disturbed sites. Wintering elk, bighorn sheep, and deer all contribute to these mechanisms within the analysis area. Elk and wild sheep moving on steep slopes often cause considerable soil disturbance. Deer have a lesser impact due to their smaller size, but contribute by trailing or moving habitually or in large numbers through areas with susceptible soils. All three can act as seed vectors. This role is crucial since all three species move regularly through remote terrain where human access is problematic, especially in the unroaded portions of the Tucannon and Cummings Creek drainages. Any ensuing establishment of weeds can create populations that are difficult to detect and even more difficult to treat or eradicate.

Although implementation of the upcoming new Forest-wide invasive species EIS is a reasonably foreseeable future action, it is not possible to calculate its effects on infested acreage.

Pomeroy District plans to increase monitoring and manual treatment efforts, to the extent possible, over the next two to three years. Some funding has been identified to provide for increased vigilance against weed spread. While efforts to limit invasive species spread in the aftermath of the burn are expected to help reduce the area that may be affected, it is not possible to estimate acreage, either of actual spread, or of spread reduction through those efforts.

Effects Common to Action Alternatives (B and C)

Direct/Indirect Effects – Alternatives B and C:

Preventing seed set during salvage operations is expected to reduce any increase in weed infestations caused by the spreading of new seed, even if prevention measures are not 100 percent effective. These prevention measures would not affect spread of any older seed that may be present in the soil seedbank in the vicinity of pre-existing populations. It is not possible to calculate exact acreage reductions resulting from these weed treatments. However, the reductions in areas at risk would be proportional for each action alternative.

Danger trees would be removed from open Class 3 or higher system roads, any road designated for hauling, Boundary, Alder Thicket, Rose Spring Sno Park, and Tucannon developed recreation sites, and the Tucannon Guard Station administrative site. Table 3-74 lists documented invasive species at recreational and administrative sites where danger trees would be removed.

Table 3-74 Invasive Species at Recreational and Administrative Sites

Site	Documented Weed Species	NEPA Cleared
Rose Spring Sno Park	Spotted knapweed	No
Pataha Campground	Spotted knapweed	No
Forest Boundary Campground	Diffuse knapweed	No
Alder Thicket Campground	Diffuse knapweed	Yes
Tucannon Campground	Diffuse knapweed, Dalmatian toadflax	No
Tucannon Guard Station	Yellow starthistle, diffuse knapweed, sulfur cinquefoil	No

All sites except one overlap known weed populations. Tucannon Campground has populations of diffuse knapweed and Dalmatian toadflax within 400 feet. The Tucannon Guard Station site adjoins two populations of yellow starthistle, and includes diffuse knapweed and a large un-mapped population of sulfur cinquefoil. Only the Alder Thicket Campground weed population is cleared for treatment under the 1995 Umatilla Noxious Weed EA.

Danger tree removal in designated recreation and administrative sites would increase the amount of ground disturbance in areas that are already highly vulnerable to weed spread. Such disturbance would also facilitate invasion by new species whose seeds are typically introduced by the vehicle traffic and human activities that are common on these sites. Portions of some of the sites are already included in high risk zones associated with road corridors and/or documented weed populations. The remaining acres of these recreational sites that may undergo danger tree removal increase the total high risk acres for each alternative approximately 20 acres.

Areas of danger tree salvage along roadways are already included in calculations of acres at high risk for noxious weed spread since they are within 100 feet of existing roads.

Cumulative Effects - Alternatives B and C:

As time and funding allow, populations more distant from planned activities may be treated to further remove risk of seed spread. Intensive monitoring and efficient mapping and assessment of new populations would increase tracking capacity in preparation for treatment under the forthcoming Umatilla Invasive Species EIS. Both of these foreseeable future actions would further reduce the number of acres at high risk of weed spread. It is not possible to calculate exact acreage reductions resulting from these weed treatments. However, the reductions in areas at risk would be proportional for each action alternative.

Primary contributors to cumulative effects of danger tree removal are the past, current, and future use of roads, recreational sites, and administrative sites. Localized ground disturbance along open roads is intermittent but ongoing from such activities as snow plowing, brushing, and blading. Along closed roads, these activities occurred only in the past. Road use is not a future contributor to the spread of weed seed on closed roads, although that cause of spread is ongoing and would continue on roads that are kept open to agency and public traffic. Recreational and administrative sites are also subject to ground disturbing activities related to their maintenance and use in the present and future, as well as the past. Offsetting these opportunities for weed seed spread and population establishment is the ease of access for detecting and treating any invasive plants that appear or already exist at these sites. This should reduce existing populations over time as well as the opportunities for weed spread and establishment that are generated by disturbance from proposed project activities.

In summary, danger tree removal subjects vulnerable sites to a high risk of noxious weed increase. However, the sites are all easily accessible and treatable. Monitoring and design criteria (Chapter 2, Table 2-3) are included in the proposed project specifically to reduce any spread of invasive species. Treatment options remain limited until the new Forest-wide Invasive Plant EIS can be implemented.

Summary of Effects:
Due to time constraints associated with this salvage harvest, completion of weed treatment prior to operations is not guaranteed. Several design criteria (Chapter 2, Table 2-3) for the project do address reduction of risk through design and operational plans. The first of the design criteria addresses the efforts that will be made by the District to reduce seed set by known noxious weed populations. The intent is to preclude spreading new seed into areas of harvest activity; therefore the highest priority sites would be those within or adjacent to harvest units and areas of operation such as landings.

Alternative B – Proposed Action

Direct /Indirect Effects – Alternative B:
Assumptions for calculating the acreages of direct and indirect effects for this alternative include the following:

Acres at low risk for noxious weed invasion are the same as under Alternative A, Table3-73.

Acres at high risk include all of the following:

- within 100 feet of an active road
- within 100 feet of a known population of a noxious weed
- burned at high severity and also within 500 feet of a known weed population
- within a forwarder unit and also within 500 feet of a known weed population
- within a forwarder unit and also within 1,000 feet of a known weed population when the unit intersects the weed population
- within a skyline unit and also within 500 feet of a known weed population
- within a helicopter unit and also within 300 feet of a known weed population
- within a designated recreation site subject to danger tree removal

Acres at a medium level of risk include all those within the project perimeter that do not fall into the high or low categories. The following table shows the acres at high risk of invasive weed spread for Alternative B.

Table 3-75 Alternative B - Acres at Risk of Invasive Weed Spread

Risk Level	Acres
Low	8,945
Medium	16,680
High	4,390

Alternative B has more acres to be salvage harvested, receive fuel treatments, be burned, be reforested, and more miles of road to be used during project activities than Alternative C. Because these are activities that create habitat most vulnerable to weeds, this alternative poses the highest risk of invasive plant species introduction and spread.

Alternative B proposes that just over a quarter of the salvage be done by forwarder, and the same proportion by helicopter, with skyline systems accounting for the remainder. Of the logging systems proposed, forwarder is considered to be the most disruptive to soils, with skyline and helicopter systems listed in decreasing order of soil disturbance (McIver and Starr 2000), also indicating that Alternative B poses the highest potential for weed spread as measured by harvest-related ground disturbance.

Ground fuels created by salvage harvest may be reduced by either yarding out the tops of tree boles or by lopping and scattering of tops and limbs that are left behind. The latter treatment creates minimal disturbance to encourage noxious weed establishment. Lop and scatter areas which are then jackpot burned may show a patchy increase in soil degradation/disturbance in spots where fuel concentrations result in a hot burn. Yarding of tops may create localized pockets of exposed mineral soil susceptible to weed establishment. Since Alternative B has more acres than Alternative C affected by each of these treatments, it poses the highest risk for the establishment and spread of invasive weed species from fuel treatments.

Reforestation creates a small amount of soil disturbance at each planting site. However, in the long run, the regeneration of canopy cover can be expected to limit the potential habitat for invasive weed species, most of which require high light environments to grow and reproduce. Therefore, the larger the proportion of ground that is actively reforested, the less weed habitat is expected in the future. In Alternatives B and C all harvested ground would be planted, so relative disturbance is the same for both.

Miles of road to be used for harvest activities are 92 for Alternative B, compared to 76 for Alternative C. Since each extra mile accessible to vehicles increases the area in which weed seed is likely to be spread, Alternative B poses the highest potential for noxious weed introduction and spread in the category of system road use. Construction of new temporary roads and use of existing unauthorized roadbeds are also higher in Alternative B than C, further increasing weed invasion risk.

Inclusion of a number of design criteria in project activities will help to reduce the risk of invasive species introduction and spread. The criteria are intended to minimize ground disturbance and the exposure of mineral soils, to reduce the introduction of weed seed into areas where ground disturbance is occurring, to minimize the moving of any weed seed that already exists in project area soils, and to re-establish weed-free ground cover as quickly as possible after any ground-disturbing activities. For a detailed list of design criteria common to all action alternatives (see Chapter 2, Table 2-3).

Cumulative Effects – Alternative B:

Past and foreseeable future actions are the same as those described for cumulative effects under Alternative A.

Assumptions for calculating the acreages of cumulative effects for this alternative include the following:

Acres at low risk are the same as those in Alternative A (Table 3-73).

Acres at high risk include all those considered high risk under Alternative B, indirect and direct effects (Table 3-75), plus the following:

- State logging acres in the Tucannon River corridor that are within 300 feet of a known weed population (190 acres),

and less the following:

- any high severity burn areas within 500 feet of a known weed population that were seeded and/or mulched as part of the BAER treatments (90acres).

Acres at a medium level of risk include all those within the project perimeter that do not fall into the high or low categories.

Total acres at high risk due to cumulative effects for Alternative B are 4,490.

While the direct and indirect effects for noxious weeds in Alternative B are greater than in Alternative A based on the amount of ground disturbance in the proposed action, all other activities contributing to cumulative effects are the same for both alternatives.

Pomeroy District plans to increase monitoring and manual treatment efforts, to the extent possible, over the next two to three years. Some funding has been identified to provide for increased vigilance against weed spread. While efforts to limit invasive species spread in the aftermath of the burn are expected to help reduce the area that may be affected, it is not possible to estimate acreage, either of actual spread, or of spread reduction through those efforts.

Alternative C

Direct /Indirect Effects – Alternative C:

Assumptions for calculating the acreages of direct and indirect effects for this alternative are the same as those for Alternative B. Harvest units are a subset of those in Alternative B, however, exact acres at high risk were not modeled. Total activity acres for Alternative C are only about 40 percent of those proposed in Alternative B. In addition, a greater proportion of logging would be done by helicopter in Alternative

C, and fewer miles of road would be used during the project. The resulting overall reduction of ground disturbance under Alternative C would result in fewer acres at high risk for spread of invasive plants.

Design criteria to mitigate the effects of project activities are the same as noted in Alternative B.

Cumulative Effects – Alternative C:

Past and foreseeable future actions are the same as those described for cumulative effects under Alternative A.

While direct and indirect effects on noxious weeds for Alternative C are less than Alternative B, based on the amount of ground disturbance for each, all other activities contributing to cumulative effects are the same for both alternatives.

Alternative C would place more acres at high risk of weed spread than would Alternative A (No Action). Alternative C would place fewer acres at high risk than Alternative B.

Pomeroy District plans to increase monitoring and manual treatment efforts, to the extent possible, over the next two to three years. Some funding has been identified to provide for increased vigilance against weed spread. While efforts to limit invasive species spread in the aftermath of the burn are expected to help reduce the area that may be affected, it is not possible to estimate acreage, either of actual spread, or of spread reduction through those efforts.

Summary of Effects:

Within the School Fire Salvage project boundary, the primary difference in effects to invasive plant species from the three project alternatives is shown by the differing numbers of acres that are placed at high risk of noxious weed spread. Alternative B creates the most acreage at high vulnerability for weed infestation, due to the amount of ground disturbing activities proposed. The smaller area of ground disturbance in Alternative C results in fewer acres at high risk. Alternative B places about 23 percent more acres at high vulnerability to weed spread than the No Action Alternative (A).

There is potential for a rapid increase in noxious weed infestation within the project area due to existing conditions. No matter which alternative is implemented, execution of prevention measures and careful and thorough monitoring, with rapid treatment by whatever means are available, would remain critical for at least the next three years in minimizing weed spread.

Finding of Consistency:

The proposed School Fire Salvage Recovery Project is consistent with the Umatilla Forest Plan direction, as amended with respect to noxious weeds. Compliance with Prevention Standard #1 from the Pacific NW Regional FEIS includes the above discussions of existing condition, the mechanisms of invasive species spread, the prevention measures listed as design criteria, and the risks that remain even after implementation of the prevention measures.

(Standards from the Pacific NW Regional FEIS for the Invasive Plant Program are listed in Appendix 1 of the Invasive Plant Species report located in the analysis file).

THREATENED, ENDANGERED AND SENSITIVE PLANTS (TES)

SCALE OF ANALYSIS

The analysis area for Threatened, Endangered, or Sensitive (TES) plants includes the perimeter of School Fire plus a mile wide buffer around the perimeter of the fire.

Direction for the management of TES plant species is in the Umatilla Forest Plan (1990), and requires maintenance and improvement of habitats for threatened or endangered species, and management of habitats for sensitive species to prevent their becoming threatened or endangered. The presence of threatened or endangered species requires preparation of a Biological Assessment and consultation with the U.S. Fish and Wildlife Service. Presence of Sensitive species requires preparation of a Biological Evaluation to assess risks to those populations by any project activities, and to propose any mitigation measures that might be necessary to ensure the continued existence of the populations. Project evaluation for the presence of any TES species is based on botanical field surveys of the area in question.

Plant survey records and the forest-wide TES plant occurrence layer in GIS were reviewed to determine if any rare plant populations were documented in the vicinity of the School Fire. Botanical survey data show that 19 surveys have been done within the fire boundary and up to a mile outside the boundary. The survey method was intuitive controlled, meaning botanists sampled all habitat types present within the survey area while focusing on the locations and plant communities most likely to support rare species. Complete vascular plant species encounter lists were recorded during these surveys, and are on record at the Umatilla National Forest supervisor's office in Pendleton, Oregon. Because complete species lists were kept, any TES vascular plant species that have been added to the Region 6 Regional Forester's Sensitive Plant List (R6 Sensitive List) since 1992 would likely be documented. Table 3-76 lists the year and survey name of botanical surveys.

Table 3-76 Botanical Surveys

Year	Survey Name
1988	Waterman Planning Area
1989	West Patit Planning Area
1990	Wheatfield Planning Area Tucannon Planning Area
1991	Huckleberry-Cummins Planning Area Pataha Planning Area Upper Charlie Planning Area
1992	Big Springs Expanded Eckler Meadow Scoggin Tallow Flat
1994	Clearwater

Year	Survey Name
1996	Little Tucannon M. Tucannon/Cow
1999	Charlie Creek Sheep Creek West Patit Creek
2000	Middle Tucannon

The Tucannon River corridor was examined for potentially rare moss species during a bryophyte workshop with regional experts in the fall of 2000.

AFFECTED ENVIRONMENT

No TES plants have been found on Umatilla National Forest within the School Fire Salvage Recovery project area. One population of the R6 sensitive clustered ladyslipper (*Cypripedium fasciculatum*) was documented in 1989, a few yards outside the Forest boundary on state land in School Canyon. Forest Service botanists have informally monitored this population of one or two plants since it was found.

Cypripedium fasciculatum - The small population of *C. fasciculatum* in School Canyon appears to have been subject to low intensity burning during the School Fire event. The fire crept about in the moss layer on the soil and rock surface, but left much of it intact. Many of the overstory trees were not killed, and the immediate shrub layer appears to have survived. The state has marked green trees to leave in the vicinity of the orchid to help provide shade to the plant population and preserve its microhabitat.

The Conservation Assessment (Vance 2005) for *Cypripedium fasciculatum*, a widespread but uncommon orchid of the montane inland and coastal western U.S., describes suitable habitat for this species as the understory beneath mature coniferous canopy, and also the shade of smaller shrubs and perennial forbs in forest edges and openings. Shade is not the only factor crucial to the lady's slipper's survival. "Because of the strong connection with mycorrhizal fungi and a pollinator that preys on fungal gnats, the habitat includes a rich organic layer that supports microflora" (Vance 2005).

Habitat is likely to be adversely affected by "activities that alter the moisture or temperature regime, actions that disturb the soil and litter layer, or decrease vegetation cover" (Vance 2005). A well-shaded and relatively cool, moist environment, with down wood in decay classes 4 or 5 and a duff layer on the soil surface, can support the mycorrhizal associates that the orchid needs for germination and growth. At lower elevations (below 4000 ft.) in eastern Washington and Oregon such an environment is most often associated with north aspects or broader riparian zones.

Six populations of clustered lady's slipper have been documented on Pomeroy Ranger District. They occur in plant associations ranging from ponderosa pine (drier) to grand fir (more moist) series. Four of the six include Douglas maple in the shrub overstory, an indicator of the relatively cool moist environments most typical in draws and riparian areas, or on north slopes. The remaining two sites are assumed to be cool and moist since they occur in riparian zones in grand fir series plant associations.

The School Canyon population grows beneath a Douglas-fir canopy and an understory of oceanspray shrubs near the mouth of the east-facing canyon. The substrate at this site consists of an old basalt slide of cobble-sized rock. An accumulation of duff has filtered into sheltered spots between the rocks to provide organic matter, while a thick layer of moss covers the rock surfaces. The plants are not near a creek or water source, but the forest floor stays relatively cool and moist due to the layers of shade above and the gaps between the rocks that can trap moisture.

There are at least ten similar east-facing canyons that open onto the Tucannon. Because the topography of the whole burn is highly dissected, there are numerous east and north sloping canyons throughout the salvage area that might have provided potential habitat for the lady's slipper. Since the orchid is sensitive to fire (Vance 2005), any ground that sustained a moderate or high severity burn will have lost plants that may previously have been present. Potential habitat has also been lost in moderate to high severity fire zones since the shade canopy has been removed and most of the duff layer consumed. Areas of low intensity fire may have retained much of the duff layer; however if the overstory consisted of thin-barked tree species prone to fire-kill, such as grand fir, canopy shade may have been lost or be decreasing as the trees succumb to fire damage over the next two to three years. Therefore, potential habitat for the clustered lady's slipper is now limited to any cool moist sites that have retained viable canopy cover, or at least a dense shrub understory, as well as an organic duff layer on the soil surface.

***Silene spaldingii* -** *Silene spaldingii* is Federally Listed as Threatened and occurs on the northeast corner of the Umatilla National Forest about 6 air miles from the project area. This catchfly grows primarily in open grasslands with deep Palousian soils in association with Idaho fescue and other grassland species. Extensive surveys have not found any occurrences of this plant closer to or within the School Fire.

***Nonvascular Plants* -** Potential habitat for several nonvascular species added to the R6 Sensitive List in 2004 was found in the lower Sheep Creek drainage about one mile south of the fire perimeter. No R6 TES species were documented. No habitat for currently listed R6 Sensitive nonvascular species occurs within the School Fire perimeter.

ENVIRONMENTAL CONSEQUENCES

Consequences of the project alternatives to sensitive and federally threatened plant species are evaluated qualitatively, based on multiple years of observation of known populations and on the professional judgment of the Umatilla Forest Botanical Resources staff.

Each of the action alternatives includes activities that could adversely affect suitable habitat for rare plants. Comparison of possible adverse effects of the School Fire Salvage Recovery project on potential habitat is based on the amount of ground disturbing activities proposed, as defined by acres to be harvested. The area analyzed is limited to Forest Service ownership, except that it includes lower School Canyon where the documented population of *Cypripedium fasciculatum* occurs on Washington State land.

The following table shows plant species considered in this analysis. Neither species has been documented within the project area. The lady's slipper occurs a few yards outside the NFS boundary. A major population of Spalding's catchfly occurs within approximately six airmiles of the project area boundary, but no occurrences have been found closer to the project.

Table 3-77 Threatened, Endangered, and Sensitive Plant Species Considered

Species	Scientific Name	Federal Status	*R6 Status	**WNHP Status	Effects Determinations of Action Alternatives
Clustered lady' slipper	*Cypripedium fasciculatum*	SoC	S	S	**NI**
Spalding's catchfly	*Silene spaldingii*	T	S	T	**NE**

*R6 = Regional Forester's Sensitive Species List
**WNHP = Washington Natural Heritage Program

Status:

T	Federally Threatened
SoC	Federal Species of Concern
S	Sensitive Species from Regional Forester's list

Effects Determinations:

Federally Threatened and Endangered Species

NE	No Effect
NLAA	May Affect, Not Likely to Adversely Affect
LAA	May Affect, Likely to Adversely Affect
BE	Beneficial Effect

Sensitive Species

NI	No Impact
MIIH	May Impact Individuals or Habitat, but Will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species
WIFV	Will Impact Individuals or Habitat with a Consequence that the Action May Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species
BI	Beneficial Impact

There is no potential habitat for any currently listed sensitive non-vascular plants, so there would be no impacts to any such species from this project.

Cypripedium fasciculatum - Because there are no known occurrences within the project area, there can be no direct effects on plants of clustered lady's slipper. However possible impacts to habitat deserve some further discussion, in consideration of cumulative effects to the species.

Silene spaldingii -Extensive surveys have not found any occurrences of this plant closer to or within the School Fire. It is therefore assumed that the open grasslands within the analysis area do not provide the conditions associated with true potential *Silene spaldingii* habitat, in particular the deep soils (Hill & Gray 2004).

Alternative A – No Action

Direct /Indirect Effects and Cumulative Effects – Alternative A:

The No Action alternative would not create any further human-caused ground disturbance. Therefore, this alternative would cause No Impacts to *Cypripedium fasciculatum* or its habitat.

Because neither the plant nor its potential habitat occurs within the analysis area, Alternative A will have No Effect on *Silene spaldingii*.

Alternative B – Proposed Action

Direct /Indirect Effects – Alternative B:

There are no *Cypripedium fasciculatum* populations known within the project boundaries.

Examination of burn severity maps, predictions of tree mortality, and location of proposed logging units show no intersection of proposed harvest with remaining viable habitat for this orchid, as described above. Therefore, this alternative would cause No Impacts to *Cypripedium fasciculatum* or its habitat.

Because neither the plant nor its potential habitat occurs within the analysis area, Alternative B would have No Effect on *Silene spaldingii*.

Cumulative Effects – Alternative B:

Actions that may contribute to effects on *Cypripedium fasciculatum* include past and future fires in the form of wildfire, prescribed burns, and fuels treatments; timber harvest, on NFS and adjacent lands; and possibly past and future grazing.

Fire itself, not just suppression activities, can have widespread detrimental effects on clustered lady's slipper and its habitat. Low severity burns do not always harm existing populations, only reduce habitat on a patchy basis, and may even stimulate germination of new plants and expansion of existing populations (Lichthardt 2001) Hotter fire kills plants and reduces the duff layer needed for effective habitat, and may reduce shading as well. The small fires of the 1960s in the Tucannon drainage affected little-to-no potential habitat. Past fuels treatments by broadcast burning may have adversely affected some habitat.

Timber harvest, with the associated combination of ground disturbance and canopy/shade removal may harm lady's slipper plants as well as reduce potential habitat. This was especially true before 1995 when RHCA buffers were instituted. Because of the highly dissected topography and steep slopes of the local landscape, a significant proportion of the mesic plant communities that can support the clustered lady's slipper fall within riparian areas that are now protected by PACFISH buffers. So past timber harvest may have contributed to loss of plants or potential habitat, but future foreseeable actions would affect a smaller proportion of potential habitat.

Current grazing use of the project area and surrounding landscape is much lower than it was historically, and is not of concern. Large numbers of sheep pastured here in the past had the capacity to do mechanical damage to any existing *Cypripedium fasciculatum* populations. However, the habitats in which the orchid thrives do not support preferred sheep forage, and do not occur in good bed grounds, so damage would not have been extensive. Cattle, on the other hand, are attracted during hot weather to the same shady environments that support the lady's slipper, so cattle presence, especially at historic numbers, may have caused soil compaction and loss of supportive microflora, decreasing the potential for the plant to occupy that habitat. (Numbers in the allotment ran over 800 pairs in the 1930s and 1940s; more recently they peaked at 265 pairs per pasture in the early 1980s. The current stocking rate is 83 pairs for the whole allotment.)

Alternative C

Direct /Indirect Effects – Alternative C:

There are no *Cypripedium fasciculatum* populations known within the project boundaries.

Examination of burn severity maps, predictions of tree mortality and location of proposed logging units show no intersection of proposed harvest with remaining viable habitat for this orchid, as described above. Therefore, this alternative would cause No Impacts to *Cypripedium fasciculatum* or its habitat.

Because neither the plant nor its potential habitat occurs within the analysis area, Alternative C will have No Effect on *Silene spaldingii*.

Cumulative Effects – Alternative C:
Cumulative effects are the same as discussed under Alternative B for *Cypripedium fasciculatum*.

Finding Of Consistency:
The proposed School Fire Salvage Recovery project is consistent with the Umatilla National Forest Land and Resource Management Plan standards and guidelines for Threatened, Endangered and Sensitive (TES) plant species, as amended. Inventories were completed for TES plant species and the effects analysis above determined that there would be no effect to plants or habitat for the one threatened and one sensitive plant species that occur in the vicinity of the planned project.

As required the Biological Evaluation is available in the analysis file for this project.

WILDLIFE

SCALE OF ANALYSIS

The School Fire changed approximately 27,000 acres of wildlife habitat. The adjacent William Wooten Wildlife Area, an area managed by the State of Washington along the Tucannon River, was also nearly completely burned (12,000 acres). Proposed activities could affect wildlife remaining in the area, and could affect the recovery of habitats.

Affected environment was described for each species, group of species, or habitat. Species presence/absence determinations were based on habitat presence, wildlife surveys, recorded wildlife sightings, observations made during field reconnaissance, non- Forest Service databases, and status/trend and source habitat trend documented for the Interior Columbia Basin. Formal wildlife surveys were not conducted for most species. Formal surveys are being done in some areas of the forest, but not specifically for this project. Information was also obtained from the Tucannon Ecosystem Analysis (USDA 2002).

The following categories of wildlife or habitats are discussed: old growth habitat; management indicator species (MIS); threatened, endangered and sensitive (TES) species; landbird habitat; and dead wood habitat. Dead wood habitat and old growth habitat are specifically assessed because of their importance to multiple species. Landbirds, including Neotropical migratory birds (NTMB), were analyzed based on high priority habitats identified in the Oregon-Washington Chapter of Partners in Flight, Northern Rocky Mountains Bird Conservation Plan (Altman 2000).

Direct effects to animals are based on the likelihood of the species being present during project activities. Effects on habitats are discussed, with the assumption that if appropriate habitat is available for a species, then that species occupies or could occupy the habitat. Effects to habitat are primarily based on information in the Silviculture Specialist Report for this project. Field reconnaissance information, pre-fire and post-fire aerial photos, and Geographic Information System analysis of data provided additional information.

Effects to wildlife were assessed for the area of National Forest System lands burned by the School Fire, focusing on effects of activities within proposed treatment units. Non-National Forest System land within the project area boundary was generally not included in calculations, although it was considered in cumulative effects analysis. A larger area was analyzed for dead wood habitat in order to help determine how the fire is contributing to habitat at the larger scale. For this project dead wood is evaluated at multiple scales, including treated units/stands, School Fire Salvage Recovery project area, and the Tucannon-Pataha-Asotin watersheds (Tucannon –Asotin).

The effects to wildlife species and habitats will be measured by:

- Amount of Dedicated Old Growth and late, old stand structure
- Degree of effects to Management Indicator Species
    - Elk: security and habitat quality as measured by cover, forage, and roads
    - Marten
    - Pileated woodpecker
    - Primary Cavity Excavators
        - Percent reduction of habitat for selected cavity excavator species
        - Comparative level of assurance that habitat would be available for selected cavity excavator species, based on distribution and amount of habitat in the > 50 % species tolerance level
- Degree of effects to Threatened, Endangered, and Sensitive wildlife species

AFFECTED ENVIRONMENT - OLD GROWTH HABITAT

Allocated Old Growth - The Forest Plan allocated stands between 75 and 300 acres in size as C1-Dedicated Old Growth or C2- Managed Old Growth to provide old growth tree habitat across the Forest. Old growth stands were initially classified as suitable and/or capable habitat for a selected management indicator species. Unit size and distribution are variable and depend on the vegetation type and target management indicator species (USDA 1990).

School Fire burned 1,600 acres of Dedicated Old Growth. Two of these stands are within Willow Springs inventoried roadless area. Three of the C1 management areas contain green trees that may have survived the fire, however, delayed mortality is expected and the remaining green areas are not large enough to meet Dedicated Old Growth requirements. The fourth area on Cummings Creek (#2612) was burned completely black. The Forest Service is proposing to amend the Forest Plan to reallocate the existing burned C1 areas and designate new C1 areas, located outside of the fire perimeter. Appendix A contains a map displaying the changes in land allocation and Appendix J includes two tables that display the changes in acreage by land allocation.

Late and Old Structure – Umatilla National Forest Plan Amendment #11 established interim riparian, ecosystem, and wildlife standards for timber sales (the Eastside Screens) (USDA 1995). The Interim Wildlife Standard (wildlife screen) restricts the harvest of timber in stands classified as late or old structure (LOS), if the amount of LOS in the area is below the historic range. Stands in Old Forest Single Story and Old Forest Multi-Story structural stages are considered late and old structure habitat in this analysis. Because of the fire, the amount of late and old structure forest is well outside the historic range of variability. According to the Silviculture Specialist Report, only an estimated 1,513 acres of LOS remain on NFS land within the fire perimeter, including LOS in Management Area C1. This equates to 7 percent of the potentially forested areas in the analysis area. Most of these areas occur in the southeastern portion of the fire which burned with lower severity. About one half of the post-fire LOS is rated as having high expected mortality in the coming year.

Connectivity – The Interim Wildlife Standard also requires that connectivity between blocks of late and old structure (LOS) stands be evaluated. Connective habitat does not necessarily need to meet the same description of old forest habitat, but provides "free movement" between LOS stands for various wildlife species associated with old forest conditions. Much of the area was naturally broken up by grassland areas and past timber harvest. Since the fire there are very few options to connect live LOS stands, and since mortality is expected to increase in the next few years, mapping connectivity now would be premature. Connective stands would primarily consist of Young Forest Multi-Strata, Stem Exclusion Closed Canopy, and Understory Regeneration structural stages. Additional information regarding the Interim Wildlife Standard can be found in Appendix C of this document.

ENVIRONMENTAL CONSEQUENCES – OLD GROWTH HABITAT

Effects Common to All Alternatives, including No Action

Direct/Indirect Effects – Alternatives A, B, and C:
Species dependent on mature forest would not likely occupy much of the fire area for up to 100 years. Northern goshawk, pileated woodpecker, and American marten habitat would not be extensive enough to support populations within the fire perimeter until extensive areas of mature forest develop.

Alternative A – No Action

Direct/Indirect Effects – Alternative A:
Remaining green patches of old growth would continue to exist, and no large diameter dead trees would be removed from old growth stands affected in the fire. Large snags would be left to persist until they eventually fall. The tops of many snags would likely break, which results in fewer trees blowing down, hence a longer snag persistence on the landscape. Large diameter, legacy snags may persist long enough to provide denning and nesting opportunities for a variety of wildlife as a new generation of trees grow in Forest Plan designated C1 - Dedicated Old Growth stands that were affected by the fire would not be replaced at this time and existing C1 stands would remain as C1. The effect of not changing these management allocations is that replacement areas would not be protected from woodcutting, recreational developments, road building, and timber harvest. This could eventually lead to a reduction in the amount of undisturbed old forest areas outside of the School Fire. If the No Action alternative is selected, it would not preclude completing an amendment to replace the C1 in the future

Effects Common to Action Alternatives (B and C)

Direct/Indirect – Alternatives B and C:
Tree seedlings would be planted in harvested areas, which would speed-up the recovery of the area back to a forested condition, and shorten the time it would take stands to become old forest (Silviculture Specialist Report).

A Forest Plan amendment would reallocate Management area C1-Dedicated Old Growth to the following(see Table J-1, Appendix J): Management Area C3 - Big Game Winter Range; Management Area E2 - Timber and Big Game; Management Area C8 - Grass Tree Mosaic; and Management Area C5 - Riparian (Fish and Wildlife) . The amendment would also designate areas outside of the fire area as Management Area C1-Dedicated Old Growth. Selection factors for replacement old growth included: location; aspect; stand size and shape; and stand composition and structure (see Table J-2, Appendix J).

Timber harvest is allowed in burned C1, so changing the C1 allocation to other management strategies has no effect to the existing amount of timber available for harvest. This amendment could affect the amount of timber made available for public use outside this project area. Designating new C1 areas would protect these areas from woodcutting, recreational developments, road building, and timber harvest. Approximately 1,500 acres of the new C1 is within inventoried roadless areas.

This amendment will not preclude or require other amendments specific to old growth, and this amendment will not preclude or require other actions across the forest in old forest habitat. The effect of designating replacement old growth is that a good faith effort towards meeting Forest Plan management requirements for Dedicated Old Growth, pileated woodpecker, and American marten would be made.

Alternative B – Proposed Action

Direct/Indirect Effects – Alternative B:

Harvest of dead and dying trees would occur in these burned C1 areas in the same manner as all other stands (698 acres). Large diameter snags would be harvested in these areas, but all green trees that have a high probability of surviving would remain (see Appendix B- Implementation/Marking Guide). Table 3-78 shows the amount of harvest proposed in burned C1-Dedicated Old Growth.

Table 3-78 Harvest Proposed in Burned C1 Units

C1	Location	Burned C1 Acres	Alternative B Salvage acres*	Alternative C Salvage acres
0012	Pataha Creek	373	370	0
0022	Upper Cummings Creek	374	328	0
0032	Camp Wooten	504	0	0
2612	Abel's Ridge/ Cummings Creek	345	0	0
Total		1600	698	0

*RHCAs acres are included in total acres, but would not be harvested.

Salvage would also occur on approximately 902 acres categorized as stands with late or old structure (LOS) post-fire. Most of these stands are expected to have moderate to high delayed mortality according to stand reviews. However, a few stands of LOS that were lightly burned may still meet the criteria for late old structure in the long-term. Harvest of dead, dying, and danger trees is proposed in less than 200 acres of this habitat.

Alternative C

Direct/Indirect Effects – Alternative C:

There would be no timber salvage in burned C1 - Dedicated Old Growth, and large diameter dead trees ($\geq$21 inches dbh) would not be removed in any unit. Salvage would occur in approximately 195 acres categorized as stands with late or old structure post-fire. All of these acres are expected to have moderate to high delayed mortality, therefore salvage of dead and dying trees in these stands would not detract from LOS habitat any more than Alternative A -No Action.

Effects Common to Action Alternatives (B and C)

Cumulative Effects – Alternatives B and C:

Previous harvest activity on the District removed substantial amounts of old growth habitat. Willow Fire also caused a reduction of about 200 acres of old growth forest adjacent to School Fire. A few stands of

LOS that were lightly burned in School Fire are bordered by past harvest units and/or the previously salvaged Willow Fire. Harvest of dead and dying trees in these potentially long term LOS stands (<200 acres) would create additional openings in the canopy. At the same time, heavy fuel loading and the potential for future stand replacement fire would be reduced. Since only dead and dying trees would be taken, there would be little difference between harvesting and leaving the trees to fall.

Replacement stands would be identified for the C1 stands that were lost in the fire under all action alternatives, but the loss of old growth habitats incurred by the fire would not be recovered in the short-term.

Additional tree planting outside of harvest units would decrease the time it takes for the fire areas to become forested again and grow into large, mature trees. Other ongoing and proposed activities would have no effect to old forest habitat.

MANAGEMENT INDICATOR SPECIES

The Forest Plan identified 15 wildlife Management Indicator Species (MIS) to represent a larger group of wildlife species presumed to share the same habitat requirements. Not all Forest Plan management indicator species will occur in the analysis area because post-fire conditions do not provide suitable habitat for some of the species. Habitat in the fire area remains suitable for Rocky Mountain elk, northern three-toed woodpecker, and some primary cavity excavators (black-backed woodpecker, downy woodpecker, hairy woodpecker, Lewis's woodpecker, and northern flicker).

AFFECTED ENVIRONMENT – ROCKY MOUNTAIN ELK

Rocky Mountain elk was selected as an indicator species in the Forest Plan to represent general forest habitat and winter ranges. Habitat quality for elk will be evaluated in terms of forage, cover (satisfactory and marginal), elk screening, and open road density. The HEI model (Habitat Effectiveness Index, Thomas et al. 1988) will not be applied here because the model is not a suitable tool for evaluating management effects after a fire of this magnitude. In addition, no reductions in satisfactory and marginal cover are proposed and no change in miles of open road is proposed, therefore, the habitat effectiveness index would not change from the existing condition.

School Fire burned through areas that provided important winter and summer habitat for deer, elk, and bighorn sheep. The fire burned about 70 percent of the Tucannon Winter Range, which is comprised of the Wooten Wildlife area, Forest Service lands, and private lands. In the 1960s an elk barrier fence stretching over ten miles was built to prevent elk from moving off of state and federal land, in order to reduce impacts to adjacent agricultural areas. This fence burned in School Fire and is in the process of being rebuilt.

Washington Department of Fish and Wildlife Management Objectives (MO's) for the Tucannon Game Management Unit (GMU) and Lick GMU combined are 1,700 elk and 900 deer (WDFW 2003). Over the past decade, elk populations have been around 25 percent and 60 percent below this goal, respectively. Elk numbers have declined in the Lick GMU and east of the Tucannon River in the Tucannon GMU. Low calf survival, low adult bull survival, and the loss of antlerless elk have negatively impacted the herd (WDFW 2003). Causes for low survival rates include calf predation, efficient harvest (hunting), and changes in habitat, leading to vulnerability during the hunting season (Pat Fowler, WDFW, personal communication).

It is unusual for fire to cause extensive mortality of big game animals (Lyon et al. 2000). Generally, there is time for them to move away from the flames and smoke. In this case, however, School Fire moved so quickly that some animals became trapped. Almost half of the elk and bighorn sheep on the Wooten Wildlife Area died, and nearly a third of the deer (WDFW news release). Surveys of Forest Service land did not result in similar finds; however the intensely burned inventoried roadless area has not been looked at closely. The effects of this reduction in big game numbers on the population are yet unknown.

Forage for elk will be in short supply this winter because vegetation will not have fully grown back before snowfall. Pre-existing grasses, forbs and shrubs are already sprouting in many areas, providing some forage. New sprouts are rich in nutrients and highly palatable, which could ultimately bolster populations. Soon after the fire, about 1,760 acres were seeded with native grasses to reduce erosion and weed invasion.

The majority of satisfactory and marginal cover throughout the 28,000 acre analysis area was burned during the School Fire and now is classified as forage habitat. Some satisfactory cover and marginal cover still exist inside the fire perimeter on sites that did not burn, or which burned at low intensity. The Forest Plan indicates that a minimum of 30 percent of an area be maintained in a cover condition (marginal and satisfactory cover combined). Areas that burned lightly and remain green will have some delayed tree mortality, but some areas still provide big game cover. Current total cover levels are estimated to be between 10 to 20 percent of the 28,000 acres analysis area.

The quality of elk habitat is influenced by the presence of humans, which causes animal stress and hunting vulnerability. This is primarily associated with motorized use of open roads and the availability of vegetation (live and dead) to screen elk. Elk have been found to select habitats preferentially based on increasing distance from open roads (Rowland et al. 2000). Vulnerability and hunting mortality have been found to be higher in forested stands with greater road densities and less vegetation to provide screening (Weber et al. 2000). The open road density in the analysis area is currently 1.6 miles per square mile, which is within the desired condition of an average 2 miles per square mile forest wide (USDA 1990)

ENVIRONMENTAL CONSEQUENCES – ROCKY MOUNTAIN ELK

Effects Common to all Alternatives, including No Action

The fire area has become predominantly foraging habitat for elk and deer. Since fire removed most of the tree cover, more sunlight will touch the ground, favoring grass, forb, and shrub growth. As green-up occurs this next spring and summer; the new sprouts should be highly palatable and rich in nutrients. Areas containing micro sites of sprouting vegetation could attract big game in high numbers and lead to soil and vegetation damage. The forage component would increase in quality and quantity across the fire area within the next three to five years. Potential invasions by noxious weeds could reduce forage long into the future.

Satisfactory and marginal cover for elk would not be well distributed and would develop slowly. Fire blackened trees would serve as screening to obscure the view of elk, but eventually the dead trees would fall. Areas that burned lightly and remain green would have some delayed tree mortality, but some areas would still provide big game cover. This amount that would continue providing cover is difficult to predict until one or two years after the fire, but would probably be less than 10 percent of the 28,000 acre analysis area. Vegetation for screening in the fire area would eventually improve through conifer and riparian plantings and natural regeneration. Cover developing in the area would occur in small patches rather than the large stands of dense cover. Marginal cover would likely develop over larger areas in 30-40 years, while suitable cover would take longer, particularly since tree seed sources were consumed in a large portion of the fire.

Open road densities would remain at the current level and public recreation activities on and adjacent to roads are expected to remain stable or increase in the near future. With the loss of cover due to fire, the number of open miles (outside the roadless area) could affect elk use near open roads (Rowland et al. 2000, Weber et al. 2000). Because stands are now more open, human disturbance of all wildlife would be greatest in the spring and autumn during mushroom harvesting and hunting seasons. With the combined loss of cover and potential increase in human activities, big game disturbance and displacement in the general area would increase and would vary in intensity throughout the year.

Alternative B – Proposed Action

Direct/Indirect Effects – Alternative B:

Timber harvest and road activities on 9,432 acres could create short-term disturbances for big game animals, causing changes in habitat use and movement. Helicopter logging would occur on the winter range (1,400 acres), but not during the crucial big game wintering time period. Harvest would likely occur in several stages, with a majority of the area having little disturbance while a small area is affected in each phase.

Areas that burned nearly completely black comprise 85 percent of the 9,432 acres proposed for harvest (i.e. dead shade), while areas that burned lightly and contain green trees comprise 15 percent. All burned trees with a high probability of surviving would remain on the landscape (see Appendix B-Implementation/Marking Guide). Some stands currently have a mosaic of marginal cover and dead trees (forage). No areas that currently classify as satisfactory or marginal cover would be changed to a forage condition because of proposed activities. Salvage harvest on lands classified as forage habitat will not change the habitat classification. Salvage harvest would remove dead trees that elk could use for screening. Elk are expected to displace as needed to areas where live and dead vegetation is sufficient to provide security. Effects to satisfactory and marginal cover, forage, and screening vegetation are consistent with the Forest Plan. Tree planting after harvest and prescribed fire would facilitate growth of cover and screening vegetation. Conifer tree planting would establish forest cover more quickly than by waiting for natural plant succession to reestablish a forested condition (Silviculture Specialist Report).

Proposed road projects would not result in a net increase in open road densities. Temporary roads used for harvest would be closed once all treatments for the associated units are completed. Road disturbance to big game would be short in duration; however, the disturbance would occur while screening from vegetation is at the lowest levels.

Alternative C

Direct/Indirect Effects – Alternative C:

Timber harvest and road activities on 4,188 acres could create a short term disturbance for big game animals as described for Alternative B, but across less than one half the acres and fewer miles of road used in support of harvest. Effects to satisfactory and marginal cover, forage, vegetative screening, and open road densities are the same as described in Alternative B except limited to 4,188 acres harvested and the roads used. The effects of tree planting would be similar to Alternative B, except that trees would be planted on less than half the amount of acreage as Alternative B. Many areas with mixed mortality would remain unharvested. These areas would likely contain green trees and high snag densities, providing a diversity of habitat. Some of these stands that burned less severely have adjacent old clearcuts on several sides, so leaving these areas would be beneficial for short-term cover in particular. Overall, since most trees proposed for removal are expected to fall regardless of harvest, the long-term effects of harvest would be negligible.

Effects Common to Action Alternatives (B and C)

Cumulative Effects – Alternatives B and C:
Reasonably foreseeable actions and associated disturbances likely to occur within the fire area over the next five years include riparian planting, upland conifer planting, and small wildlife habitat improvement projects. Additional tree planting would occur outside of harvest units. Alternatives B and C would have similar cumulative reforestation efforts. Tree planting of burned areas outside of proposed harvest units would offset any short-term reductions in habitat quality by initiating the recovery of shrub and tree cover. Ongoing activities that would add to disturbance or changes in habitat condition within and adjacent to the School Fire Salvage Recovery project area include harvest on private and state lands, livestock grazing, road maintenance, and recreational type uses by the public such as firewood cutting, mushroom harvesting, hunting, camping, snowmobiling, and OHV trail use. Effects of these activities would be time specific and more pronounced early on in the fire recovery process, and would decrease over time as cover develops. Logging on the Wooten Wildlife Area is expected to be completed before logging would start on NFS land. Livestock grazing would not occur the first season after the fire. Recreation use would be reduced during logging activities through temporary area closures. Past timber harvest and roading on both private and NFS lands have changed big game cover to forage. The 2003 Willow Fire also reduced cover just south of School Fire Salvage Recovery project area; however, many other areas adjacent to the project area continue to provide cover. The nearby Wenaha–Tucannon Wilderness and the Upper Tucannon roadless areas provide extensive undisturbed summer habitat.

Cumulatively, the School Fire, past timber harvest and roading, and ongoing activities combined with proposed activities would increase short-term disturbance. No areas that currently classify as satisfactory or marginal cover would be changed to a forage condition because of proposed activities. Salvage harvest on lands classified as forage habitat will not change the forage habitat classification. Salvage harvest would remove dead trees that elk could use for concealment. Elk are expected to displace as needed to areas with live and dead vegetation sufficient to hide. Effects to satisfactory and marginal cover, forage, and screening vegetation are consistent with the Forest Plan. Tree planting after harvest and prescribed fire would facilitate growth of cover and vegetation for screening. Conifer tree planting would establish forest cover more quickly than by waiting for natural plant succession to reestablish a forested condition. Proposed road projects would not result in a net increase in open road densities. Temporary roads used for harvest would be decommissioned once all treatments for the associated units are completed. Road disturbance to big game would be short in duration; however, the disturbance would occur while vegetation for screening is at the lowest levels. Effects to elk relative to open road densities are consistent with the Forest Plan. Based on these conclusions the habitat effectiveness index would not change from the existing condition

AFFECTED ENVIRONMENT – AMERICAN MARTEN

The American marten was selected as an indicator species in the Forest Plan to represent complex mature and old growth stands. Preferred habitat for the marten consists of high elevation (> 4000') stands of dense conifer and down wood, often associated with streams. While dense forest is required in the winter, marten eat squirrels, fruits, and insects in areas burned by stand-replacing fire (Koehler and Hornocker 1977). The historic density and distribution of marten in the School Fire Salvage Recovery project area is unknown, but they probably occurred in low numbers. The fire removed most of the potential marten habitat and it is highly unlikely that they inhabit the project area.

ENVIRONMENTAL CONSEQUENCES – AMERICAN MARTEN

Effects Common to All Alternatives, including No Action

Recovery of mature forests and well-developed riparian areas over large areas could take up to 100 years. Martens prefer forest with complex physical structure near the ground (Ruggiero et al. 1994). Large amounts of large down logs would provide structure on the forest floor, ultimately creating better habitat for marten as the forest recovers.

Effects Common to Action Alternatives (B and C)

Direct/Indirect Effects – Alternatives B and C:
Proposed harvest would not occur in existing marten habitat. Salvage and fuels treatments would not reduce the likelihood of future marten use of the area since riparian areas would not be harvested. The allocation of new Dedicated Old Growth areas would contribute to marten management requirements identified in the Forest Plan.

Cumulative Effects – Alternatives B and C:
School Fire, past timber harvest, and roading have reduced habitat for marten. Tree planting on burned areas outside of proposed harvest units would quickly initiate the recovery of forest habitat, and the allocation of new Dedicated Old Growth areas would contribute to marten management requirements identified in the Forest Plan. Ongoing activities such as, livestock grazing, road maintenance, and public recreation would not add disturbance to marten since they are not expected to inhabit the project area.

AFFECTED ENVIRONMENT – PRIMARY CAVITY EXCAVATORS

The primary cavity excavator guild was selected as an indicator species in the Forest Plan to represent a vast array of vertebrate species that depend upon dead standing trees and down logs for reproduction and/or foraging. Primary cavity excavators include 15 bird species that create holes for nesting or roosting in live, dead or decaying trees. Secondary cavity users such as owls, bluebirds, and flying squirrels may use cavities later for denning, roosting, and/or nesting. Habitat for primary cavity excavators includes coniferous and hardwood stands in a variety of structural stages and the availability of dead trees in various size and decay classes (Thomas 1979).

Not all woodpeckers benefit from post-fire conditions because they depend on live, green trees and uncharred logs for habitat. Primary cavity excavators that are expected to do well in the fire area for the next 10-20 years are the Lewis's woodpecker, black-backed woodpecker, three-toed woodpecker, hairy woodpecker, downy woodpecker, and the northern flicker.

Certain cavity nesters likely respond positively to stand replacement burns for a number of reasons. Bark beetles and wood boring beetles often colonize fire-killed or injured trees in high densities. Subsequently, this is followed by an increase in the abundance of *Picoides* woodpeckers, which are strongly associated with dying or recently killed trees. Bark and wood boring insects form the prey base for some woodpeckers. As wood boring insects colonize fire-killed trees, an abundance of nesting and foraging opportunities for cavity nesting species will result.

Primary species associated with burned forest are the Lewis, black-backed, and three-toed woodpeckers. Black-backed and three-toed woodpecker increases last for about 5 years, and are most attracted to unlogged sites, or clumps of high density snags for nesting and foraging (Saab and Dudley 1998). Lewis woodpeckers favor open woodlands and often forage in the air rather than on the tree. In a post burn study in Idaho, Lewis woodpecker selected the largest diameter snags, whereas black-backed tended to use the smaller diameters (Saab et al. 2002). A range of habitat conditions are important to accommodate cavity nesting species. Large expanses of standing dead trees in an open setting are also important for secondary cavity nesters that are aerial foragers (Hutto 1995).

Northern Three-toed Woodpecker **-** The northern three-toed woodpecker was selected as an indicator species in the Forest Plan to represent dead and down tree habitat in mature and old growth lodgepole pine stands. Mature lodgepole pine stands are scarce in the analysis area. However, three-toed woodpeckers will be attracted to the School Fire Salvage Recovery project area to forage where insect outbreaks occur in the dead and dying stands. Three-toed woodpecker increases last for about 5 years after a stand replacement fire, and are most attracted to unlogged sites or clumps of high density snags for nesting and foraging (Saab and Dudley 1998).

Pileated woodpecker - Pileated woodpecker was selected as an indicator species in the Forest Plan to represent dead and down tree habitat in mature and old growth mixed conifer stands. Pileated woodpeckers were relatively common in the project area prior to the fire, based on incidental observations. They are apparently negatively affected by stand-replacement burns (Saab and Dudley 1998). Because they foraging primarily on ants (Hymenoptera and Formicidae) within softened wood, pileated woodpeckers rely on large areas of unburned, mature and old-growth forests for their foraging resources (Bull and Holthausen 1993). Foraging habitat was reduced by the fire with the loss of pre-existing down wood and snags. Fire hardened snags, which will eventually become down wood, are less likely to be colonized by carpenter ants, a key pileated woodpecker food item. Pileated woodpecker nesting habitat is no longer available where the fire resulted in heavy tree mortality, but may be present on the fringes of the fire where closed canopy nesting and roosting areas are available.

ENVIRONMENTAL CONSEQUENCES – PILEATED WOODPECKER

Effects to Pileated woodpecker will be addressed here. Effects to other Primary Cavity Excavator species are addressed in the Dead Wood Habitat section.

Effects Common to All Alternatives, including No Action

As snags and down wood begin to decay and insects are available, pileated woodpeckers may forage within the project area. Mixed conifer stands that burned lightly could provide opportunities for nesting, foraging and roosting. In the long-term, recovery of mature forests throughout the fire area could take up to 100 years. Tree planting would initiate forest recovery and provide pileated woodpecker habitat in the future.

Alternative B – Proposed Action

Direct/Indirect Effects – Alternative B:

Proposed harvest and other activities in areas of low to moderate tree mortality could impact pileated woodpecker habitat. Salvage could reduce the likelihood of pileated woodpecker use since large diameter dead and dying trees would be removed in partially burned stands that may provide nesting and foraging opportunities. Since use by pileated woodpecker in the area is currently unknown, the degree of effect is unknown but should be small considering the small amount of habitat potentially impacted (200 acres).

The allocation of new Dedicated Old Growth areas would contribute to pileated woodpecker management requirements identified in the Forest Plan, and tree planting would quickly initiate forest recovery over a large portion of the burned area.

Action Alternative C

Direct/Indirect Effects – Alternative C:
Proposed harvest and other activities in areas of high tree mortality would not impact pileated woodpecker habitat and would not likely cause any disturbance to individuals. Salvage and fuels treatments would not reduce the likelihood of pileated woodpecker use since living trees would not be removed and partially burned stands would not be entered. Dead tree harvest, fuels reduction, and tree planting would quickly initiate forest recovery over a large portion of the burned area and reduce the likelihood of future fires. The allocation of new Dedicated Old Growth areas would follow Forest Plan guidance for pileated woodpecker management requirements.

Effects Common to Action Alternatives (Alternatives B and C)

Cumulative Effects – Alternatives B and C:
School Fire and past timber harvest have reduced habitat for pileated woodpecker. Salvage of dead and dying trees could potentially reduce pileated habitat in Alternative B, but to a small degree. Additional tree planting on burned areas outside of proposed harvest units and in riparian areas would quickly initiate the recovery of forest habitat.

Alternative C would not cumulatively affect pileated woodpecker habitat and would not detract from current habitat use since only dead trees would be removed and mixed mortality stands would not be entered.

THREATENED, ENDANGERED AND SENSITIVE (TES) WILDLIFE SPECIES

An endangered species is an animal or plant species listed under the Endangered Species Act that is in danger of extinction throughout all, or a significant portion, of its range. A threatened species is an animal or plant species listed under the Endangered Species Act that is likely to become endangered within the foreseeable future throughout all, or a significant portion of, its range. A sensitive species is an animal or plant species identified by the Forest Service Regional Forester for which species viability is a concern either a) because of significant current or predicted downward trend in population numbers or density, or b) because of significant current or predicted downward trends in habitat capability that would reduce a species existing distribution. Threatened, endangered, and sensitive species effects are summarized in this section by TES status and species.

The sections of this EIS that deal with threatened, endangered, proposed, and other species listed on the Regional Forester's Sensitive Species List constitute the Terrestrial Wildlife Biological Evaluation for the proposed project. A separate Biological Assessment (BA) will also be prepared in compliance with the Endangered Species Act of 1973 to assess potential effects on threatened and endangered species (FSM 2670.1). The Forest Service Region 6 Sensitive Animal List (USDA 2000a) and updates in 2004 were reviewed for species that may be present on the Umatilla National Forest. The U.S. Fish and Wildlife Service also maintain a list of Threatened, Endangered, and Candidate species which may occur in the area.

Based on these resources, as well as local studies, surveys, and monitoring, and published literature regarding distribution and habitat use, the following Threatened, Endangered, Proposed, and Sensitive wildlife species have the potential to occur in or adjacent to the fire area: Canada Lynx (*Lynx canadensis*), northern bald eagle (*Haliaeetus leucocephalus*), gray wolf (*Canis lupus*), California wolverine (*Gulo gulo*), peregrine falcon (*Falco peregrinus*), gray flycatcher (*Empidinax wrightii*), and green-tailed towhee (*Pipilo chlorurus*).

Project activities would not occur in potential habitat for peregrine falcon, gray flycatcher, and green-tailed towhee, and there are no records of their presence in affected areas. The same is true for state species of concern yellow-billed cuckoo (*Coccyzus americanus*) and Washington ground squirrel (*Spermophilus washingtoni*). No impacts to these species would occur from any alternative; therefore they will not be analyzed further in this document.

Forest Service Sensitive Species striped whipsnake (*Masticophis taeniatus*), upland sandpiper (*Bartramia longicauda*), northern leopard frog (*Rana pipiens*) potentially occur on the Forest, but habitat for these species is not present within the project area. For this reason, there would be no effect from any alternative and these species will not be analyzed further in this document.

AFFECTED ENVIRONMENT – CALIFORNIA WOLVERINES (SENSITIVE)

California wolverines have not been observed and are not known to occur within the analysis area, however occasionally sightings are reported on the district. The project area may provide some marginal foraging and dispersal habitat for wolverines, particularly in the inventoried roadless area. Winter foraging habitat is available in the big game winter range. High levels of human disturbance (management activities, firewood cutting, and recreational use) and development (primarily roads) make most of the managed areas unsuitable for summer foraging habitat. This wide-ranging species may pass through or skirt the edge of the fire to opportunistically seek large mammal carrion among wintering ungulate populations. No denning habitat is known to be present in the analysis area.

ENVIRONMENTAL CONSEQUENCES – CALIFORNIA WOLVERINES (SENSITIVE)

Effects Common to All Alternatives, including No Action

Direct/Indirect Effects – Alternatives A, B, and C:

Direct disturbance to wolverine is highly unlikely given that wolverines are at best infrequent visitors to the area. Harvest of fire killed trees would not hinder the wolverine's ability to travel across the landscape. Proposed activities would not take place within or adjacent to potential denning habitat. Conifer and hardwood planting proposed in the action alternatives would increase habitat for various prey species, especially small mammals, potentially increasing the prey base for predators such as the wolverine.

Effects Common to Action Alternatives (B and C)

Cumulative Effects – Alternatives A, B and C:

Summer and winter recreation use is constant or increasing with more powerful snow machines, and more OHV use, and much of Pomeroy District has received harvest and fuels treatments. However, there are also several roadless areas and the Wenaha-Tucannon wilderness providing undisturbed habitat. Since no direct effects to wolverine are expected, no cumulative effects would occur with either action alternative. Cumulatively, these alternatives would not cause a trend toward Federal listing.

Determination:
Wolverines are thought to be infrequent visitors to the project area. Human disturbance related to proposed salvage activities could have short-term effects on wolverines, although the risk of disturbance to wolverines is considered very low. None of the treatment areas include denning habitat. Activities proposed in any of the action alternatives would not alter prey availability or use of the area by wolverine; therefore, there would be No Impact to wolverine.

AFFECTED ENVIRONMENT – NORTHERN BALD EAGLE (THREATENED)

Northern bald eagles may have nested along the Tucannon River at one time, but recently only winter foraging by a few eagles has been documented. Wintering eagles generally arrive in southeastern Washington in early December and may stay until March. Bald eagles tend to roost in large diameter, tall, open-structured Douglas-fir and ponderosa pine trees (Dellasala et al. 1998), often communally, near abundant food sources (Isaacs et al. 1993), usually along waterways. Eagles will also congregate in areas with road-killed or winter-killed deer. Bald eagles occasionally use the School Fire area in the winter, because of the proximity to ungulate winter range, and the availability of perch sites along the Tucannon River. No monitoring or surveys have been completed.

The Tucannon River corridor is largely owned and managed by the state of Washington as part of the Wooten Wildlife Area. Only a few small sections of the river cross NFS land. Within the School Fire Salvage Recovery boundary, about 10 miles of the Tucannon River corridor is relatively intact, with thriving cottonwood trees and shrubs.

ENVIRONMENTAL CONSEQUENCES – NORTHERN BALD EAGLE (THREATENED)

Effects Common to All Alternatives, including No Action

Direct/Indirect Effects – Alternatives A, B, and C:
Proposed activities would comply with PACFISH standards and guidelines, which preclude harvest and other activities within Riparian Habitat Conservation Areas. These standards are designed to protect fish habitat, a major prey item for bald eagles. Therefore, no indirect effects to eagles and eagle prey habitat would occur.

Effects Common to Action Alternatives (B and C)

Direct/Indirect Effects - Alternatives B and C:
The Tucannon River road is a main paved access road that may be used by log trucks during the winter bald eagle use period. Direct effects to bald eagles could occur if the increased traffic and noise causes eagles on the river to flush or abandon customary perches or food sources. The potential for vehicle collisions with an eagle would also be increased, however unlikely. Winter logging is not planned in the nearby big game winter range, where eagles may be attracted to winter killed ungulates.

Cumulative Effects – Alternatives B and C:
Logging on the state Wooten Wildlife Area began in January 2006, potentially displacing bald eagles along the river and on the winter range. No harvest is planned within 200 feet of the river, except for danger trees next to the road. Perching habitat for bald eagles may be removed as danger trees and further upslope outside of the riparian buffer.

Tucannon River road is open year round and is occasionally snow plowed to allow access to Camp Wooten. Eagles using the river corridor are likely accustomed to a small amount of road traffic. The addition of heavy truck traffic and noise would have an additive effect to the existing loss of perching and foraging habitat on the river. These activities could cause eagles to expend more energy than is typical each winter if they are prompted to move frequently or abandon the area completely.

Future activities such as riparian area improvements and road decommissioning would improve habitat for fish and other eagle prey species. Other ongoing and proposed activities would have no effect to bald eagles or their habitat.

Determination:

Because only a few bald eagles use the area on an occasional basis, the proposed projects may affect, but will not likely adversely affect the bald eagle (MA, NLAA). Consultation with the U.S. Fish and Wildlife Service will be completed with regard to bald eagles before activities are implemented.

AFFECTED ENVIRONMENT – GRAY WOLF (ENDANGERED)

Wolves were extirpated from the region by the early 1900's. Recent successful reintroduction programs in Idaho and Montana have increased wolf populations in the northern Rocky Mountains. Individual gray wolves have dispersed from Idaho into the Blue Mountains, but as of yet no packs have formed to our knowledge. The Idaho wolf population has been increasing steadily, and dispersion into the Blue Mountains will likely continue. There have been no verified tracks or sightings of gray wolf within the analysis area.

Recovery regulations require consideration of potential impacts to known denning habitat or rendezvous sites (USDI 2003). Wolves generally den between April and June, then move pups to a series of rendezvous sites for the remainder of the summer. Gray wolves have been documented to abandon den sites if disturbed by humans (Mech et al. 1991).

There are currently no known denning or rendezvous sites near this project or on the Forest. The potential for denning or rendezvous habitat in the project area is very low, especially since the fire removed forest cover. Several inventoried roadless areas and the Wenaha Tucannon Wilderness area provide large secluded areas to the south of the project area, which would be more logical places for wolves to inhabit.

ENVIRONMENTAL CONSEQUENCES – GRAY WOLF (ENDANGERED)

Effects Common to All Alternatives, including No Action

Direct/Indirect Effects – Alternatives A, B, and C:

Since wolves are not known or suspected in the area, human activities and use of heavy equipment would have no effect to wolves. Salvage logging in the School fire area, which is poor quality habitat since the fire, should have no effect on the potential future occurrence of wolves on the forest.

Effects Common to Action Alternatives (B and C)

Cumulative Effects – Alternatives B and C:

Because there are no direct or indirect effects from proposed actions, no cumulative effects to the gray wolf are expected from this project when combined with past, present, and foreseeable activities in or near the project area.

Determination:
Since wolves are not currently known to occur in the area, no denning or rendezvous sites are known, and timber harvest would not impact wolf habitat. There would be no effect to gray wolf.

AFFECTED ENVIRONMENT – CANADA LYNX (THREATENED)

The Blue Mountains are considered to be on the fringe of the range of Canada lynx. A few lynx are known to have occurred in the Blue Mountains historically, and several recent but unconfirmed sightings have been reported. Based on limited verified records of lynx, the lack of reproductive records, low frequency of occurrences, and correlations with cyclic lynx populations in Canada, lynx are considered dispersers/transients and not reproducing residents in the Blue Mountains of SE Washington and NE Oregon (Verts and Carraway 1998, McKelvey et al. (Chapter 8) in Ruggiero et al. 2000, Stinson 2001 and USDI 2003); including the School Fire Salvage Recovery analysis area.

Lynx habitat on the Umatilla National Forest was mapped using the vegetation and environmental conditions for the Northern Rocky Mountains Geographic area, and more specifically, the Blue Mountain Section, including NE Oregon and SE Washington. Primary vegetation was based on the direction provided in the Canada Lynx Conservation Assessment and Strategy (LCAS) (Ruediger et al. 2000), and follow-up guidance from the forest service regional office and the lynx biology team. Sixth code HUCs were used as the basis for delineating Lynx Analysis Units (LAUs) across the Forest. Five LAUs are connected and generally occur in an elongated cluster in the northern portion of the Umatilla National Forest.

School Fire affected a small portion of the Asotin LAU (see Lynx Habitat Map – Appendix A), the northernmost lynx habitat on the forest. The Asotin LAU contains 50,627 acres of potential lynx habitat, entirely within the Umatilla National Forest administration boundary. All other areas surrounding the Asotin LAU are either dry forest types or nonforested, which are not considered lynx habitat. There are no state wildlife management areas or other administrative units immediately adjacent to the Asotin lynx habitat.

About seven percent (2,000 acres) of the School Fire Salvage Recovery analysis area is considered potential lynx habitat. Some lynx habitat within the fire perimeter did not burn or burned with low severity. Several stands (400 acres) are still considered foraging habitat within the School Fire Salvage Recovery boundary. Of the 1,400 acres that were suitable for denning and foraging prior to the fire, about 1,000 acres will likely no longer be suitable. Despite setbacks caused by the fire, 78 percent of the habitat in the Asotin LAU is suitable for lynx denning or foraging (Table 3-79).

Table 3-79 Lynx Habitat Condition in Asotin Lynx Analysis Unit (Acres)

Asotin LAU	Potential	Denning	Foraging	Unsuitable	Percent Suitable	Percent Unsuitable*
Pre-fire	50,627	19,819	20,652	10,156	80 %	20 %
Post-fire	50,627	19,519	19,952	11,156	78 %	22 %
*Lynx potential habitat in currently unsuitable conditions						

ENVIRONMENTAL CONSEQUENCES – CANADA LYNX (THREATENED)

Effects Common to All Alternatives, Including No Action

Lynx are not expected to occur in the area because of the lack of contiguous suitable habitat; therefore, no direct effects from the project are expected.

The project design for all alternatives would meet all applicable standards identified in the Forest Plan, once amended for the School Fire Salvage Recovery project (Appendix J). These standards were developed largely from information in "Ecology and Conservation of Lynx in the United States" (Ruggiero et al. 1999) and the "Lynx Conservation Assessment and Strategy" (Ruediger et al. 2000). These publications represent the most credible and applicable science concerning ecology and management of lynx and lynx habitat in the contiguous United States. All habitat evaluations and management recommendations regarding lynx are based on these documents and subsequent recommendations from the Lynx Steering Committee.

Stands that burned at high intensity will not provide foraging or denning habitat until the forest begins to regenerate. Dead trees that fall will create denning habitat, but it may take 25 years for new trees to grow tall enough to provide forage for snowshoe hare above the snow. Stands that are still providing foraging habitat within the School Fire boundary (400 acres) may have some delayed mortality but overall would continue to provide habitat.

The Asotin LAU will have sufficient lynx habitat, with 78 percent (39,471 acres) of the habitat in a suitable condition. In the long-term, some areas may regenerate with dense lodgepole pine, creating optimal foraging habitat within 25 years.

The effect of having 78 percent suitable habitat within the Asotin LAU is that these lands will likely provide productive, connected lynx habitat. As a result, habitat within the LAU is expected to continue to contribute to the conservation of Canada lynx (Ruediger et al. 2000).

Alternative A – No Action

Direct/Indirect Effects – Alternative A:

Since no harvest would occur in lynx habitat, there would be no effect to Canada lynx. In the long-term, potential growth in vegetation is expected to result in indirect increases in suitable lynx foraging and denning habitat.

Effects Common to Action Alternatives (B and C)

Direct/Indirect Effects – Alternatives B and C:

Implementation of Alternatives B or C may affect, but would not likely adversely affect Canada lynx. This determination is based on the low risks to lynx from the combined and individual actions under consultation, and because these actions meet or exceed recommendations found in the latest science regarding Canada lynx (Ruediger et al. 2000). Direct or indirect mortality of individual lynx are not expected because the School Fire Salvage Recovery project does not propose any activities identified as mortality risk factors (Ruediger et al. 2000), and lynx are not known to be present in the area.

Harvest is proposed in a small portion of lynx habitat where trees burned nearly completely black, or where burned trees are expected to die in the near future. These areas are no longer suitable for lynx denning or foraging, therefore, harvest and other activities would occur within unsuitable habitat. Harvest, tree planting, and fuels treatments would not preclude a return to suitable habitat in the future; these stands could develop into lynx foraging habitat within 25 years. Planting trees would help restore appropriate forest cover by establishing early- and mid-seral species adapted to post-fire conditions (Silviculture Specialist Report).

Other proposed activities that could affect lynx habitat include temporary road construction, roadside brushing, roadside danger tree removals, and snow plowing.

Temporary roads in lynx habitat could cause a temporary reduction of a very small amount of suitable habitat (< 1 mile of road). Temporary roads in lynx habitat would not be located in forested stringers, ridges, saddles, or riparian areas. Roadside brushing and danger tree removal would only occur where necessary to eliminate safety hazards. Closed roads that would be opened for the project would be closed upon completion, so open road density will remain low (< 2 mi/mi2) in lynx habitat. Given the low open road density and the location of the proposed road activities, no meaningful changes to lynx habitat would occur from road activities, when compared to baseline conditions.

Groomed snowmobile and ski routes, plowed roads, and snowmobile tracks all create compacted snow routes that can facilitate the movement of other predators into higher elevations and potentially compete with lynx for a limited prey supply. Snow plowing for winter logging may or may not be necessary depending on weather and timing of timber harvest. In the unlikely event that lynx are in the area, winter plowing could be detrimental to winter survival, however, there is an abundance of lynx habitat in surrounding areas that could serve as refugia from these effects. This disturbance would be limited to the very edge of the LAU for a short period of time.

Habitat connectivity within and between LAUs would be maintained. Proposed harvest units are at the northwestern perimeter of the LAU and would not effectively bisect or fragment interior lynx habitat. Project activities would not preclude free movement of lynx through the area. The Asotin LAU is bordered on the southwest side with the Wenaha LAU, much of which is inventoried roadless. None of the proposed activities would occur on the south side of the Asotin LAU where it connects with the Wenaha LAU, so connectivity between LAUs would not be affected.

Implementation of Alternatives B or C would result in 22 percent unsuitable conditions in the Asotin LAU (Table 3-79); no change from the baseline condition. These conditions would be fully consistent with the Forest Plan standard, once amended for School Fire Salvage Recovery project, that no further reduction of suitable lynx habitat conditions should occur with vegetation management if more than 30 percent is already unsuitable. The Forest Plan, once amended, requires the maintenance of denning habitat in patches generally larger than 5 acres, and comprising at least 10 percent of lynx habitat in an LAU. Note the percent of denning habitat does not change in any alternative compared to current post-fire condition, because no activities are proposed in denning habitat.

The incorporation of objectives, standards, and guidelines into the Umatilla Forest Plan specific to Canada lynx is specific to the purpose and need and actions in the alternatives for the School Fire Salvage Recovery project only. This amendment would not preclude or require other amendments specific to lynx and this amendment would not preclude or require other actions across the forest in lynx habitat. For example, the incorporation of this management direction would not affect the amount of timber made available for public use outside this project area nor would there be changes in livestock grazing permits or plans of operations for mining. This amendment would not change or require future changes to the access and travel management plan for the Ranger District.

Alternative B – Proposed Action

Direct/Indirect Effects – Alternative B:
Harvest is proposed in about 1,000 acres of lynx habitat where trees burned nearly completely black, or where burned trees are expected to die in the near future. These areas are no longer suitable for lynx denning or foraging, and constitute only two percent of the Asotin LAU. Salvaging dead and dying trees would not change the percentage of suitable habitat in the LAU, because those stands are already considered unsuitable.

Tree planting after salvaging in these areas (about 1,000 acres) would help restore appropriate forest cover by establishing early and mid-seral species adapted to post-fire conditions (Silviculture Specialist Report). Lodgepole pine, subalpine fir, and grand fir would be expected to grow in through natural regeneration. These species would only be planted if nearby seed sources are lacking. Generally, the areas typical of lynx habitat would be planted with a mixture of larch, Douglas-fir, western white pine, and Engelmann spruce.

Alternative C

Direct/Indirect Effects – Alternative C:
Harvest is proposed in about 175 acres of lynx habitat where trees burned nearly completely black, or where burned trees are expected to die in the near future. These areas are no longer suitable for lynx denning or foraging, and constitute less than one percent of the Asotin LAU.

Salvaging dead and dying trees would not change the percentage of suitable habitat in the LAU, because those stands are already considered unsuitable.

The effects of tree planting would be similar to Alternative B, but would occur in a smaller area of lynx habitat (about 175 acres). Natural regeneration would likely take place in all other lynx habitat, since these areas burned at lower intensity and there should be seed trees nearby.

Effects Common to Action Alternatives (B and C)

Cumulative Effects - Alternatives B and C:
Past projects created some unsuitable lynx habitat within the Asotin LAU. The Sweeney timber sale, once completed, would reduce one to two percent of the suitable lynx habitat in the LAU. Two percent change is within the standard that no more than 15 percent of the lynx habitat be changed to an unsuitable condition in a ten year period. The effect of this project is already included in the baseline condition, as are the effects of past and current livestock grazing. Private lands do not occur within the Asotin LAU and so have not affected lynx habitat.

Ongoing public uses in the area such as camping, hiking, hunting, fishing, ATV and motorcycle riding, mountain biking, snowmobiling, and firewood collection generally occur in the daytime when lynx are least active. The U.S. Fish and Wildlife Service has concurred that these activities do not have adverse impacts to lynx (USDI 2000).

The only future foreseeable future action within lynx habitat in the Asotin LAU is the North South OHV trail. This project utilizes existing trails and old roads to tie existing OHV trails together. Designation of this trail would reduce the amount of off-road OHV use on the forest and has minimal impacts to lynx habitat.

About 28 miles of existing snowmobile trails within the Asotin LAU are regularly groomed, and the School Fire Salvage Recovery project could add 15-20 more miles of compacted snow within lynx habitat, although not all roads would be plowed at the same time for timber harvest. Since there is an abundance of lynx habitat in surrounding areas that could serve as refugia from these impacts cumulative effects from snow plowing are not expected.

Cumulative mortality of individual lynx is not expected because the School Fire Salvage Recovery project does not propose any activities identified as mortality risk factors (trapping, shooting, predator control, and highways) and there is no resident lynx population.

The cumulative effect of maintaining 78 percent suitable habitat, of which 39 percent is suitable denning habitat within the Asotin LAU (Table 3-79 above), is that these lands will likely continue to provide productive, connected lynx habitat. As a result, habitat within the Asotin LAU is expected to contribute to the conservation of Canada lynx (Ruediger et al. 2000).

Because the amendment only applies to lynx habitat within the School Fire Salvage Recovery project area for the duration of that project, there are no other required changes in the forest plan or required actions across the forest in other areas within lynx habitat. The incorporation of this management direction would not cumulatively affect the amount of timber made available for public use nor would there be changes in livestock grazing permits or plans of operations for mining in other areas of the forest because there are no direct and indirect impacts to these resources anticipated. This amendment would not change or require future changes to access and travel management plans. All other cumulative effects of amending the forest plan for lynx are as described for direct and indirect effects. The desired and expected programmatic cumulative effects of those reasonable foreseeable amendments added to the School Fire Salvage amendment is suitable habitat within the Asotin LAU would continue to provide productive, connected lynx habitat. As a result, habitat within the Asotin LAU is expected to contribute to the conservation of Canada lynx (Ruediger et al. 2000).

Determination:

Alternatives B and C may affect, but will not likely adversely affect Canada lynx (MA, NLAA). This determination is based on the low risks to lynx from the combined and individual actions under consultation, and because these actions meet or exceed recommendations found in the latest science regarding Canada lynx. A detailed Biological Assessment addressing the effects of this project on Canada lynx will be prepared and submitted to the U.S. Fish and Wildlife Service. Table 3-80 is a summary of determinations made for TES wildlife species.'

Table 3-80 Summary of Determination - Threatened, Endangered and Sensitive Species

Species	Alternative A	Alternative B	Alternative C
California wolverine	No Impact	No Impact	No Impact
Northern Bald Eagle	No Effect	MA, NLAA	MA, NLAA
gray wolf	No Effect	No Effect	No Effect
Canada Lynx	No Effect	MA, NLAA	MA, NLAA

LANDBIRDS (Including Neotropical)

AFFECTED ENVIRONMENT- LANDBIRDS

Prior to School Fire, burned old forest was lacking because fire suppression had all but eliminated the influence of this disturbance factor in the project area. Large-scale declines in open park-like dry forests with large trees and snags have led to population declines of the white-headed woodpecker, flammulated owl, white-breasted nuthatch, pygmy nuthatch, Williamson's sapsucker, and Lewis's woodpecker. These bird species have likely suffered some of the greatest population declines and range retractions (Altman 2000).

School Fire caused a conversion of a majority of mature and old growth stands in the planning area to early successional stages. Over 70 percent of School Fire area was burned with a high intensity fire. Overstory nesting species and foliage or crown feeders have likely disappeared within the severely burned areas, and decreased in the moderate severity burn areas. Local species negatively affected by the loss of habitat may include the pine siskin, golden-crowned kinglet, mountain chickadee, hermit thrush, ruby-crowned kinglet, yellow-rumped warbler, and western tanager.

The *Conservation Strategy for Landbirds* (Altman 2000) identifies three priority habitat types: Dry Forest, Mesic Mixed Conifer, and Riparian Woodland and Shrub. Several "unique" habitats are also important. The analysis area contains all three forest types over large areas.

Dry Forest habitat type is characterized as coniferous forest composed exclusively of ponderosa pine, or dry stands co-dominated by ponderosa pine and Douglas-fir or grand fir. It is generally at lower elevations and mostly on xeric, upland sites with shallow soils. The desired condition is a large tree, single-layered canopy with an open, park-like understory dominated by herbaceous cover, scattered shrub cover, and pine regeneration. The conservation focus includes the following habitats conditions: large patches of old forest with large trees and snags; old forest with interspersed grassy openings and dense thickets; open understory with regenerating pines; and patches of burned old forest. Focal species include: white-headed woodpecker (large patches of old forest with large trees and snags), flammulated owl (old forest with interspersion of grassy openings and dense thickets), chipping sparrow (open understory with regenerating pines, and Lewis' woodpecker (patches of burned old forest).

Dry forest type comprises about one third of the analysis area. Since the fire, the ponderosa pine cover type is far below what likely occurred in the area historically. The historical range is estimated to be between 50 and 90 percent of the dry forest, and the existing condition is 8 percent (Silviculture Specialist Report). The historic range of variability analysis for this area indicates that 15 to 55 percent of the dry forest type would occur in Old Forest Single Structure (OFSS) stage. Post-fire, only 6 percent is OFSS, and these areas will probably have delayed mortality. Hence, the amount of live open ponderosa pine habitat is very limited, and may not provide enough habitat to support the species associated with it. Lewis woodpecker will likely use patches of burned, large ponderosa pines (600-700 acres) until these trees fall.

Late Successional Mesic Mixed Conifer habitats are primarily Douglas-fir and grand fir sites that are generally higher elevation, wetter, on northerly aspects, and in draws where soils are mesic. The desired condition is a multi-layered old forest with a diversity of structural elements. The conservation focus is on the following five habitat conditions: large snags; overstory canopy closure; structurally diverse and multi-layered; dense shrub layer in forest openings or understory; and edges and openings created by wildfire. Focal species include Vaux's swift (large snags), Townsend's warbler (overstory canopy closure), varied thrush (structurally diverse, multi-layers), MacGillivray's warbler (dense shrub layer in forest openings or understory), and olive-sided flycatcher (edges and openings created by wildfire**).**

Mesic mixed conifer (moist upland forest) also occurs on about one third of the School Fire area. The Historic Range of Variability analysis for this area indicates that 10 to 20 percent of these stands would occur in the Old Forest Multi Structure (OFMS) stage. Current conditions are now well below this range with only one percent of the moist upland forest in the OFMS stage. Edges and openings created by wildfire now dominate the landscape in the planning area, benefiting olive-sided flycatcher and other birds drawn to this type of habitat. The other important components of mesic mixed conifer forest are lacking since the fire, i.e. late successional forest with large snags, canopy closure, multiple layers, and dense shrubs.

Riparian woodland and shrub habitats are typified by the presence of hardwood tree and shrub species, along with associated wetland herbaceous species. Water is an important component of these habitats, whether it is in the form of standing wetlands, springs, seeps, or flowing water (streams). Riparian vegetation is particularly important to Neotropical migratory songbirds (Sallabanks et al. 2001). Although these habitats generally comprise only a small portion of the landscape, they usually have a disproportionately high level of avian diversity and density when compared to surrounding upland habitats.

The desired condition of "Riparian Woodland and Shrub" habitat for birds is a structurally diverse vegetative community of native species that occur in natural diversity relative to hydrological influences (Altman 2000). The conservation focus includes the following habitat conditions: large snags; canopy foliage and structure; understory foliage and structure; and willow/alder shrub patches. In addition, the Conservation Strategy identifies aspen as a unique habitat important to landbirds. In the Blue Mountains, aspen trees are nearly always associated with riparian areas or ephemeral draws, so they are included in this section. Focal species include: Lewis' woodpecker (large snags), red-eyed vireo (canopy foliage and structure), veery (understory foliage and structure), willow flycatcher (willow/alder shrub patches), and red-naped sapsucker (aspen).

Although some riparian areas were severely burned by School Fire, many other wet areas proved resilient and continue to provide green islands and corridors within the fire area. About 10 miles of the Tucannon River corridor is relatively intact, with thriving cottonwood trees and shrubs; portions of Pataha, Tumalum, and upper Cummings Creeks also currently remain flush with green trees. The fire likely improved habitats for species that use riparian snags, such as Lewis' woodpecker and downy woodpecker. Initially, the fire reduced habitat for species such as the red-eyed vireo, veery and willow flycatcher; however, these areas are expected to recover rapidly as hardwood shrubs recover.

Focal species for Unique habitats include: hermit thrush (subalpine forest), upland sandpiper (montane meadows), vesper sparrow (steppe shrubland), and gray-crowned rosy finch (alpine). A small amount of subalpine habitat occurs in the highest elevations, which burned in a mosaic fashion. No montane meadows, steppe shrublands or alpine habitats occur in the planning area.

ENVIRONMENTAL CONSEQUENCES - LANDBIRDS

Effects Common to All Alternatives, including No Action

Direct/Indirect Effects – Alternatives A, B and C:

Flycatchers, ground feeders, and cavity nesters are expected to increase as a result of the fire. Local species that may benefit include the Lewis' woodpecker, olive-sided flycatcher, red-naped sapsucker, chipping sparrow, western-wood peewee, Hammond's flycatcher, dusky flycatcher, dark-eyed junco, Cassin's finch, mountain and western bluebirds, evening grosbeak, and American robin.

Many neotropical migratory species require high tree canopy levels for nesting and foraging, and it will likely take at least 30 to 50 years before overstory canopies are restored to levels that begin to mimic pre-fire conditions in some areas. Habitat for species that require mature or old-growth conditions may take 75 to 150 years to develop.

Initially, many landbirds associated with riparian habitats declined; however, effects are likely short-lived. Although the fire killed most of the conifer overstory, the expected flush of ground vegetation, particularly shrub species, may elevate the amount and distribution of riparian hardwoods to levels higher than existed prior to the fire. Grasses and forbs are expected to reestablish naturally in two to five years; shrubs are expected to reestablish in two to 15 years. Population numbers for grass and shrub nesting Neotropical migratory birds are expected to remain stable or increase due to recovery of ground vegetation, both inside and outside riparian areas. Species such as the willow flycatcher, and red-eyed would likely increase.

Indirectly, riparian landbirds may experience increases in population levels as a result of the fire. Snag-dependent species are expected to increase. Population numbers for grass and shrub nesting species is expected to remain stable or increase due to recovery of grass, forbs and shrub vegetation as described in the No Action section.

Riparian Meadows and springs will likely recover quickly. Where riparian areas burned severely, most of the shrub and tree cover was lost. Grasses, forbs, and shrubs will recover first, but it may take 10-15 years for trees to be re-established in these areas.

Alternative A – No Action

Direct/Indirect Effects – Alternative A:

The fire removed large expanses of dry forest, including nearly all the mature and old growth habitat, and nearly all riparian and aspen habitat. Species that are foliage or crown feeders and overstory nesting species, likely disappeared within the severely burned areas, but may still be using the moderate and low severity burn areas. Since the No Action Alternative removes no snags or downed logs; habitat would be maximized for species that use post-fire conditions such as the olive-sided flycatcher and the Lewis' woodpecker. The Dead Wood Habitat section describes effects to cavity excavators in detail.

Effects Common to Action Alternatives (B and C)

Direct/Indirect Effects – Alternatives B and C:

Overall forest habitat recovery would be accelerated, because seedlings planted in harvest units would establish appropriate tree species within just a few years. The reduction in fuels would decrease the potential negative effects of future fires.

Removal of snags would have a short-term negative effect on most species of cavity nesting birds including Neotropical migratory species. Raphael and White (1984) reported that species richness declined only in the most severely salvaged burns, although even partial salvaging altered species composition. Areas outside the fire, and areas within the fire that would not be harvested (particularly the Willow Creek roadless area), would provide habitat for these species (see Dead Wood Habitat section).

Short-term habitat would be reduced for Lewis' woodpecker, the focal species for patches of burned old forest. Where post-fire salvage logging is occurring in old ponderosa pine, Altman (2000) recommends leaving more than 50 percent of the trees unsalvaged, retaining all snags and trees > 20 inches dbh, and retaining at least one half of all snags and trees 12-20 inches dbh. The salvage proposed in large diameter ponderosa pine stands would not meet these criteria. Some snags and trees greater than 20 inches dbh would likely be left, but most would probably be harvested. There are two large stands of burned, large diameter ponderosa pine in the Willow Creek roadless area that would remain unharvested and would provide this rare habitat for a period of time. The Dead Wood Habitat section describes the effects to woodpecker species in more detail.

Cumulative Effects:

Past timber harvest and fire suppression have altered the habitat used by many bird species. Many of the unburned or lightly burned areas within School Fire Salvage Recovery project area are previously harvested stands, some of which have young trees growing in them.

Future livestock grazing could degrade riparian habitat if areas have not recovered fully from the fire, and could reduce wildlife habitat by spreading noxious weeds. Livestock grazing would be delayed for at least a year post-burn to allow for recovery of ground cover. Current levels of noxious weeds in the project area are below threshold levels that can cause measurable changes in terrestrial habitat. Over the long-term, habitat may be degraded by encroaching noxious weeds if they are not controlled.

Additional tree planting on burned areas outside of proposed harvest would cumulatively contribute to the planting in harvest units and further accelerate the recovery of forest and riparian habitat.

Cumulatively, School Fire, past timber harvest and roading, and ongoing activities combined with proposed activities would increase disturbance and reduce habitat for a short period of time, while tree planting would provide future habitat.

DEAD WOOD HABITAT

AFFECTED ENVIRONMENT- DEAD WOOD

Dead wood includes standing dead trees or "snags" and down wood or logs. Bird and mammal species rely on dead wood for dens, nests, resting, roosting, and/or feeding on animals and organisms that use dead wood for all or parts of their life cycle. In forest environments, about 93 wildlife species utilize snags and about 86 vertebrate wildlife species are associated with down wood (Rose et al. 2001). Dead wood comes in all sizes (diameters) and goes through a decay process from hard to soft, ultimately ending up on the ground and turning into soil nutrients.

Snag and down wood evaluations are best performed at the landscape, watershed, or larger scale (Mellen et al. 2006). Fires are a unique phenomenon, creating a boom and bust cycle of dead wood habitat, across a large landscape. Habitats created by fire represent only a small percentage of a broader landscape. Therefore, the analysis for dead wood habitat needs to be conducted on a larger area than just the fire area to help determine how an individual fire is contributing to habitat at the larger scale. As a general rule-of-thumb, the planning area should be at least 20 square miles in size [12,800 acres], and analysis areas (landscapes or watersheds) should be sufficiently large to encompass the range of variation in wildlife habitat types and structural conditions that occur in the area (Mellen et al. 2006).

For this project, dead wood will be evaluated at multiple scales including treated units/stands, School Fire Salvage Recovery project area, and the Tucannon-Pataha-Asotin watersheds (Tucannon-Asotin). Tucannon-Asotin analysis area is approximately 122,500 acres and contains a range of wildlife habitat types and structural stages representative of the Pomeroy District and School Fire Salvage Recovery project area. The approximately 28,000-acre School Fire Salvage Recovery project area is entirely within the Tucannon-Asotin area. Selected units/stands within School Fire Salvage Recovery project area would be affected by the proposed action. Direct and indirect effects will be evaluated for units/stands affected by the proposed action and within School Fire Salvage Recovery project area. Cumulative effects to dead wood habitat will be addressed at the Tucannon-Asotin analysis area scale. This provides a means for comparison to the DecAID reference conditions, which are naturally expected conditions on the landscape.

There are three general habitat types found in the analysis area: ponderosa pine/Douglas-fir, eastside mixed conifer (East Cascades/Blue Mountains) and montane mixed conifer forest. Ponderosa pine/ Douglas-fir habitat includes dry upland forest plant associations, consisting of ponderosa pine with lesser amounts of Douglas-fir and grand fir. On the northern portion of the Umatilla National Forest, ponderosa pine/Douglas fir habitat is limited in area and somewhat disconnected from larger areas of similar habitat on the south end of the Forest. Generally, dry upland forest habitat is at low elevations, flat dry ridges, and south facing slopes. Ponderosa pine/Douglas-fir (dry upland forest) habitat consists of 36 percent (~10,000 acres) of the School Fire Salvage Recovery project area and about 27 percent (~32,500 acres) of the Tucannon-Asotin analysis area. Eastside mixed conifer includes moist upland forest plant associations, consisting of a mix of Douglas-fir, grand fir, western larch, and ponderosa pine. Moist upland habitat receives more annual precipitation than drier sites and generally occurs at mid to upper elevations. Approximately, 38 percent (~10,400 acres) of School Fire Salvage Recovery project area contains Eastside mixed conifer (moist upland forest) habitat and about 50 percent (~61,000 acres) of the Tucannon-Asotin area. Montane mixed conifer forest includes cold/cool upland plant associations with a mixture of white fir, lodgepole pine, subalpine fir, and spruce. Cold upland habitats occur at high elevations, flat ridges, and north facing slopes. One stand of montane mixed conifer type occurs in the School Fire Salvage Recovery project area and that stand will not be affected by the proposed action. Less than one percent of the Tucannon-Asotin area has montane mixed conifer type. With a very limited amount of cold upland forest in the School Fire Salvage Recovery project area and the Tucannon-Asotin area, this habitat will not be affected by the proposed action, and the montane mixed conifer type will not be addressed or further analyzed. The remaining habitat within School Fire Salvage Recovery project (26 percent) and the Tucannon-Asotin analysis area (23 percent) consists of non-forested habitat consisting of grasslands and shrublands.

A variety of structural conditions occurs in the Tucannon-Asotin area, including School Fire Salvage Recovery project area prior to the fire. Size classes include sapling/pole (1-9”), small trees (10-14”), medium trees (15-19”), and large trees (≥20”). Overall, the Tucannon-Asotin area predominately consisted of saplings/poles and small to medium trees. Larger trees are scattered throughout the area but mostly occur in the roadless areas and the Wenaha-Tucannon Wilderness area. Approximately 75 percent of School Fire Salvage Recovery project area burned with high severity, 18 percent moderate and about 8 percent with a low burn severity (Silviculture and Fuels Report). Stand replacement occurs on about 92 percent (~9,200 ac.) of the dry forest type and 84 percent (~8,800 ac.) of the moist forest type (Silviculture Specialist Report). Because forested habitat burned extensively in the area and the proposed action occurs entirely within School Fire Salvage Recovery project, the post-fire structural condition in DecAID (Mellen et al. 2006) will be used to evaluate effects of the proposed action in School Fire Salvage Recovery project area. The small/medium trees structural condition in DecAID will be used as a reference condition to compare cumulative effects in the Tucannon-Asotin analysis area.

The Forest Plan (USDA 1990) provides standards and guidelines for dead standing and down wood for various levels of biological potential in each management area. The Umatilla Forest Plan Amendment #11, also known as the “Eastside Screens” states that:

> *“all sale activities (including salvage) will maintain snag and green replacement trees greater than or equal to 21 inches diameter breast height (or the representative diameter of the overstory layer trees if they are less than 21 inches diameter breast height), at 100 percent potential population levels of primary cavity excavators. This should be determined using the best available science on species requirements as applied through current species models or other documented procedures.”*

In order to be consistent with the amended Forest Plan, dead wood requirement and replacement trees objectives for each vegetative working group were changed in the “*Interim Snag Guidance for Salvage Operation*” (USDA Forest Service 1993). Table 3-81 identifies the retention objectives for snags and dead wood, as compared to existing post fire dead wood conditions in the School Fire Salvage Recovery project area.

Table 3-81 Dead Wood Retention Objectives and Existing Dead Wood Densities

<table>
<tr><th colspan="5">Umatilla Forest Plan (as amended)</th><th colspan="5">School Fire Recovery Project Area (post fire)</th></tr>
<tr><th rowspan="2">Working Group</th><th colspan="3">Snags/Acre</th><th>Down wood Pieces/Acre</th><th rowspan="2">Potential Vegetation Group</th><th colspan="3">Snags/Acre</th><th>Down wood Pieces/Acre</th></tr>
<tr><th>≥10” dbh</th><th>≥12” dbh</th><th>≥20” dbh</th><th>>12”small end & > 6’</th><th>≥10” dbh</th><th>≥12” dbh</th><th>≥20” dbh</th><th>≥12” small end & > 6’</th></tr>
<tr><td>Ponderosa Pine</td><td>2.25</td><td>1.5</td><td>0.14</td><td>3-6</td><td>Dry upland forest</td><td>75</td><td>49</td><td>8</td><td>0</td></tr>
<tr><td>South Associated</td><td>2.25</td><td>1.5</td><td>0.14</td><td rowspan="2">15-20</td><td rowspan="2">Moist upland forest</td><td rowspan="2">73</td><td rowspan="2">53</td><td rowspan="2">12</td><td rowspan="2">0</td></tr>
<tr><td>North Associated</td><td>1.8</td><td>1.5</td><td>0.14</td></tr>
</table>

In general, after School Fire much of the pre-existing down wood was consumed in the high and moderate severity areas. In the low severity area, the fire consumed most of the < 12 inch material. However, since the fire some trees may have fallen, providing woody material within decay Class 1 and 2 (Thomas 1979) on the ground. Therefore, current down wood densities within the School Fire Salvage Recovery project area are expected to be zero or less than 1 piece per acre for several years, until more dead trees fall to the ground..

DecAID Vegetation Inventory Data

More recently, the Decayed Wood Advisor (DecAID) by Mellen et al. (2006) has become available to assess dead wood availability. DecAID is a web-based advisory tool to help land managers evaluate effects of forest conditions, and existing or proposed management activities on organisms that use snags, down wood, and other wood decay elements. DecAID is a summary, synthesis, and integration of published scientific literature, research data, wildlife database, forest inventory database, and expert judgment and experience. The use of DecAID is a culmination of the most recent science and data available. As stated by Rose et al. (2001), DecAID is based on a thorough review of the literature, available research and inventory data, and expert judgment. DecAID is intended to provide information regarding snags and down wood across a large area (i.e. watershed (HUC5) or greater). The tool does not provide dead wood levels on a unit-by-unit basis. Thus, DecAID will not be used to determine snag retention levels for specific units in this project.

The DecAID inventory data is composed of statistical summaries of forest inventory on snags and down wood in unharvested forests and entire landscapes across Oregon and Washington. The “natural condition” of snag and down wood distribution, represented by the summary of forest inventory data, from unharvested inventory data in DecAID, will compare project alternatives over time. The distribution of snags in DecAID is not expected to resemble the snag distribution in School Fire Salvage Recovery project area; however as stands move toward the small/medium tree structural condition, this comparison would be appropriate. Use caution when assuming unharvested stands represent “natural condition.” Due to years of fire exclusion, current levels and composition of snags and down wood may not accurately reflect “pre-settlement” or “natural” condition in eastside forest (Mellen et al. 2006). Although snag and down wood levels found in DecAID may not accurately reflect “natural” conditions, within reason, they are comparable to recent research (Harrod et al. 1998, Agee 2002, Ohmann and Waddell 2002) regarding historic dead wood densities. Until new information becomes accessible, DecAID vegetation data provides the most current scientific data available for dead wood evaluations. The reference condition presented in DecAID will be used to evaluated effects and compare alternatives in the Tucannon-Asotin analysis areas.

The current distribution of snag densities for the post-fire environment in the School Fire Salvage Recovery project area are displayed on Table 3-82 for the ponderosa pine (dry upland forest) and eastside mixed conifer (moist upland forest) habitat types. Table 3-82 also portrays the distribution of snag densities in the Tucannon-Asotin area, including the project area, and the reference condition from DecAID.

Table 3-82 Current (Post Fire) Snag Density Distribution in School Fire Salvage Recovery Project Area and Tucannon-Asotin Analysis Areas

Snags		Snags/Acre[1]	Tolerance Interval	School Fire	Tucannon -Asotin	DecAID[2]
				Percent of Landscape		
Ponderosa Pine/Douglas-fir	≥ 10 Inches dbh	0	**0**	2	4	**54**
		0.1-1.2	**0-29%**	0	0	**0**
		1.3-2.6	**30-49%**	0	5	**0**
		2.7-7.1	**50-79%**	0	11	**26**
		≥ 7.2	**≥ 80%**	98	80	**20**
	≥ 20 Inches dbh	0	**0**	4	8	**71**
		0.1-1.0	**0-29%**	4	26	**0**
		1.1	**30-49%**	0	1	**0**
		1.2-2.4	**50-79%**	13	15	**9**
		≥ 2.5	**≥ 80%**	78	51	**20**
Eastside Mixed Conifer	≥ 10 Inches dbh	0	**0**	13	10	**15**
		0.1-6.6	**0-29%**	6	13	**15**
		6.7-12.5	**30-49%**	2	6	**20**
		12.6-25.2	**50-79%**	6	33	**30**
		≥ 25.3	**≥ 80%**	74	37	**20**
	≥ 20 Inches dbh	0	**0**	19	16	**31**
		0.1-2.6	**0-29%**	7	33	**0**
		2.7-4.2	**30-49%**	3	11	**19**
		4.3-8.5	**50-79%**	12	17	**30**
		≥ 8.6	**≥ 80%**	58	22	**20**

[1]DecAID (Mellen et al. 2006) PPDF_S. Table inv-3a & 4a and EMC_ECB_S, Table inv-3a & 4a.
[2] DecAID (Mellen et al. 2006), Figure PPDF_S.inv-22 & inv-23 and Figure EMC_ECB_S. inv-22 &23

Ponderosa pine/Douglas fir Habitat

About 98 percent of the School Fire Salvage Recovery project area has densities ≥ 7.2 snags/acre for snag ≥ 10 inches in the Ponderosa pine/Douglas-fir (dry upland forest) habitat type (Table 3-82). The remaining 2 percent of the area occurs at zero (0) snags/acre. For snags ≥ 20 inches, 78 percent of the area has densities ≥ 2.5 snags/acre. Thirteen percent of the area has a density of 1.2-2.4 snags/acres and the remaining 8 percent of the landscape has a density ≤1.0 snags/ acre.

The distribution of snag densities in Tucannon-Asotin area is compared to the reference or "natural" distribution of snag densities in DecAID. For snags ≥ 10 inches in the ponderosa pine/Douglas-fir habitat, density classes that exceed the reference condition include the 1.3-2.6 and the ≥ 7.2 snag/acre. Snag density classes that are deficient in the Tucannon-Asotin area include the zero (0) and the 2.7-7.1 snag/acre classes. For snag ≥ 20 inches, density classes that are exceed the reference condition in DecAID include densities ≥ 0.1 snags/acre. The only density class deficient is the zero (0) snags/acre class.

Eastside mixed conifer

Seventy-four percent of the School Fire Salvage Recovery project area has densities ≥ 25.3 snags/acre for snag ≥ 10 inches (Table 3-82), for the Eastside mixed conifer (moist upland forest) type. Eight percent of the landscape has densities between 6.7-25.2 snags/acres. The remaining 19 percent of the area occurs at densities ≤ 6.6 snags/acre. For snags ≥ 20 inches, 58 percent of the area has densities ≥ 8.6 snags/acre. Fifteen percent of the area has a density of 2.7-8.5 snags/acre and the remaining 26 percent of the landscape has densities ≤ 2.6 snags/ acre.

Comparing the distribution of snag densities in DecAID with the Tucannon-Asotin area, for eastside mixed conifer habitat with snags ≥ 10 inches, density classes that exceed the reference condition in DecAID include those ≥ 12.6 snag/acre. Snag density classes that are deficient in the Tucannon-Asotin area include the zero (0) snags/acre and those between 0.1-12.5 snag/acre. For snags ≥ 20 inches, density classes that exceed the reference condition include the 0.1-2.6 and the ≥ 8.6 snags/acre. Density classes that are deficient in the area include the zero (0) snags/acre and the 2.7-8.5 snag/acre classes.

DecAID Species Data

Primary cavity excavators, as a group, are management indicator species for the Forest Plan (USDA 1990). Thirteen primary cavity excavators potentially occur on the Forest, but few are associated with a post-fire condition and have the potential to occur in School Fire Salvage Recovery project area. Dead wood is habitat is analyzed for four of these species because, the post-fire condition in School Fire Salvage Recovery project area resulted in mostly dead and dying trees with very few live or “green” trees on the landscape (Table 3-83). In addition, the understory burned, temporarily removing grasses and shrubs and leaving mostly bare soil and some scattered patches of duff and litter. Essentially, remaining habitat consists of snags and very little down wood. While many species use dead wood habitat, most of these species are secondary cavity users that depend on primary cavity nesters to excavate cavities for their use. By addressing available habitat and effects to primary cavity excavators, habitat for secondary cavity users will be provided. Also, the *wildlife data* available in the Decay Wood Advisor (Mellen et al. 2006), provides limited information on fewer primary cavity excavators.

The analysis was further reduced to focus on primary cavity excavators that have a “conservation concern.” The Conservation Strategy for Landbirds in the Northern Rocky Mountains of Eastern Oregon and Washington (Altman 2000) and the Species of Conservation Concern (USDI 2002) were referenced to identify species of concern. In addition, Conservation Status Rankings (Nature Serve 2006) of S2 or S3 for the state of Washington were reviewed to identify species of concern. An S2 ranking identifies a species as “imperiled”, because of rarity due to very restricted range, very few populations, steep declines, or other factors making it very vulnerable to extirpation from the state (NatureServe 2006). The S3 ranking classifies the species as “vulnerable,” due to a restricted range, relatively few populations, recent and widespread declines or other factors making it vulnerable to extirpation (NatureServe 2006).

With these considerations, Table 3-83 identifies primary cavity excavators selected for the dead wood analysis in School Fire Salvage Recovery project and the Tucannon-Asotin analysis areas. Habitat availability for these species will be evaluated against the no action alternative.

Table 3-83 Primary Cavity Excavators Selected For Evaluating the Post-Fire Condition In School Fire Salvage Recovery Project Area

Species	Habitat[1]	DecAID Habitat	Status[2]
Lewis's woodpecker	Ponderosa pine and burned old forest	Ponderosa Pine/Douglas-fir (Dry Upland Forest)	CSNR, S3, BCC
White-headed woodpecker	Open ponderosa pine with large trees and snags	Ponderosa Pine/Douglas-fir (Dry Upland Forest)	CSNR, S2, BCC
Three-toed woodpecker	Mid-upper elevation Coniferous forests with insect –infested snags or dying trees	Eastside Mixed Conifer (Moist Upland Forest)	MIS, S3
Black-backed woodpecker	Mixed conifer forest, associated with diseased trees within burned forest	Eastside Mixed Conifer (Moist Upland Forest)	S3

[1] Based on Poole and Gill eds. 2005, Wahl et al. 2005, Johnson and O'Neil 2001, and Thomas 1979.
[2] CSNR= Conservation Strategy for landbirds in the Northern Rocky Mountains of Eastern Oregon and Washington (Altman 2000); S2= imperiled, S3= vulnerable to extirpation or extinction (Washington Ranking, NatureServe 2005); BCC= Birds of Conservation Concern (USDI 2002); and MIS=Management Indicator Species (USDA 1990)

Other primary cavity excavators associated with stand replacement fires, like hairy woodpecker, downy woodpecker, northern flicker, and others, will not be evaluated because they have a Conservation Status Ranking of S4 or S5 in Washington (NatureServe 2006). The S4/S5 rankings identifies the species as "apparently secure" and/or "secure" based on, 1) uncommon but not rare; some cause for long-term concern due to declines or other factors; or 2) common, widespread, and abundant in the state.

In addition, species identified in Table 3-83 provide a diverse set of habitat conditions that represents other primary cavity excavators that could occur in School Fire Salvage Recovery project area. As indicated by Saab and Dudley (1998) and Saab et al. (2002), "managing for a range of post-fire habitat conditions, characteristic of black-backed and Lewis's woodpecker, would likely incorporate habitat features necessary for nest occurrence of other cavity nesting birds." Furthermore, habitat should be evaluated at multiple spatial scales (e.g. School Fire Salvage Recovery project area and Tucannon-Asotin area) to incorporate the continuum of habitat used by black-backed and Lewis's woodpeckers (Johnson et al. 2000, Saab et al. 2002). This suggests that maintaining habitat characteristics at the extremes (e.g. black-backed and Lewis's woodpeckers) and considering micro and landscape scales, habitat would be maintained for the entire assemblage of cavity nesting birds.

The wildlife data set in DecAID provides the most current scientific data available for dead wood evaluations, and will be used to evaluated effects and compare alternatives for selected species. The wildlife data set in DecAID was obtained from a thorough review of published literature and other available data on wildlife use of snags and down wood. DecAID provides a statistical synthesis of data showing level of use by individual wildlife species for snags and down wood, primarily in Oregon and Washington. Wildlife use data are not available for all wildlife habitat types and species in DecAID (Mellen et al. 2006). This data allows the user to relate the abundance of dead wood habitat for both snags and logs to the frequency of occurrence of selected wildlife species requiring dead wood habitat for some part of their life cycle.

Wildlife data is portrayed at 30 percent, 50 percent, and 80 percent "tolerance level." Tolerance levels are not indicators of population viability, "thresholds" or potential populations. Tolerance levels are estimates of individuals in a population expected to use a certain dead wood characteristics (i.e. density, size, etc. (Mellen et al. 2006)). Tolerance levels are equivalent to the percent of individuals in a population. Essentially, the lower the tolerance level, the fewer individuals would use the area (landscape, watershed, etc.) relative to the habitat characteristic. DecAID tolerance levels "may also be interpreted as three levels of "assurance": low (30 percent tolerance level), moderate (50 percent tolerance level), and high (80 percent tolerance level)" (Mellen et al. 2006). The higher the tolerance level, the higher the "assurance" habitat (snag/down wood) will be provided.

For each species identified in the Table 3-83 specific snag densities (i.e. tolerance intervals) were obtained from the wildlife data found in DecAID. Table 3-84, provides estimates of available habitat for these species in the recent post-fire condition in both ponderosa pine and mixed conifer habitats. For example, within the sampled population of Lewis's woodpecker, use of snag densities in post-fire environments of Eastside Mixed Conifer and Ponderosa Pine/Douglas-fir habitats, 30 percent of the population uses less than 24.4 snag/acre ≥ 10 inches. Out of about 20,500 acres of potential habitat in School Fire Salvage Recovery project area, about 3,345 acres of this habitat would be available. This is the lowest level of assurance that habitat would be provided for the Lewis's woodpecker. Conversely, 70 percent of the population uses more than 24.4 snags/acre ≥ 10 inches. This snag level is found on about 17,154 acres in the School Fire Salvage Recovery project planning area. There is a moderate to high level of assurance that habitat would be provided for the Lewis's woodpecker.

Table 3-84 Post Fire Habitat by Snag Density and Tolerance Interval For School Fire Salvage Recovery Project Area

Species	Snags	Snags/Acre[1]	Tolerance Intervals	Post Fire (2006) Acres	Post Fire (2006) Percent
Lewis's woodpecker	≥ 10 Inches dbh	0-24.3	**0-29%**	3,345	16
		24.4-39.5	**30-49%**	813	4
		39.6-62.8	**50-79%**	3,342	16
		≥ 62.9	**≥ 80%**	12,999	63
Lewis's woodpecker	≥ 20 Inches dbh	0	**0-29%**	2,436	12
		0.1-6.1	**30-49%**	5,945	29
		6.2-16.0	**50-79%**	6,155	30
		≥ 16.1	**≥ 80%**	5,960	29
White-headed woodpecker	≥ 10 Inches dbh	0-18.5	**0-29%**	2,722	13
		18.6-51.9	**30-49%**	3,500	17
		52.0-98.6	**50-79%**	6,735	33
		≥ 98.7	**≥ 80%**	7,540	37
Three-toed woodpecker	≥ 5 Inches dbh	0-44.1	**0-29%**	3,070	15
		44.2-71.4	**30-49%**	1,704	8
		71.5-111.7	**50-79%**	2,070	10
		≥ 111.8	**≥ 80%**	13,653	67
Black-backed woodpecker	≥ 10 Inches dbh	0-57.1	**0-29%**	6,586	32
		57.2-82.3	**30-49%**	4,511	22
		82.4-119.1	**50-79%**	4,550	22
		≥ 119.2	**≥ 80%**	4,850	24

[1] DecAID (Mellen et al. 2006) Tables EMC_PF.sp-23 and PPDF_PF. Sp-23

Species Summary

Snag densities in School Fire Salvage Recovery project area are currently within the 80 percent tolerance interval for the Lewis's woodpecker (≥ 10"), and three-toed woodpecker on at least 63 percent of the School area. Snag densities at the 80 percent tolerance interval for black-backed woodpecker occur on 24 percent of the area. Habitat for the white-headed woodpecker occurs on 70 percent of the area, for tolerance intervals above 50 percent. Snag densities above the 50 percent interval for Lewis woodpecker habitat, ≥ 20 inches, occurs on 59 percent of the School Fire Salvage Recovery project area.

ENVIRONMENTAL CONSEQUENCES - DEAD WOOD

Effects Common to All Alternatives, Including No Action

Direct/Indirect Effects Alternatives A, B, and C:

School Fire resulted in the short-term increase in snag numbers. Snag habitat in School Fire Salvage Recovery project area serves as intermittent habitat for many cavity excavators (Saab et al. 2004). Snag numbers in the area would not remain static over time, because the process of tree mortality and snag recruitment are balanced by the processes of snag decay and fall (Everett el al. 1999). Over time, snag habitat would decrease creating a gap in time when little snag habitat exits (stands with high to moderate severity), because there are few green trees of sufficient size to provide recruitment. Dahms (1949) found 10 years post-fire, 50 percent of the fire killed ponderosa pine snags remained standing but this declined to 22 percent standing after 22 years. About 75 percent of all snags may fall in the area within 20 years (Keen 1929, Dahms 1949, Parks et al. 1999, and Everett et al. 1999). The effect of School Fire is a sudden increase in snag habitat and woodpecker populations followed by a reduction in available habitat and a decrease in local populations as snags fall over time. The increase and abundance of woodpeckers coincides with the increase in bark beetle and wood-boring beetle populations in the burn.

Green stands with little mortality would not be harvested, and snag levels would remain unaffected by proposed activities in those stands. Therefore, these stands would continue to provide habitat for species that require live canopy along with snag habitat (e.g. pileated woodpecker, Williamson's sapsucker, pygmy nuthatch, and white-headed woodpecker). Green trees throughout the burn area will serve as snag recruitment trees for future snag development in the area.

A portion of School Fire Salvage Recovery project area would not be treated, benefiting species who utilize high density snag patches. Hairy woodpecker, black-backed woodpeckers, and mountain bluebirds prefer high densities of snags ranging from 64-126 snags/acres (Saab and Dudley 1998, Haggard and Gaines 2001, Saab et al. 2002, Kotliar et al. 2002). Approximately, 54 percent of the forested area in the School fire would not have harvest activities, including inaccessible stands and "roadless". About, 52 percent of that area (5,790 acres) would provide high-density (> 64 snags/acre) snag patches.

Numerous factors influence the length of time snags remain standing on a site, including weather events, diameter, tree species, height, aspect, slope, elevation, and soil type/moisture. Diameter is one of the most important factors that influence snag fall rates. Typically, large diameter snags (≥ 20 inches diameter breast height (dbh)), stand longer on a site then small diameter snags (Bull et al. 1997). This is attributed to decay moving through the sapwood quicker than heartwood; generally, small diameter trees have a higher proportion of sapwood than heartwood. Keen (1929), Dahms (1949), Parks et al. (1999), and Everett et al. (1999) all found that smaller snags (<9" dbh) fell sooner than larger snags (>16" dbh) and Everett and Keen both reported rapid snag fall 3-15 years post-fire. In addition, Dahms (1949) reported that fire killed snags tended to stand longer than insect killed snags. Everett et al. (1999) reports that thick-barked species like Douglas-fir and ponderosa pine > 16 inches dbh remained standing longer than thin-barked species (e.g. lodgepole pine, Engelmann spruce, white/grand fir, etc.).

Probable snag fall in School Fire Salvage Recovery project area from 2006 through 2045 is estimated in Table 3-85. In School Fire Salvage Recovery project area, most snag fall would occur between 2025 and 2035 for ponderosa pine/Douglas-fir, ≥ 10 inches, and continue to decline through 2045. In contrast, eastside mixed conifer ≥ 10 inch snags would have reduced significantly by 2025 and continue to decline sharply through 2045. Snags ≥ 20 inches in the dry upland forest would decline at a much slower rate and seem to persist on the landscape long, although at lower densities. Snags in the moist upland forest type would decline quicker than the ≥ 20 inch snags in the dry type. By 2035, their density has declined sharply. Snag fall contributes to the reduction of foraging and nesting habitat for primary cavity excavators.

Table 3-85 Estimated Snag Density Distribution Over Time In School Fire Salvage Recovery Project Area

Snags		Snags/Acre[1]	Tolerance Interval	Year 2006	Year 2015	Year 2025	Year 2035	Year 2045
				Percent of Landscape				
Ponderosa Pine/Douglas-fir	≥ 10 Inches dbh	0	**0**	2	2	2	2	2
		0.1-1.2	**0-29%**	0	0	0	2	0
		1.3-2.6	**30-49%**	0	0	0	0	18
		2.7-7.1	**0-79%**	0	0	2	59	63
		≥ 7.2	**≥ 80%**	98	98	96	37	16
	≥ 20 Inches dbh	0	**0**	4	4	4	2	2
		0.1-1.0	**0-29%**	4	4	18	20	19
		1.1	**30-49%**	0	5	0	4	3
		1.2-2.4	**0-79%**	13	13	12	17	32
		≥ 2.5	**≥ 80%**	78	74	66	57	45
Eastside Mixed Conifer	≥ 10 Inches dbh	0	**0**	13	13	13	13	13
		0.1-6.6	**0-29%**	6	7	11	28	31
		6.7-12.5	**30-49%**	2	4	5	14	36
		12.6-25.2	**0-79%**	6	4	15	43	16
		≥ 25.3	**≥ 80%**	74	72	57	2	3
	≥ 20 Inches dbh	0	**0**	19	19	18	17	15
		0.1-2.6	**0-29%**	7	7	9	18	23
		2.7-4.2	**30-49%**	3	4	13	9	15
		4.3-8.5	**0-79%**	12	18	16	27	31
		≥ 8.6	**≥ 80%**	58	52	44	28	16

[1]DecAID (Mellen et al. 2006) PPDF_S. Table inv-3a & 4a and EMC_ECB_S, Table inv-3a & 4a.

Kotliar et al. (2002) reports in a review of literature associated with effects of fire and post-fire salvage logging, that black-backed and three-toed woodpecker rapidly colonize stand replacement burns within 1-2 years and are rare after 5 years due to declines in bark and wood boring beetles. In contrast, Lewis' woodpeckers have been found to be abundant in both recent (2-4 year) and older burns (10-25 years) which may be associated with arthropod prey availability and their preference of low-density snag areas. Hairy woodpeckers and northern flickers have shown mixed responses but usually decline within the first 25 years post-fire while mountain and western bluebirds commonly nest in recently burned forests, but decline in mid-successional stages. A variety of snag densities and sizes on the landscape would provide for a suite of species and account for individual preferences in snag density, size, and structure.

Essentially, snag recruitment would not occur for several decades. However, green trees not affected by the fire, or burned at low-moderate severity would provide future snag recruitment in the area. Smaller diameter snags (8-10”) should reoccur in the burn area 40-50 years after the burn. These snags would begin providing foraging habitat for some species; however nesting habitat could still be limited for several years. Larger snags (> 20”) will remain on the landscape longer than smaller snags; however, all snags will eventually fall. Recruitment of large snags on the landscape may take more than 80 years to develop, depending on the site.

Danger tree removal includes the routine removal of snags along roads, high-use recreation areas and around facilities. This activity occurs approximately 150 feet (one and a half tree height) on either side of roads and around high use areas. When snags occur in these areas, they pose a danger to the public and/or facilities and would be removed; therefore, these areas would not be managed for snag retention. However, additional snags would be retained outside and adjacent to these areas to maintain the prescribed density for the affected area. Snag habitat would decrease along roadways, landings, and areas where concentrated use occurs.

Currently, there is a limited amount of down wood within the fire area. Most of the down wood habitat in the area was burn up by the School fire. While large down logs are not always abundant in early post-fire years, fire-killed tree eventually fall and become woody debris. However, down wood will continue to be limited in the area for approximately 10-20 year, when most snags begin to fall. At that time, more than 75 percent of the landscape would exceed the Forest Plan standard for down wood.

Alternative A- No Action

Direct/Indirect Effects – Alternative A:

Snag would be retained at current levels through out the project area. As time progresses, smaller snags would begin to fall and large snags would start to decay, changing habitat suitability for many species. Grass and shrubs would reestablish and ultimately increasing and providing abundant foraging habitat. Natural regeneration would begin, establishing new stands across the area. Down wood levels are expected to increase, as snags fall. Remaining snags could be at risk from resultant higher fuel loads, subject to the occurrence of fire in the area.

Tolerance intervals found in DecAID for recent post-fire habitat in ponderosa pine/Douglas-fir and eastside mixed conifer habitat types are used to estimate available habitat across School Fire Salvage Recovery project area. Table 3-86 portrays the percent of available habitat by tolerance interval over time. Snag densities occur within the 80 percent tolerance interval for the Lewis’s woodpecker (≥10”) on 40 percent of the project area through 2015. This area drops to 1 percent or less after 2025. For Lewis’s woodpecker habitat ≥ 20 inches, 17 percent of the School Fire Salvage Recovery project area meets the 80 percent tolerance interval through 2015 and drops to 4 percent or less after 2035. Snag densities occur above the 50 percent tolerance interval for the white-headed woodpecker on 50 percent of the project area through 2015 and drops to 9 percent of the area in 2025. Densities occur within the 80 percent tolerance interval for the three-toed woodpecker on 45 percent of the project area through 2015. This area drops to 0 percent in 2025 but increased to 53 percent of the landscape in 2045, because of re-growth. For the black-backed woodpecker, snag densities at the 80 percent tolerance interval drop to 4 percent of the area or less after 2015.

Table 3-86 Estimated Available Habitat, Over Time For Selected Primary Cavity Excavators In School Fire Salvage Recovery Project Analysis Area

Species	Snags	Snags/ Acre[1]	Tolerance Intervals	YEAR 2006	2015	2025	2035	2045
				Percent of Landscape				
Lewis's woodpecker	≥ 10 Inches dbh	0-24.3	**0-29%**	16	19	51	99	94
		24.4-39.5	**30-49%**	4	12	23	1	6
		39.6-62.8	**50-79%**	16	29	25	0	0
		≥ 62.9	**≥ 80%**	63	40	1	0	0
Lewis's woodpecker	≥ 20 Inches dbh	0	**0-29%**	12	12	11	10	9
		0.1-6.1	**30-49%**	29	36	44	60	75
		6.2-16.0	**50-79%**	30	35	32	26	17
		≥ 16.1	**≥ 80%**	29	17	12	4	0
White-headed woodpecker	≥ 10 Inches dbh	0-18.5	**0-29%**	13	18	32	91	90
		18.6-51.9	**30-49%**	17	33	58	9	10
		52.0-98.6	**50-79%**	33	41	9	0	0
		≥ 98.7	**≥ 80%**	37	9	0	0	0
Three-toed woodpecker	≥ 5 Inches dbh	0-44.1	**0-29%**	15	21	66	50	23
		44.2-71.4	**30-49%**	8	12	26	28	6
		71.5-111.7	**50-79%**	10	21	8	16	17
		≥ 111.8	**≥ 80%**	67	45	0	6	53
Black-backed woodpecker	≥ 10 Inches dbh	0-57.1	**0-29%**	32	56	95	100	100
		57.2-82.3	**30-49%**	22	20	5	0	0
		82.4-119.1	**50-79%**	22	21	0	0	0
		≥ 119.2	**≥ 80%**	24	4	0	0	0

[1] DecAID (Mellen et al. 2006) Tables EMC_PF.sp-23 and PPDF_PF. Sp-23

Snags would be retained at high densities throughout the project area. These densities may be too high for use by Lewis's woodpecker in the short term (5-10 years). Saab et al. (2002) found that Lewis's woodpeckers favor stands with moderate canopy cover (40-10 percent) in a burned condition or sites with moderate densities of snags of large sizes for nesting. As time progresses, smaller snags would begin to fall (1-15 years) and large snags begin to decay increasing habitat suitability for the Lewis's woodpecker. Habitat for the Lewis's woodpecker would increase until large snags are absent on the landscape (approximately 40-45 years).

Foraging and nesting opportunity exist, where adjacent to green ponderosa pine dominated stands for the white-headed woodpecker. Stand replacement burned areas are not considered optimal habitat for this species. The mixed mortality and underburned areas would continue to provide habitat, as this area would have decreased understory and existing snag habitat in relation to foraging habitat for the short term.

Effects Common to Action Alternatives (B and C)

Direct/Indirect Effects – Alternatives B and C:

Snag and down wood retention levels are found in the Implementation/Marking Guides for the School Fire Salvage Recovery Project (Appendix B). Within each unit/stand proposed for salvage harvest, a minimum of 3 snags/acre ≥ 21 inches in diameter at breast height (dbh) would be retained after treatments. Hard snags would be selected for retention, with a preference for ponderosa pine and

Douglas-fir. Soft snags are not considered merchantable, and therefore would not be removed from the unit. Snags would be distributed as individuals, scattered across the unit and in groups (3-5 snags). Generally, non-merchantable snags < 10 inches would be maintained within the unit; however, harvest activities may knockdown and/or breakup a portion of these snags. In addition, all salvage harvest units would retain clumps of snags no smaller than one acre in size and no larger than 3 acres. A clump would occur on every fifteen acres in the unit. All snags, regardless of diameter would be retained within the clump. Within harvest units, all snags in designated riparian corridors will be retained.

All existing down wood greater than 10 inches in diameter at the large end would be retained as down wood within the harvest unit. Down wood within riparian corridors and snag-clumps within the unit would be retained.

Stands in School Fire Salvage Recovery project area and outside proposed salvage harvest units would maintain current snag and down wood levels; unless considered a danger tree, and threaten public safety.

The increase in snag density created by the fire is short-term, regardless of action alternative (see Tables 3-85 and 3-86). Proposed harvest treatments would reduce snag densities on the landscape, specifically snags $\geq$ 10 inches dbh. This would result in a decrease in habitat for species that require high-density patches like black-backed woodpecker (Saab and Dudley 1998 and Saab et al. 2002). However, harvesting dead trees would also provide some habitat sooner for species that utilize moderate to low density patches like Lewis's woodpecker (Saab and Dudley 1998 and Saab et al. 2002).

At the stand/unit scale, snag densities would exceed Forest Plan standards, because over 50 percent of the forest area would not be harvested and snag densities in unharvested stands are well above 2.5 snags/acre. In addition, harvested stands/units would retain at least 3 snags/acre > 21 inches, this is at least 0.8 snags/acres above the Forest Plan standard for dry and moist forest types.

Treated areas would eventually develop into desired habitat components because desirable tree species would be planted on the landscape (Silviculture Specialist Report). Ponderosa pine and Douglas-fir trees would eventually dominate stand composition on the site. Establishment of habitat in the mixed conifer and ponderosa pine/Douglas-fir habitat types would be most beneficial for species like the white-headed woodpecker.

Activity treatments may result in a slight to moderate decrease in down woody material levels, depending on the tree density in the unit. When available, down material > 3 inches in diameter would remain on site at a minimum of 5 tons/acre for dry forest types (Brown et al. 2003) and 10 tons/acre for moist forest types (Brown et al. 2003), to meet desired conditions for soil, water, fuel and wildlife.

Cumulative Effects – Alternatives B and C:

Past and present activities that affect dead wood dynamics include fire suppression, Burned Area Emergency Response (BAER), timber and fuel wood harvest, fuels treatment, and wildfire. These management activities and disturbances have led to the current dead wood condition in the Tucannon-Asotin analysis area. This has resulted in the current (Alternative A) distribution of snag density, identified in Table 3-82 for the Tucannon-Asotin analysis area.

As snags fall over time, stands with high snag densities would shift to moderate and low densities, and stands with moderate density would shift to lower densities. (Table 3-85). Essentially, as snag densities change, through snag fall, they move to different (lower) tolerance intervals. As a result, the amount of area in a tolerance interval above the reference condition would eventually be reduced and match the reference condition. Tolerance intervals that are currently below the reference condition could meet the condition if a higher snag density class (tolerance interval) is above the reference condition. For example, in the mixed conifer type for snags ≥ 20 inches, snag densities in the ≥ 80 percent tolerance interval exceed the reference condition, and snag densities in the 50-79 percent interval are below the reference condition (Table 3-82). There is not enough “excess” (above reference) in the ≥ 80 percent class to make up for the deficit in the 50-79 percent class. Additional snags would need to be recruited on the landscape to maintain the reference conditions in DecAID.

Ponderosa Pine/Douglas-fir Habitat
Table 3-89 compares the reference condition in DecAID with the snag distribution in the Tucannon-Asotin analysis area. In general, the distribution of snag density classes, in the Ponderosa pine/Douglas-fir type ≥10 inches would be maintained on the same amount of area for all alternatives, except for densities in the ≥ 50 percent tolerance intervals. For both Alternatives B and C, the ≥ 80 percent tolerance interval exceeds the reference condition by 48-60 percent more area then identified in DecAID. The 50-79 percent interval is 3-15 percent below the reference condition for all alternatives. However, when these two density classes are combined, they are 45 percent above the reference condition for each of the alternatives (Table 3-89). Therefore, the cumulative effect for the distribution of snag density classes in the dry forest type, ≥10 inches remain relatively constant, with little or no overall difference between alternatives. While the effects from the different alternatives do not meet reference conditions, the area would eventually meet reference conditions over time as snags decay and fall and then move into a lower snag-density distribution class, as demonstrated in Table 3-85

For snags ≥ 20 inches in the dry forest type, the distribution of snag density classes remains the same for each alternative, because more than 2.5 snags per acre would be retained within harvest units. All snag density distribution classes above zero (>0), are 1-31 percent above the reference condition in the Tucannon-Asotin analysis area. There is no real difference in cumulative effect between alternatives for snag-density distribution classes in the ponderosa pine/Douglas-fir habitat type (Table 3-89). While the effects of alternatives do not meet the reference condition, the area would eventually approach the reference condition over time as snags decay and fall, and then move to a lower snag-density distribution class, as demonstrated in Table 3-85.

Species
In the Tucannon-Asotin analysis area, more than 70 percent of the available habitat occurs in the ≤ 49 percent tolerance intervals for each alternative and selected cavity excavators (Table 3-90). In addition, more than 50 percent of the available habitat, except for Lewis’s woodpecker >20 inches, occurs in the 0-29 percent tolerance interval. More than 57 percent of Lewis’s woodpecker, > 20 inch habitat occurs in the 30-49 percent tolerance interval and 13 percent occurs in the < 30 percent interval (Table 3-90). In the Tucannon-Asotin analysis area, the majority of available habitat in the > 50 percent tolerance intervals is attributed to the School Fire Recovery project area.

Past management and natural disturbances outside of the School Fire area (~73,000 ac.) have limited the amount of available habitat for some primary cavity excavators. For Lewis’s woodpecker habitat ≥ 10 inches, total habitat (≥ 30 percent tolerance interval) occurs on 19,639 acres (21 percent), with 5,867 acres (6 percent) ≥ 50 percent interval, outside the School analysis area. Lewis’s woodpecker habitat ≥ 20 inches, total habitat occurs on 63,089 acres (67 percent), with 14,773 acres (16 percent) ≥ 50 percent interval. For white-headed woodpecker, outside the School analysis area, habitat ≥ 30 percent tolerance interval, occurs on 28,207 acres (30 percent), with 1,949 acres (2 percent) ≥ 50 percent interval. Total habitat for the three-toed woodpecker occurs on 24,760 acres (26 percent), with 8,980 acres (10 percent) ≥ 50 percent intervals. Outside the School fire analysis area, black-backed woodpecker total habitat occurs on 1,496 acres (2 percent) with 527 acres (<1 percent) in the ≥ 50 percent tolerance intervals.

More than 62 percent of available habitat, ≤ 49 percent tolerance intervals, for all selected primary cavity excavators, occurs outside the School fire. In addition, between 48 percent and 76 percent of available habitat occurs in the 0-29 percent tolerance interval, for all species except for Lewis's woodpecker > 20 inches. About 51 percent of Lewis's woodpecker, > 20 inch habitat occurs in the 30-49 percent tolerance interval and 11 percent in the < 30 percent interval. Overall, very little habitat in the Tucannon-Asotin analysis area occurs outside the School fire area for selected cavity excavators in the ≥ 50 percent tolerance interval.

Alternative B – Proposed Action

Direct/Indirect Effects – Alternative B:

Ponderosa Pine/Douglas-fir Habitat

Proposed salvage harvest would reduce snag habitat ≥ 10 inches on approximately 9,400 acres in School Fire Salvage Recovery project area. For snags ≥ 10 inches in the Ponderosa pine/Douglas-fir (dry upland forest) habitat type, Table 3-87 shows densities ≥ 7.2 snags/acre reduced to 60 percent of the landscape when compared to 98 percent for Alternative A. However, densities between 2.7-7.1 snags/acre increase to 37 percent of the landscape, this is the result of retaining 3 snags/acre ≥ 21 inches in harvest units. Tolerance intervals between zero (0) and 49 percent remain the same when compared to Alternative A. For snags ≥ 20 inches, densities across the landscape remain the same, because snag retention levels are ≥ 2.5 snags/acre within harvest units.

Eastside Mixed Conifer Habitat

For the Eastside mixed conifer type (moist upland forest) with snags ≥ 10 inches, Table 3-87shows salvage harvest reducing snag densities to 36 percent of School Fire Salvage Recovery project area for ≥ 25.3 snags/acre when compared to 74 percent for Alternative A. In addition, densities in the 12.6-25.2 snags/acre class are reduced to 4 percent of the landscape when compared to Alternative A. As expected, the density class 0.1-6.6 snags/acre increases to 46 percent of School Fire Salvage Recovery project area, based on snag retention levels. Snag densities in the zero and 30-49 percent tolerance interval remain unchanged when compared to Alternative A. For snags ≥ 20 inches, decreases would occur in densities ≥ 4.3 snags/acres and the resultant increase occurs with densities 2.7-4.2 snags/acre when compared to Alternative A. Snag densities remain unchanged for snags <2.7 snags/acre.

Table 3-87 Alternative Comparison of Snag Density Distribution In School Fire Salvage Recovery Project Area

Snags		Snags/Acre[1]	Tolerance Interval	Alt. A	Alt. B	Alt. C
				Percent of Landscape		
Ponderosa Pine/ Douglas-fir	≥ 10 Inches dbh	0	**0**	2	2	3
		0.1-1.2	**0-29%**	0	0	2
		1.3-2.6	**30-49%**	0	0	3
		2.7-7.1	**50-79%**	0	37	4
		≥ 7.2	**≥ 80%**	98	60	87
	≥ 20 Inches dbh	0	**0**	4	4	4
		0.1-1.0	**0-29%**	4	4	4
		1.1	**30-49%**	0	0	0
		1.2-2.4	**50-79%**	13	13	13
		≥ 2.5	**≥ 80%**	78	78	78
Eastside Mixed Conifer	≥ 10 Inches dbh	0	**0**	13	13	13
		0.1-6.6	**0-29%**	6	46	9
		6.7-12.5	**30-49%**	2	2	6
		12.6-25.2	**50-79%**	6	4	10
		≥ 25.3	**≥ 80%**	74	36	61
	≥ 20 Inches dbh	0	**0**	19	19	19
		0.1-2.6	**0-29%**	7	7	7
		2.7-4.2	**30-49%**	3	39	3
		4.3-8.5	**50-79%**	12	6	13
		≥ 8.6	**≥ 80%**	58	30	58

[1]DecAID (Mellen et al. 2006) PPDF_S. Table inv-3a & 4a and EMC_ECB_S, Table inv-3a & 4a.

<u>Species</u> - Based on the above snag data, habitat for primary cavity excavators would be affected by the change in snag densities (Table 3-88).

Table 3-88 Alternative Comparison of Habitat for Selected Primary Cavity Excavators That Use Eastside Mixed Conifer and Ponderosa Pine/Douglas-Fir Post-Fire Conditions In School Fire Salvage Recovery Project Area

Species	Snags	Snags/ Acre[1]	Tolerance Intervals	Alternative A		Alternative B		Alternative C	
				Acres	%	Acres	%	Acres	%
Lewis's woodpecker	≥ 10 Inches dbh	0-24.3	**0-29%**	3,345	16	10,815	53	6,238	30
		24.4-39.5	**30-49%**	813	4	388	2	1,213	6
		39.6-62.8	**50-79%**	3,342	16	2,376	12	3,053	15
		≥ 62.9	**≥ 80%**	12,999	63	6,949	34	9,999	49
Lewis's woodpecker	≥ 20 Inches dbh	0	**0-29%**	2,436	12	2,448	12	2,448	12
		0.1-6.1	**30-49%**	5,945	29	11,212	55	5,937	29
		6.2-16.0	**50-79%**	6,155	30	3,417	17	6,159	30
		≥ 16.1	**≥ 80%**	5,960	29	3,452	17	5,959	29
White-headed woodpecker	≥ 10 Inches dbh	0-18.5	**0-29%**	2,722	13	10,485	51	5,539	27
		18.6-51.9	**30-49%**	3,500	17	2,379	12	2,769	18
		52.0-98.6	**50-79%**	6,735	33	3,321	16	5,500	27
		≥ 98.7	**≥ 80%**	7,540	37	4,342	21	5,696	28
Three-toed woodpecker	≥ 5 Inches dbh	0-44.1	**0-29%**	3,070	15	5,625	27	4,625	23
		44.2-71.4	**30-49%**	1,704	8	2,050	10	1,938	9
		71.5-111.7	**50-79%**	2,070	10	2,261	11	2,083	10
		≥ 111.8	**≥ 80%**	13,653	67	10,591	52	11,857	58

Species	Snags	Snags/ Acre[1]	Tolerance Intervals	Alternative A		Alternative B		Alternative C	
				Acres	%	Acres	%	Acres	%
Black-backed woodpecker	≥ 10 Inches dbh	0-57.1	**0-29%**	6,586	32	13,020	63	9,589	47
		57.2-82.3	**30-49%**	4,511	22	2,324	11	3,898	19
		82.4-119.1	**50-79%**	4,550	22	2,485	12	3,182	16
		≥ 119.2	**≥ 80%**	4,850	24	2,698	13	3,834	19
[1] DecAID (Mellen et al. 2006) Tables EMC_PF.sp-23 and PPDF_PF. Sp-23									

For Lewis's woodpecker habitat ≥ 10 inches, shows salvage harvest reduces habitat in the ≥ 80 percent tolerance interval to 34 percent (6,949 ac.), 12 percent (2,376 ac.) for the 50-79 percent interval, and 2 percent (388 ac.) in the 30-49 percent interval. Available habitat increased to 53 percent in the 0-29 percent interval. Total habitat, ≥ 30 percent tolerance interval, occurs on about 48 percent (9,713 ac.) of the area, with 46 percent (9,325 ac.) in the ≥ 50 percent interval. Because total habitat occurs on nearly half (48%) the forested area and over two-thirds of the total habitat (34%) occurs in the ≥ 80 percent tolerance interval, there would be a moderate-high level of assurance Lewis's woodpecker habitat would be available in the School fire area after treatments. Alternative A, has a high level of assurance because total habitat is not affected by proposed harvest and more than half of the habitat available (63%) is in the ≥ 80 percent interval. When compared to Alternative A, Alternative B would have a greater amount of total habitat affected and a lower level of assurance Lewis's woodpecker habitat would be available in the School fire area.

In Lewis's woodpecker habitat ≥ 20 inches habitat is reduced to 17 percent (~3,430 ac.) of the landscape for the ≥ 80 percent interval and the 50-79 percent tolerance interval. Available habitat increases to 55 percent (11,212 ac.) in the 30-49 percent interval, largely the result of retaining 3 snags/acre ≥ 21 inches in harvest units. Total habitat, ≥ 30 percent tolerance interval, occurs on 89 percent (18,081 ac.) of the area, with 34 percent (6,869 ac.) in the ≥ 50 percent intervals (Table 3-88). Nest sites are associated with the presence and abundance of free-living insects brought about by dense ground cover (Tobalske 1997). Higher nesting densities could occur in less desirable habitat (snag density) if higher insect populations occur in those areas. Even though total habitat occurs on nearly all (89 percent) the forested area, the majority (55 percent) of habitat occurs in the 30-49 percent tolerance interval, therefore a low-moderate level of assurance is expected for Lewis's woodpecker habitat in the School fire area after proposed activities. Alternative A, has a moderate level of assurance because total habitat is not affected by proposed harvest and total habitat is evenly distributed among all tolerance intervals. When compared to Alternative A, Alternative B would have a greater amount of habitat affected in the ≥ 50 percent tolerance interval and a lower level of assurance for Lewis's woodpecker habitat in the School fire area.

Proposed activities in potential white-headed woodpecker habitat would reduce habitat to 21 percent (4,342 ac.) in the ≥ 80 percent tolerance interval, 16 percent (3,321 ac.) in the 50-79 percent interval and 12 percent (2,379 ac.) in the 30-49 percent interval. Total habitat, ≥ 30 percent tolerance interval, occurs on 49 percent (10,042 ac.) of the area, with 37 percent (7,663 ac.) in the ≥ 50 percent interval (Table 3-88). Stand replacement burns are not considered optimal habitat for the white-headed woodpecker, however they have been found nesting and foraging in burned areas (Saab and Dudley 1998, and Haggard and Gaines 2001). Mixed mortality and underburned areas provide suitable habitat (Garret et al 1996) in the School area. Because of the reduction in total habitat, mostly in the > 50 percent tolerance interval and habitat use occurring in mixed mortality areas, there would be a low-moderate level of assurance white-headed woodpecker habitat would be available in the School Fire area after proposed treatments. Alternative A, has a moderate-high level of assurance because total habitat is not affected by proposed harvest activities and over half (63 percent) of the available habitat is in the ≥ 50 percent tolerance interval. When compared to Alternative A, Alternative B would have the greater amount of habitat affected in the ≥ 50 percent tolerance interval and a lower level of assurance for white-headed woodpecker habitat in the School fire area.

Proposed activities in available three-toed woodpecker habitat would reduce habitat in the ≥ 80 percent tolerance interval to 52 percent (10,591 ac.). Increases in available habitat occur in all tolerance intervals ≤ 79 percent. The increase in habitat is the result of retaining non-merchantable snags (< 10 inches) within harvest units. Total habitat, ≥ 30 percent tolerance interval, occurs on 73 percent (14,902 ac.) of the area, with 63 percent (12,852 ac.) in the ≥ 50 percent interval (Table 3-88). Because total habitat occurs on nearly 75 percent of the forested area and the majority (52 percent) of habitat occurs in ≥ 80 percent tolerance interval, there would be a high level of assurance three-toed woodpecker habitat would be available in the School fire area after treatments. Alternative A, has a high level of assurance because total habitat is not affected by proposed harvest activities and over half (67 percent) of the available habitat is in the ≥ 80 percent tolerance interval. When compared to Alternative A, Alternative B would have a greater amount of habitat affected in the ≥ 80 percent tolerance interval however; the assurance level would remain high for both alternatives.

Salvage harvest in potential black-backed woodpecker habitat, reduces habitat to 13 percent (2,698 ac.) in the ≥ 80 percent tolerance interval, 12 percent (2,485 ac.) in the 50-79 percent interval and 11 percent (2,324 ac.) in the 30-49 percent interval (Table 3-88). Total habitat, ≥ 30 percent tolerance interval, occurs on 36 percent (7,507 ac.) of the area, with 25 percent (5,183 ac.) in the ≥ 50 percent interval. The black-backed woodpecker is highly associates with post-fire environments and breeding densities are much greater in burned rather than unburned forests (Dixon and Saab 2000); therefore, burned forests are important for survival and reproduction of black-backed woodpecker. Because total habitat would occur on less than half (36 percent) the forested area and a very small amount (13 percent) of habitat ≥ 80 percent tolerance interval, there would be a low level of assurance, black-backed woodpecker habitat would be available in the School fire area after treatments. Alternative A, has a moderate level of assurance because total habitat is not affected by proposed harvest activities and over half (68 percent) of the available habitat is in ≥ 30 percent tolerance intervals. When compared to Alternative A, Alternative B would have a greater amount of habitat affected in the ≥ 30 percent tolerance intervals and a lower level of assurance black-backed woodpecker habitat would be available in the School fire area.

Cumulative Effects – Alternative B:

Past, present and foreseeable future actions in the analysis area have resulted in changes in snag ≥ 10 inches, for the Eastside mixed conifer type. Table 3-89 compares the cumulative effects of snag density distribution in the Tucannon-Asotin analysis area. Overall, snag densities would meet or exceed Forest Plan standards, because over 90 percent of the forest area in the Tucannon-Asotin analysis area is not proposed for harvest, and snag densities in unharvested stands in the School fire are well above 2.5 snags/acre. In addition, at least 3 snags/acre > 21 inches would be retained in harvested stands, which is at least 0.8 snags/acres above the Forest Plan standard for dry and moist forest types.

Eastside Mixed Conifer Habitat

In the Eastside mixed conifer type, ≥ 10 inches the distribution of snag density classes are generally 3-11 percent above the reference condition in DecAID, except for densities in the 30-49 percent interval and the zero (0) percent tolerance interval; which are 5-14 percent below the reference condition. Even though some snag density classes may be below the reference condition in DecAID, they would eventually meet conditions over time, as snags decay and fall and then move into lower-density snag distribution classes (Table 3-85). Therefore, the cumulative effects of past, present, and foreseeable future actions maintain snag density distributions above the reference condition for the ≥ 50 tolerance intervals and the 0-29 percent interval, and maintains the amount area in the zero (0) and 30-49 percent tolerance intervals.

For snags >20 inches in the moist forest type, the snag density in the zero (0) and ≥ 50 percent intervals are 3-15 percent below the reference condition in DecAID and densities in the 0-29 percent interval are 33 percent above the reference condition. The 30-49 percent tolerance interval is within reference conditions, because of snag retention levels in harvest units are > 2.5 snags/acre. For the ≥ 30 percent tolerance intervals below the reference condition, snag fall would result in a decrease in area for these tolerance intervals over time. Therefore, the cumulative effects of past, present, and foreseeable future actions, reduces snag density distribution below the reference condition for the ≥ 50 tolerance intervals but maintains the area in the zero (0) and 0-29 percent tolerance intervals.

Table 3-89 Cumulative Effects of Snag Density Distribution In Tucannon-Asotin Analysis Area

Snags		Snags/Acre [1]	Tolerance Interval	DecAID [2]	Alt. A	Alt. B	Alt. C
				Percent of Landscape			
Ponderosa Pine/Douglas-fir	≥ 10 Inches dbh	0	**0**	**54**	4	4	4
		0.1-1.2	**0-29%**	**0**	0	0	1
		1.3-2.6	**30-49%**	**0**	5	5	6
		2.7-7.1	**50-79%**	**26**	11	23	12
		≥ 7.2	**≥ 80%**	**20**	80	68	76
	≥ 20 Inches dbh	0	**0**	**71**	8	8	8
		0.1-1.0	**0-29%**	**0**	26	26	26
		1.1	**30-49%**	**0**	1	1	1
		1.2-2.4	**50-79%**	**9**	15	15	15
		≥ 2.5	**≥ 80%**	**20**	51	51	51
Eastside Mixed Conifer	≥ 10 Inches dbh	0	**0**	**15**	10	10	10
		0.1-6.6	**0-29%**	**15**	13	19	13
		6.7-12.5	**30-49%**	**20**	6	6	7
		12.6-25.2	**50-79%**	**30**	33	33	34
		≥ 25.3	**≥ 80%**	**20**	37	31	35
	≥ 20 Inches dbh	0	**0**	**31**	16	16	16
		0.1-2.6	**0-29%**	**0**	33	33	33
		2.7-4.2	**30-49%**	**19**	11	18	11
		4.3-8.5	**50-79%**	**30**	17	16	17
		≥ 8.6	**≥ 80%**	**20**	22	17	22

[1]DecAID (Mellen et al. 2006) PPDF_S. Table inv-3a & 4a and EMC_ECB_S, Table inv-3a & 4a.
[2] DecAID (Mellen et al. 2006), Figure PPDF_S.inv-22 & inv-23 and Figure EMC_ECB_S. inv-22 &23

Species
The changes in snag habitat in the ponderosa pine/Douglas fire type and the Eastside mixed conifer types have changed habitat for selected primary cavity excavators. Table 3-90 compares the cumulative effect on selected primary cavity excavators in the Tucannon-Asotin analysis area (including the School fire area).

For Lewis's woodpecker habitat ≥ 10 inches, total habitat, ≥ 30 percent tolerance interval, occurs on 29,252 acres with 15,092 acres in the ≥ 50 percent interval (Table 3-90). The cumulative effect on Lewis's woodpecker habitat (>10") would result in a moderate level of assurance, habitat would be available in the Tucannon-Asotin analysis area. This is based on the amount of available habitat (9,325 ac.), ≥ 50 percent tolerance intervals, in the School fire area and very little habitat, ≥ 50 percent interval, distributed elsewhere in the Tucannon-Asotin analysis area. With habitat at a moderate assurance level, the population of Lewis's woodpeckers is expected to be maintained at the current level and increase in the School fire area, within the next 5 years, as habitat conditions become more plentiful. Alternative A, would have a moderate-high level of assurance because total habitat in the School fire area is not affected by harvest activities and very little habitat, ≥ 50 percent interval, is distributed across the Tucannon-Asotin analysis area. When compared to Alternative A, Alternative B would have a greater amount of total habitat affected and a lower level of assurance Lewis's woodpecker habitat would be available in Tucannon-Asotin analysis area.

In Lewis's woodpecker habitat ≥ 20 inches, total habitat, ≥ 30 percent tolerance interval, occurs on 81,170 acres with 21,642 acres ≥ 50 percent interval (Table 3-90). Therefore, the cumulative effect on Lewis's woodpecker habitat (>20")would result in a low-moderate level of assurance habitat would be available in the Tucannon-Asotin analysis area, because the majority of habitat (71,872 ac.) occurs in the ≤ 49 percent tolerance intervals and remaining habitat, ≥ 50 percent interval, is somewhat distributed in the Tucannon-Asotin analysis area. With habitat at a low-moderate assurance level, the population of Lewis's woodpeckers is expected to be maintained at the current level with a potential increase, in the School fire area, within the next 5 years, as habitat conditions become more plentiful. Alternative A, would have a moderate level of assurance because total habitat in the School fire area is not affected by harvest activities and habitat, ≥ 50 percent interval, is somewhat distributed across the Tucannon-Asotin analysis area. When compared to Alternative A, Alternative B would have a greater amount of total habitat affected and a lower level of assurance Lewis's woodpecker habitat would be available in Tucannon-Asotin analysis area.

For white-headed woodpecker, total habitat, ≥ 30 percent tolerance interval, occurs on 38,249 acres with 9,612 acres ≥ 50 percent interval (Table 3-90). The cumulative effect on white-headed woodpecker habitat results in a low-moderate level of assurance habitat would be available in the Tucannon-Asotin analysis area. This is based on the majority of habitat in the School fire area (63 percent) and the Tucannon-Asotin area (90 percent) occurs in the ≤ 49 percent tolerance interval, with little habitat in the ≥ 50 percent interval, and habitat is somewhat distributed in the Tucannon-Asotin analysis area. With habitat at a low-moderate assurance level, the population of white-headed woodpeckers is expected to be maintained at the current level in the Tucannon-Asotin analysis area. Alternative A, would have a moderate level of assurance because the majority of habitat in the Tucannon-Asotin analysis area occurs in the ≤ 49 percent tolerance interval, and total habitat is not affected by harvest activities in the School fire area, resulting in 70 percent of the area in the ≥ 50 percent tolerance interval. In addition, habitat is somewhat distributed across the Tucannon-Asotin analysis area. When compared to Alternative A, Alternative B would have a greater amount of total habitat affected and a lower level of assurance white-headed woodpecker habitat would be available in Tucannon-Asotin analysis area.

In three-toed woodpecker habitat, total habitat, ≥ 30 percent tolerance interval, occurs on 39,662 acres with 21,832 acres ≥ 50 percent interval (Table 3-90). Therefore, the cumulative effect on three-toed woodpecker habitat would result in a moderate level of assurance habitat would be available in the Tucannon-Asotin analysis area, because of the large amount of total habitat in the School fire area and the wide distribution of total habitat across the Tucannon-Asotin analysis area. With habitat at a moderate assurance level, the population of three-toed woodpeckers is expected to be maintained at the current level with increases in the School fire area, within the next 5 years, as available habitat (>10") becomes more desirable. Alternative A, would have a moderate level of assurance, because total habitat in the School fire area is not affected by harvest resulting in a large amount of available habitat in the ≥ 50 percent interval and the wide distribution of total habitat across the Tucannon-Asotin analysis area. When compared to Alternative A, Alternative B would have a greater amount of total habitat affected and a lower level of assurance three-toed woodpecker habitat would be available in Tucannon-Asotin analysis area.

For black-backed woodpecker, total habitat, ≥ 30 percent tolerance interval, occurs on 9,003 acres with 5,710 acres ≥ 50 percent interval (Table 3-90). Therefore, the cumulative effect on black-backed woodpecker habitat would result in a low level of assurance habitat would be available in the Tucannon-Asotin analysis area, because of the small amount of habitat (5,710 ac.), ≥ 50 percent tolerance interval, in the Tucannon-Asotin area, with over 90 percent of the habitat in the School fire portion of the analysis area. The black-backed woodpecker is highly associates with post-fire environments and breeding densities are much greater in burned rather than unburned forests (Dixon and Saab 2000). With habitat at a low assurance level, the population of black-backed woodpeckers is expected to be maintained at the current level. A slight increase in numbers could occur, within the next 5 years, in unharvested areas of the School fire analysis area. Alternative A, would have a moderate level of assurance, because total habitat in the School fire area is not affected by harvest resulting in a large amount of available habitat (9,927 ac.) in the ≥ 50 percent interval and the limited distribution of total habitat the Tucannon-Asotin analysis area. When compared to Alternative A, Alternative B would have a greater amount of total habitat affected and a lower level of assurance three-toed woodpecker habitat would be available in Tucannon-Asotin analysis area.

Table 3-90 Cumulative Effect Comparison of Selected Primary Cavity Excavator Habitat (Eastside Mixed Conifer and Ponderosa Pine/Douglas-Fir) In The Tucannon-Asotin Analysis Area

Species	Snags	Snags/ Acre[1]	Tolerance Intervals	Alternative A		Alternative B		Alternative C	
				Acres	%	Acres	%	Acres	%
Lewis's woodpecker	≥ 10 Inches dbh	0-24.3	**0-29%**	56,792	61	64,262	69	59,685	64
		24.4-39.5	**30-49%**	14,585	16	14,160	15	14,985	16
		39.6-62.8	**50-79%**	7,881	8	6,915	7	7,592	8
		≥ 62.9	**≥ 80%**	14,227	15	8,177	9	11,227	12
Lewis's woodpecker	≥ 20 Inches dbh	0	**0-29%**	12,332	13	12,344	13	12,344	13
		0.1-6.1	**30-49%**	54,261	58	59,528	64	56,253	58
		6.2-16.0	**50-79%**	20,669	22	17,931	19	20,673	22
		≥ 16.1	**≥ 80%**	6,219	7	3,711	4	6,218	7
White-headed woodpecker	≥ 10 Inches dbh	0-18.5	**0-29%**	47,501	51	55,264	59	50,318	54
		18.6-51.9	**30-49%**	29,758	32	28,637	31	30,027	32
		52.0-98.6	**50-79%**	8,335	9	4,921	5	7,100	8
		≥ 98.7	**≥ 80%**	7,889	8	4,691	5	6,045	6
Three-toed woodpecker	≥ 5 Inches dbh	0-44.1	**0-29%**	51,296	55	53,851	58	52,851	57
		44.2-71.4	**30-49%**	17,484	19	17,830	19	17,718	19
		71.5-111.7	**50-79%**	9,780	10	9,971	11	9,793	10
		≥ 111.8	**≥ 80%**	14,923	16	11,861	13	13,127	14
Black-backed woodpecker	≥ 10 Inches dbh	0-57.1	**0-29%**	78,075	84	84,509	90	81,078	87
		57.2-82.3	**30-49%**	5,480	6	3,293	4	4,867	5
		82.4-119.1	**50-79%**	4,967	5	2,902	3	3,599	4
		≥ 119.2	**≥ 80%**	4,960	5	2,808	3	3,944	4

[1] DecAID (Mellen et al. 2006) Tables EMC_PF.sp-23 and PPDF_PF. Sp-23

Alternative C

Direct/Indirect Effects – Alternative C:

Ponderosa Pine/Douglas-fir Habitat

Proposed salvage harvest would reduce snag habitat ≥ 10 inches on approximately 4,200 acres in School Fire Salvage Recovery project area. For snags ≥ 10 inches in the Ponderosa pine/Douglas-fir (dry upland forest) habitat type, Table 3-87 shows densities ≥ 7.2 snags/acre reduced to 87 percent of the landscape when compared to 98 percent for Alternative A, but retains 27 percent more area than Alternative B (60 percent). Densities between 2.7-7.1 snags/acre increase to 4 percent of the landscape, this is the result of retaining 3 snags/acre ≥ 21 inches in harvest units. However, this increase in area is not as great as the increase in Alternative B (37 percent). Tolerance intervals between zero (0) and 49 percent increased 2 percent when compared to Alternatives A and B. For snags ≥ 20 inches, densities across the landscape remain the same for all Alternatives, because snag retention in harvest units is greater than 2.5 snags/acre.

Eastside Mixed Conifer Habitat

For the Eastside mixed conifer type (moist upland forest) with snag ≥ 10 inches, Table 3-87 shows salvage harvest reducing snag densities to 61 percent of the School Fire Salvage Recovery project area for ≥ 25.3 snags/acre, when compared to 74 percent for Alternative A, but retains about 25 percent more area than Alternative B (36 percent). In addition, densities in the 12.6-25.2 snags/acre class increased to 10 percent of the landscape. That is 4 percent more area when compared to Alternative A (6 percent) and 6 percent more area than Alternative B (4 percent). A 2 percent increase in area for Alternative C occurs in the 6.7-12.5 sang/acre interval, when compared to Alternatives A and B. As expected, the density class 0.1-6.6 snags/acre increases to 22 percent of School Fire Salvage Recovery project area, resulting from prescribed snag retention, all snags ≥ 21 inches. However, this increase in area is not as great as Alternative B (59 percent), because proposed harvest occurs on less area in Alternative C than for Alternative B. Snag densities in the zero (0) percent tolerance interval remains unchanged when compared to Alternative A and B. For snags ≥ 20 inches, Alternative C is very similar to Alternative A, except for a very slight increase in the 4.3-8.5 snags/acre interval. Alternative A has the greatest reduction in area for the 4.3-8.5 and >8.6 tolerance intervals. A resultant increase (36%) occurs in the 2.7-4.2 snags/acre density interval, when compared to Alternative A and C. Snag densities remain unchanged for snags < 2.7 snags/acre for all alternatives.

Species

Changes in snag densities would also change habitat for selected primary cavity excavators in the School fire analysis area. For Lewis's woodpecker habitat ≥ 10 inches, Table 3-88 shows salvage harvest reduces habitat in the ≥ 80 percent tolerance interval to 49 percent (9,999 ac.) and 15 percent (2,376 ac.) in the 50-79 percent interval. A resultant increase in habitat occurs in tolerance intervals ≤ 49 percent, with 30 percent (6,328 ac.) of the area occurring in the 0-29 percent interval. Total habitat, ≥ 30 percent tolerance interval, occurs on 70 percent (14,265 ac.) of the area, with 64 percent (13,052 ac.), in the ≥ 50 percent interval (Table 3-88). Because total habitat occurs on a large portion (70 percent) of the area and nearly half (49 percent) of the habitat occurs in the ≥ 80 percent tolerance interval, there would be a high level of assurance; Lewis's woodpecker habitat would be available in the School fire area after proposed activities. Compared to Alternative B, total habitat is least affected in Alternative C and has a higher level of assurance Lewis's woodpecker habitat would be available in the School fire area. Alternative A would have the same level of assurance as Alternative C. Overall, Alternative B would have the lowest level of assurance Lewis's woodpecker habitat would be available in the School fire area, when compared to Alternatives A and C.

In available habitat for Lewis's woodpecker, ≥ 20 inches, the ≥ 80 percent interval is reduced to 29 percent (5,959 ac.). Available habitat remains unchanged in all tolerance intervals ≤ 79 percent, because all snags ≥ 21 inches are retained in harvest units. Total habitat, ≥ 30 percent tolerance interval, occurs on 88 percent (18,055 ac.) of the area, with 59 percent (12,118 ac.), in the ≥ 50 percent interval (Table 3-88). Because total habitat occurs on a large area (88 percent) and the majority of habitat (59%) occurs in the ≥ 50 percent tolerance interval, there would be a moderate level of assurance Lewis's woodpecker habitat would be available in the School fire area after harvest activities. Compared to Alternative B, total habitat is least affected in Alternative C and has a higher level of assurance Lewis's woodpecker habitat would be available in the School fire area. Alternative A would have the same level of assurance as Alternative C. Overall, Alternative B would have the lowest level of assurance Lewis's woodpecker habitat would be available in the School fire area, when compared to Alternatives A and C.

Activities occurring in white-headed woodpecker habitat reduced the ≥ 80 percent tolerance interval to 28 percent (5,696 ac.) and 27 percent (5,500 ac.) in the 50-79 percent interval. A resultant increase in habitat occurs in tolerance intervals ≤ 49 percent, with 27 percent (5,539 ac.) of the area occurring in the 0-29 percent interval. Total habitat, ≥ 30 percent tolerance interval, occurs on 73 percent (13,965 ac.) of the area, with 55 percent (11,196 ac.), in the ≥ 50 percent interval (Table 3-88). Stand replacement burned areas are not considered optimal habitat for the white-headed woodpecker, however they have been found nesting and foraging in burned areas (Saab and Dudley 1998, and Haggard and Gaines 2001). Mixed mortality and underburned areas would provide source habitat in the burn area. Because total habitat occurs on most of the area (73 percent), with the majority (55%) in the ≥ 50 percent tolerance interval, and habitat use occurring in mixed mortality areas, there would be a moderate level of assurance white-headed woodpecker habitat would be available in the School fire area after proposed treatments. Compared to Alternative B, total habitat is least affected in Alternative C and has a higher level of assurance white-headed woodpecker habitat would be available in the School fire area. Because total habitat is not affected by harvest in Alternative A, Alternative C would have a greater amount of habitat affected in the ≥ 50 percent tolerance interval and a lower level of assurance, when compared to Alternative A. Overall, Alternative B would have the lowest level of assurance white-headed woodpecker habitat would be available in the School fire area, when compared to Alternatives A and C.

Proposed activities occurring in three-toed woodpecker habitat, reduces habitat in the ≥ 80 percent tolerance interval to 58 percent (11,857 ac.) of the landscape. Increases in habitat occur in tolerance intervals ≤ 49 percent, because non-merchantable snags (< 10 inches) and all snags ≥ 21 inches are retained in harvest units. Total habitat, ≥ 30 percent tolerance interval, occurs on 77 percent (15,878 ac.) of the area, with 68 percent (13,940 ac.), in the ≥ 50 percent interval (Table 3-88). Because total habitat occurs over such a large area (77 percent) and the majority of habitat (58 percent) occurs in ≥ 80 percent tolerance interval, there would be a high level of assurance three-toed woodpecker habitat would be available in the School fire area after treatments. Compared to Alternative B, total habitat is least affected in Alternative C and has a higher level of assurance three-toed woodpecker habitat would be available in the School fire area. Alternative A would have the same level of assurance as Alternative C. Overall, Alternative B would have the lowest level of assurance that three-toed woodpecker habitat would be available in the School fire area, when compared to Alternatives A and C.

Salvage harvest in available black-backed woodpecker habitat is reduced to 19 percent (3,834 ac.) in the ≥ 80 percent tolerance interval, 16 percent (3,182 ac.) in the 50-79 percent interval, and 19 percent (3,898 ac.) for the 30-49 percent interval. Total habitat, ≥ 30 percent tolerance interval, occurs on 54 percent (10,914 ac.) of the area, with 35 percent (7,016 ac.), in the ≥ 50 percent interval (Table 3-88). Because total habitat occurs on more than half the area (54 percent) and the majority of total habitat occurs in the ≥ 50 percent tolerance interval, there would be a moderate-low level of assurance black-backed woodpecker habitat would be available in the School fire area proposed harvest activities. Compared to Alternative B, total habitat is least affected in Alternative C and has a higher level of assurance black-backed woodpecker habitat would be available in the School fire area. Because total habitat is not affected by harvest in Alternative A, Alternative C would have a greater amount of habitat affected in the ≥ 50 percent tolerance interval and a lower level of assurance, when compared to Alternative A. Overall, Alternative B would have the lowest level of assurance black-backed woodpecker habitat would be available in the School fire area, when compared to Alternatives A and C.

Cumulative Effects – Alternative C:

Past, present and foreseeable future actions in the analysis area have resulted in changes in snag ≥ 10 inches, for the Eastside mixed conifer type. Table 3-89 compares the cumulative effects of snag density distribution in the Tucannon-Asotin analysis area. Overall, snag densities would meet or exceed Forest Plan standards, because over 95 percent of the forest area in the Tucannon-Asotin analysis area is not proposed for harvest and snag densities in unharvested stands in the School fire are above 2.5 snags/acre. In addition, harvested stands/units would retain all snags, > 21 inches; this is well above the Forest Plan standard for dry and moist forest types.

Eastside Mixed Conifer Habitat

In the Eastside mixed conifer type, ≥ 10 inches, the snag density distribution classes ≥50 percent tolerance intervals are generally 4-15 percent above the reference condition in DecAID, and densities ≤ 49 percent intervals are 2-13 percent below reference conditions. Even with some snag density classes below reference conditions, they would eventually meet conditions over time, as snags decay and fall and then move into lower-density snag distribution classes as demonstrated in Table DW5. Therefore, the cumulative effect of past, present and foreseeable future actions maintain snag density distributions above the reference conditions for the ≥ 50 tolerance intervals and below for ≤ 49 percent tolerance intervals.

For snags >20 inches in the moist forest type, the snag density in the zero (0) and ≥ 30 percent intervals are 8-15 percent below the reference conditions in DecAID and densities in the 0-29 and ≥ 80 percent interval are 33 percent and 2 percent, respectively, above the reference condition. The area in the 30-79 percent tolerance interval, below reference conditions, would decrease as snags decay and fall overtime. Therefore, the cumulative effect of past, present and foreseeable future actions, maintain snag density distribution below the reference condition for the 30-79 percent tolerance intervals and maintains or increases the area in the zero (0) and 0-29 percent tolerance intervals.

Species

Table 3-90 compares the cumulative effect on selected primary cavity excavators in the Tucannon-Asotin analysis area (including the School fire area). For Lewis's woodpecker habitat ≥ 10 inches, total habitat, ≥ 30 percent tolerance interval, occurs on 33,004 acres with 18,019 acres in the ≥ 50 percent interval (Table 3-90). The cumulative effect on Lewis's woodpecker habitat (>10") would result in a moderate-high level of assurance, habitat would be available in the Tucannon-Asotin analysis area. This is based on the large amount of habitat, ≥ 50 percent tolerance intervals, in both analysis areas and the limited amount of this habitat distributed throughout the Tucannon-Asotin analysis area. With habitat at a moderate-high assurance level, the population of Lewis's woodpeckers is expected to be maintained at the current level and increase in the School fire area, within the next 5 years, as habitat conditions become more plentiful. Compared to Alternative B, total habitat is affected less in Alternative C and has a higher level of assurance habitat would be available in the Tucannon-Asotin analysis area. Alternative A would have the same level of assurance as Alternative C. Overall, Alternative B would have the lowest level of assurance Lewis's woodpecker habitat would be available in the Tucannon-Asotin analysis area.

In Lewis's woodpecker habitat ≥ 20 inches, total habitat, ≥ 30 percent tolerance interval, occurs on 83,144 acres with 26,891 acres ≥ 50 percent interval (Table 3-90). Therefore, the cumulative effect on

Lewis's woodpecker habitat (>20")would result in a moderate level of assurance habitat would be available in the Tucannon-Asotin analysis area, because harvest units retain all snags ≥ 21 inches, resulting in more desirable habitat (>20") for Lewis's woodpecker and habitat in the ≥ 50 percent interval is somewhat distributed across the Tucannon-Asotin analysis area. With habitat at a moderate assurance level, the population of Lewis's woodpeckers is expected to be maintained at the current level with a potential increase, in the School fire area, within the next 5 years, as habitat conditions become more plentiful. Compared to Alternative B, total habitat is affected less in Alternative C and has a higher level of assurance habitat would be available in the Tucannon-Asotin analysis area. Alternative A would have the same level of assurance as Alternative C. Overall, Alternative B would have the lowest level of assurance Lewis's woodpecker habitat would be available in the Tucannon-Asotin analysis area.

For white-headed woodpecker, total habitat, ≥ 30 percent tolerance interval, occurs on 43,172 acres with 13,145 acres ≥ 50 percent interval (Table 3-90). The cumulative effect on white-headed woodpecker habitat results in a moderate level of assurance habitat would be available in the Tucannon-Asotin analysis area. This is based on harvest units retaining all snags ≥ 21 inches, resulting in a large amount of habitat (55 percent), in the > 50 percent tolerance interval, for the School fire area and available habitat is somewhat distributed across the Tucannon-Asotin analysis area. With habitat at a moderate assurance level, the population of white-headed woodpeckers is expected to be maintained at the current level in the Tucannon-Asotin analysis area. Compared to Alternative B, total habitat is affected less in Alternative C and has a higher level of assurance habitat would be available in the Tucannon-Asotin analysis area. Alternative A would have the same level of assurance as Alternative C. Overall, Alternative B would have the lowest level of assurance white-headed woodpecker habitat would be available in the Tucannon-Asotin analysis area.

In three-toed woodpecker habitat, total habitat, ≥ 30 percent tolerance interval, occurs on 40,638 acres with 22,920 acres ≥ 50 percent interval (Table 3-90). Therefore, the cumulative effect on three-toed woodpecker habitat would result in a moderate level of assurance habitat would be available in the Tucannon-Asotin analysis area, because of the large amount of total habitat in the School fire area and the wide distribution of total habitat across the Tucannon-Asotin analysis area. With habitat at a moderate assurance level, the population of three-toed woodpeckers is expected to be maintained at the current level with increases in the School fire area, within the next 5 years, as habitat conditions becomes more desirable. Overall, Alternatives A, B, and C have the same level of assurance three-toed woodpecker habitat would be available in the Tucannon-Asotin analysis area.

For black-backed woodpecker, total habitat, ≥ 30 percent tolerance interval, occurs on 12,410 acres with 7,543 acres ≥ 50 percent interval (Table 3-90). Therefore, the cumulative effect on black-backed woodpecker habitat would result in a low-moderate level of assurance habitat would be available in the Tucannon-Asotin analysis area, because of the moderate amount of habitat in the ≥ 50 percent tolerance interval, for the Tucannon-Asotin area, with over 90 percent of the habitat in the School fire portion of the analysis area. With habitat at a low-moderate assurance level, the population of black-backed woodpeckers is expected to be maintained at the current level. A slight increase in numbers could occur, within the next 5 years, in unharvested areas of the School fire analysis area. Compared to Alternative B, total habitat is affected less in Alternative C and has a higher level of assurance habitat would be available in the Tucannon-Asotin analysis area. Alternative A would have a higher level of assurance than Alternative C. Overall, Alternative B would have the lowest level of assurance black-backed woodpecker habitat would be available in the Tucannon-Asotin analysis area.

Finding of Consistency:

All alternatives would be consistent with Forest Plan standards and guidelines, because they would meet design criteria set for the project, meet standards and guidelines for affected land management allocations, and provide for viable populations of wildlife species. All alternatives would provide for the diversity of plant and animal communities in the project area, based on the suitability and capability of the project area.

Umatilla National Forest Plan Amendment #11 established interim riparian, ecosystem, and wildlife standards for timber sales (the Eastside Screens) (USDA 1995). The Interim Wildlife Standard (wildlife screen) restricts the harvest of timber in stands classified as late or old structure (LOS), if the amount of LOS in the area is below the historic range. Since this standard applies to live trees, which would not be harvested, all of the alternatives would comply with the wildlife screen. Additional information regarding the Interim Wildlife Standard can be found in Appendix C of this document.

This project would not reduce population viability for any Management Indicator Species. There would be no measurable difference between the No Action and the action alternatives for the population of Rocky Mountain elk. American marten and pileated woodpecker are not expected to inhabit the affected area.

Dead wood levels would be retained in excess of snag and down wood levels identified in the Forest Plan, as amended with the Interim Wildlife Standard (Eastside Screens). The best available science was used to determine effects to snag and down wood dependent species (Mellen 2006). All alternatives would provide adequate habitat for primary cavity excavator species that are expected to occur. A low level of assurance that habitat would be available for black-backed woodpeckers indicates that the population would be maintained at the current level.

Based upon the available information and the evaluation of the direct, indirect, and cumulative effects, and interrelated and interdependent actions, it has been determined that the implementation of the proposed project activities “may affect, but will not likely to adversely affect” the northern bald eagle and the Canada lynx, and will have no effect on the gray wolf. All action alternatives would be consistent with the Bald Eagle Recovery Plan (USDI 1986). All Alternatives would be consistent with recovery regulations for gray wolf because no denning areas or rendezvous sites would be disturbed. All Alternatives would be consistent with standards and guidelines outlined in the “Lynx Conservation Assessment and Strategy” (Ruediger et al. 2000), which is considered the most credible and applicable science concerning ecology and management of lynx and lynx habitat in the contiguous United States.

All alternatives are consistent with the 1918 Migratory Bird Treaty Act (MBTA) and the Migratory Bird Executive Order 13186. The Conservation Strategy for Landbirds (Altman 2000) and the U.S. Fish and Wildlife Service’s Birds of Conservation Concern (USDI 2002) were reviewed for effects disclosures. Design criteria such as retention of adequate snags and down logs, retention of live trees, and avoidance of riparian areas proposed in this project would minimize take of migratory birds and meet the intent of current management direction.

HERITAGE RESOURCES

SCALE OF ANALYSIS

The scale of analysis for heritage resources within the scope of this project is within the School Fire perimeter on National Forest lands, approximately 28,000 acres. This area has been used for planning a survey strategy to identify, delineate, and as time allows, evaluate historic properties.

Heritage resources include historic and archaeological sites and resources used by humans in the past, historic and pre-historic. These resources are fragile and non-renewable and chronicle the history of people using the forested environment. These resources include *historic properties* defined in 36CFR800.16(1)(1) as "… any prehistoric or historic district, site, building, structure, or object included in or eligible for inclusion in the National Register of Historic Places (NRHP). The term includes artifacts, records, and remains that are related to and located within such properties" as well as, "… properties of traditional religious and cultural importance to an Indian tribe…" Heritage resources may also include cultural uses of the natural environment (such as subsistence use gathering) and traditional cultural properties; localities considered significant due to the role they pay in a community's historically rooted beliefs, customs, and practices.

AFFECTED ENVIRONMENT

Previous Inventories

There have been 107 heritage resource projects conducted within the current project area. Forty-seven of these projects have been heritage resource inventories. The remaining include 56 non-inventory heritage projects that include literature/file searches, two data recovery projects, one eligibility determination and one rehabilitation plan. As a result of the inventories, the entire project area has been surveyed. The previous surveys varied in size from thousands of acres to less than one acre. Most were conducted and documented sufficiently to be used as adequate survey, but ground conditions have changed significantly resulting from School Fire (2005). These surveys are no longer considered adequate because of the substantial change in surface visibility. Consequently, a new survey is required before project implementation.

Current Inventory

The current survey, which began October 26, 2005, is ongoing. This survey will cover high probability areas (approximately 7,000 acres) and a sample of low probability areas. These probability areas, as well as survey design and methodology, are defined in the Umatilla National Forest Inventory Plan (Fulgham 1989).

Known Resources

Through past surveys, 23 heritage sites have been located and recorded. Sites are defined as having 10 or more artifacts or the presence of features such as a structure, fire pit remains, rock art, etc. Of the sites, 13 are historic, 7 are prehistoric, and 3 have both a historic and prehistoric component. Site types represent nearly the full range of sites on the district, and include lithic scatters and possible rock cairns. Historic era sites represent early public and Forest Service administrative use. A guard station, campgrounds, remnants of sawmills, mines, and grazing activities are examples of historic types present in the project area. One site, the historic Tucannon Guard Station, has been evaluated and determined eligible for inclusion on the NRHP, the remaining sites have not been evaluated for National Register eligibility. Unevaluated sites are protected and treated as eligible until they are formally evaluated for significance.

There are numerous species of plants that are considered culturally significant within the project area, including camas, biscuitroot, and Indian carrot. However, no specific population of tribal use plants is known in the project area. The project area is within ceded and traditional-use lands of The Confederated Tribes of the Umatilla Indian Reservation as well as the Nez Perce Tribe and ethnographic and other information attests to the use and importance of this area to both tribes. Government to government consultation with the tribes has been occurring with the tribes early on in the process in the format of scoping letters and meetings.

ENVIRONMENTAL CONSEQUENCES

Alternative A – No Action

If the no action alternative is chosen, there would be no change in current management direction or in the level of ongoing management activities. There would be no direct effects on cultural resources that would change the integrity of eligible or potentially eligible sites.

Effects Common to Action Alternatives (B and C)

Activities associated with this project including, but not limited to, commercial salvage log removal, establishment of temporary roads, landing site activities, pile burning, etc., have the potential to effect heritage resources. Updated information from the ongoing survey including new site or previously recorded site information, would be incorporated into project design. Any treatment associated with this project would avoid sites or would be mitigated to protect eligible or unevaluated historic properties from direct or indirect impacts.

RANGE

SCALE OF ANALYSIS

Scale of analysis will be the Pomeroy Cattle and Horse (C&H) Allotment and School Fire Salvage Recovery project area. Effects will be evaluated using forage response and permittee access and livestock distribution.

AFFECTED ENVIRONMENT

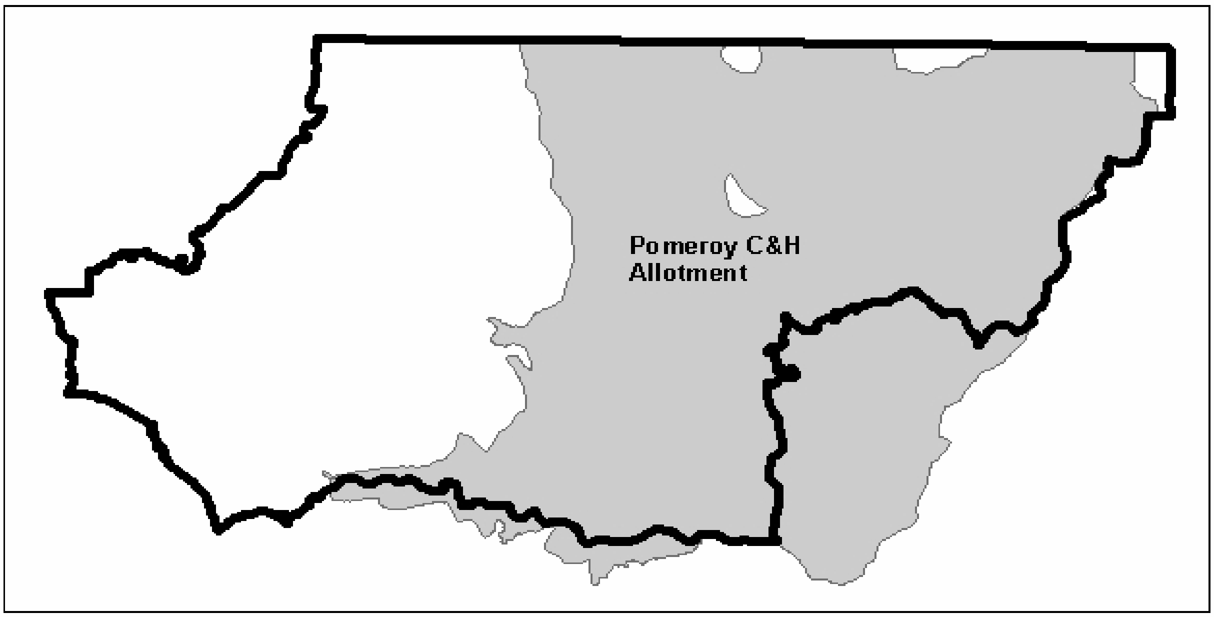
There is one grazing allotment, Pomeroy, permitted for approximately 444 AUMs (Animal Unit Months) within the School Fire perimeter. The allotment is a cattle (cow/calf) permit for a total of 83 pairs and an annual grazing season of June 10th to October 10th. There is one permit holder. There are approximately 20 miles of fence, 22 stock ponds, 14 water developments, two corrals and 8 wildlife guzzlers within the fire perimeter. At this time, extent of damage on all of these improvements has not been determined.

Pomeroy allotment is divided into three pastures; Abels, Lower Pataha and Upper Pataha. The following table lists the acreage for each pasture. These acres are divided into two categories, actual grazed acres and total pasture acres. The difference in acreage amount within Abels pasture is due to the steep slopes and inaccessibility. Acreage difference in Lower Pataha is because a fence placed in 1993 along Pataha Creek eliminated 2,096 acres of creek access to cattle.

Table 3-91 Pasture Acreages (Pomeroy Allotment)

Pasture	Actual Grazed Acres	Total Pasture Acres
Abels	2,349	7,054
Lower Pataha	3,036	5,132
Upper Pataha	9,039	9,039

Figure 3-9 (Map) Pomeroy C & H Allotment
Within School Fire Salvage Recovery Project Area



Condition and Trend transects (C&T) range analysis surveys have been completed in 1960, 1994, and 2003 within the School Fire boundary. Results of these surveys are documented in the project file. Transect results show the area to be in good vegetative condition, exhibiting a stable trend and with an excellent soil condition rating. The Forest Botanist and range manager will continue to observe and monitoring C&T sites and establish additional sites.

Historically all three pastures have met monitoring requirements; including Forest Plan standards and guidelines, Interagency Implementation Team (IIT) standards, PACFISH requirements, and terms and conditions in National Marine Fisheries Service (NMFS) Biological Opinion for the Tucannon Watershed Assessment of on going activities. Results of these monitoring activities can be examined in the project file. Factors contributing to being successful in meeting all monitoring requirements can partially be attributed to monitoring and regulating salting locations and frequent riding by permittees to keep cattle away from areas of concern.

An annual operating plan for Pomeroy Allotment lists terms and conditions stipulated in the Biological Opinion for Tucannon Watershed consultation for on-going activities Biological Assessment. These terms are as follows:

- Permittee will provide riders to check pastures twice weekly.
- Cattle in the riparian will be removed and placed back in the upland portion of the pastures. Cows that repeatedly return to riparian areas will be removed from the pasture.
- Permittee to keep a written record of their inspections and give a copy to the Forest Service at the end of each month.

Over the past 25 years, timber harvest within the Pomeroy Allotment has opened up approximately 5,324 acres of transitory range. Although not all of these acres have been made available as foraging areas, many have provided additional forage to permitted cattle and wildlife. Removal of canopy cover has made more land base available for grass to grow by allowing sunlight to reach the forest floor.

School Fire burned through all, or portions of, the three pastures. Fire severity ranged from high to unburned (see Table 3-92).

Table 3-92 Severity Acreages and Percentages in the Pomeroy Allotment

Pastures	Total Grazed Acres	Acres within Project Area (% of Pasture)	Acres by Burn Severity				
			High	Medium	Low	Unburned (within Fire Perimeter)	Unburned (outside Fire Perimeter)
Abels	2,349	2,349 (100%)	219	704	1,035	391	0
Lower Pataha	3,036	3,015 (99%)	70	855	1,640	450	21
Upper Pataha	9,039	4,625 (51%)	272	1,249	1,726	1,378	4,414
Totals	14,424	9,989 (69%)	561 (4%)	2,808 (19%)	4,401 (31%)	2,219 (15%)	4,435 (31%)

Table 3-92 shows that approximately 69 percent of Pomeroy Allotment was affected by School Fire. Only 561 acres, or 4 percent, of the total pasture acres were severely burned and 11,055 acres, or 77 percent, were either in the low severity or unburned categories. The high severity areas that were within the allotment are primarily in steep, timbered canyons where accessibility for cattle is limited.

Even though only 4 percent of the allotment acres experienced high severity burning, grazing for the 2006 season will be deferred to assure forage and soil recovery. The Forest Botanist, Soils Scientist and District Range Manager will be installing several post fire monitoring plots this summer (2006). There will be two plots with camera points established in each pasture, one in a high and one in a medium intensity burn area. Observations will determine if the first growing season following the fire would give vegetation and soils enough recovery time before allowing additional livestock grazing. Grazing before grasses have enough recovery and re-growth is harmful because native root systems will shrink if pulled up and exposed. Percent of ground cover and vegetation recovery conditions will be monitored utilizing Bluebunch Wheatgrass and Idaho Fescue as primary forage species.

In non-forested areas across the allotment there are three general basic vegetation types as shown in the Table 3-93

Table 3-93 Nonforested Types and Acres

Potential Vegetation Groups (PVG)	Plant Association Group (PAG)	Ecoclass & Common Vegetation Type	Acres
Dry Upland Herbland	Hot Dry	GB41 – Bluebunch Wheatgrass	1,077
Moist Upland Herbland	Warm Moist	GB59 – Idaho Fescue & Bluebunch Wheatgrass	32
Moist Upland Shrubland	Warm Moist	SM1111 – Mallow Ninebark & Common Snowberry	4

Charley Johnson, retired Area Ecologist for the Blue Mountains, states that depending on the composition of grasslands and shrublands it is burn severities and elevation that determine plant species response after fire (Johnson, et al.). His research findings are as follows:

- Bluebunch Wheatgrass with light to moderate burns enhances plant vigor but severe burns have a negative affect on the species.
- Idaho Fescue demonstrated the greatest vulnerability to moderate and severe burns (especially the first year after the fire).
- Severe burns promoted ninebark on cool, moist sites but common snowberry were negatively affected.
- Ground cover was also studied and by the first year following the most severe burn, mosses, liverworts, and pioneering forbs assisted in the rapid rehabilitation of the biotic community. The principal coverage of bare ground immediately following the fires in forested sites was by needle fall from moderately burned trees. On light burns the discontinuous nature of the fire left the ground surface with unburned litter which acted as protection on portions of the sites.

ENVIRONMENTAL CONSEQUENCES

Alternative A – No Action

Direct/Indirect Effects – Alternative A:

Forage Response

This alternative would result in an increase of grass, forb and shrub production and a subsequent increase in available forage in areas directly affected by the fire. The effects of the fire on forest understory and intermingled shrub and grassland communities would vary based on prior species composition and adaptive strategies of individual species (Crane 1983, Agee 1994c). Typically, understory species associated with dry forest plant communities are either tolerant of, or enhanced by, low and moderate intensity fire (Agee 1993). Also, Arno (1999) observed increases in species such as Scouler's willow, pinegrass, elk sedge and Ross' sedge following thinning and burning in dry forest vegetation types. Both rose and snowberry retained their pre-treatment abundance, while species such as bitterbrush and kinniknick showed a slight overall decline in post-treatment abundance. Owens (1982) indicates that the degree of shrub regeneration is directly associated with the amount of overstory mortality resulting from a fire. The intensity of the burn would largely affect the degree to which individual species respond. It is anticipated that the School Fire would function to enhance the understory vegetation relative to plant vigor, productivity, and diversity and consequently result in an increase in forage and browse available for grazing by permitted livestock within the allotment.

With time, the forest understory and nonforest vegetation would develop towards a mature condition. Continued reduction in the intensity and spectral quality of the light below the canopy would suppress understory growth and survival of intolerant species (Freyman 1968, Solomon et al. 1976, McLaughlin 1978, Carleton 1982). Shade tolerant species would out-compete less shade tolerant species. Over time, trees would dominate, resulting in the associated shrubs, herbs and grasses becoming less abundant due to the corresponding increase in canopy cover and associated increased shading (Naumburg and DeWald

1999, Host 1988, McConnell and Smith 1970). Downed fire-killed material (snags and debris) would contribute further to an increase in cover and associated shading. Correspondingly over time, understory productivity (forage production) and diversity would also decline (Camp 1999, Moir 1966).

Permittee Access and Livestock Distribution

The No Action Alternative would have no effect on permittee access and would provide current road access to pastures.

Artificial reforestation would not occur and therefore would have no effect on livestock grazing patterns.

Over time (5-15 years), as snags fall and material accumulates on the ground, implementation of the No Action Alternative would result in disrupting livestock distribution and grazing patterns. Areas that are currently open due to School Fire burning natural barriers will, as a result of no salvage, begin to exhibit downfall accumulations which could restrict access to authorized watering locations or herding access to grazing areas.

Cumulative Effects – Alternative A:

The cumulative effect of School Fire Salvage Recovery Project on Pomeroy C&H Allotment would be minimal. There would be an increase in available grazing vegetation for a period of years because of reduced canopy cover, reduced shading, additional sunlight and growing space. Snags and down material would begin to form the basis of closing in growing space and delivering more shade on open ground resulting in reduced growing space. In addition, over time (5-15 years) because dead stems are not removed or thinned out, accumulations may create barriers that would physically effect grazing patterns and possibly access to previously utilized areas or infrastructure.

Effects Common to Action Alternatives (B and C)

Direct/Indirect Effects – Alternatives B and C:

Forage Response

Both action alternatives propose removing various amounts of dead and dying trees. The direct effects of removing the fire impacted overstory would be: 1) reduction in shade and a corresponding increase in the intensity of direct sunlight reaching the forest understory, and 2) reduction in the amount of debris that would ultimately accumulate on the forest floor, contributing to a further increase in vegetative understory productivity.

It has been well documented that thinning and/or removal of the forest component of dry forest ecosystems results in the stimulation of the associated understory component (Clary and Folliot 1966, Carleton and Maycock 1981, Host 1988, Lieffers and Stadt 1994, Agee 1994c, Riegel et al 1995, Griffith 1996, Ricard and Messier 1996, Naumburg and DeWald 1999). In general, the research indicates that productivity of understory vegetation is inversely related to tree density and directly proportional to the amount of solar radiation that reaches the understory vegetation. Studies also emphasize the importance of plant community structure characteristics such as tree size and spacing in understory productivity (Camp 1999, Naumburg and DeWald 1999, McConnell and Smith 1970). The research indicates that increased productivity is positively correlated with larger trees and wider spacing. The indirect effect of increased plant productivity is an increase in forage and browse that is available for grazing by permitted livestock. Further, forage would be more readily available over a longer time period as salvage harvest would reduce the number of snags that fall and accumulate on the ground over time.

Permittee Access and Livestock Distribution

All action alternatives would have no effect on permittee access to the Pomeroy C&H Allotment. All action alternatives would re-close roads that were or would be opened for the purposes of implementing this project. Many roads currently existing within the allotment (including some closed roads) provide permittee access. While salvage operations are occurring, and if grazing is allowed after only one season of rest, there may be very minor disruptions (60 to 90 minute delays) in accessing authorized grazing areas due to machinery and/or safety reasons.

The effect of proposed reforestation on the grazing allotment is common to all action alternatives. Reforestation under Alternatives B or C would have a minimal effect on livestock distribution for the allotment. Permittee will be made aware of current reforestation efforts through the annual operating plan and as added protection will place salting grounds away from new plantations and will encourage riders to move livestock into adjacent areas.

Mechanical removal of dead and dying trees in areas that sustained moderate to high levels of tree mortality would result in the reduction in the abundance of downed material, which would otherwise present physical barriers to livestock travel and result in poor livestock distribution and forage utilization.

Cumulative Effects – Alternatives B and C:

School Fire burned approximately 7,700 grazed acres of the Pomeroy C&H Allotment. While the fire opened up much of the forest canopy, salvage harvest would maintain that open characteristic (by removing dead and dying trees) over time. Since 2,219 acres of the allotment was unburned and 4,401 acres were considered low severity (Table 3-92), most grass, forbs and brush species may recover within the first summer grazing season.

Therefore, the cumulative effect of any proposed salvage harvest on Pomeroy C&H Allotment would be an increase in forage and browse available for grazing by permitted livestock over a much longer time than No Action.

Finding of Consistency:

Alternative A would be consistent with Forest Plan objectives to manage the range resource to maintain and improve vegetative conditions compatible with protecting and maintaining use of the Pomeroy C&H Allotment. Over time, this trend would reverse itself as dead and dying trees would not be removed and current areas that are grazed would eventually be covered with downed material and become unavailable.

All action alternatives would be consistent with Forest Plan objectives to manage grazing resources to maintain and improve vegetative conditions compatible with protecting and maintaining use of the Pomeroy C&H Allotment.

VISUAL RESOURCE (SCENERY)

SCALE OF ANALYSIS

The School Fire analysis area including approximately 28,000 acres is analyzed in the context of the surrounding landscape. This analysis will make evaluations based on the following criteria:

- Amount of changes seen on the landscape due to action or in action in terms of shape, size and arrangement of harvest units, harvest method, location of unit in a given viewshed and from fixed viewpoints.
- Amount of alteration to conditions and/or that would cause potential risk to scenic attributes in the future.

Specific direction by management area is listed in the Forest Plan. A3- Viewshed 1 management area is specific to Tucannon River Road #4712. A4-Viewshed 2 management area is specific to the Pomeroy-Grouse Flat Road #40. Visual quality objectives are mapped according to Agriculture Handbook 462, National Forest Landscape Management, Vol. 2 Chapter 1, The Visual Management System (USDA Forest Service 1974).

Table 3-94 Visual Quality Objectives for Specific Management Areas

Management Area	Foreground	Middleground	Background
A1- Non-Motorized Dispersed Recreation	Retention		
A2 - OHV Recreation	Retention		
A3 - Viewshed 1	Retention	Partial Retention	
A4 - Viewshed 2	Partial Retention	Modification	

The Forest Plan also states that landscapes (in Viewsheds 1 and 2) that are in condition of catastrophic occurrence such as blow down, insect and disease attacks, wildfire, and others, shall be rehabilitated (Forest Plan p. 4-101). Catastrophic occurrences are considered as those that cause conditions that are outside the historical range of variability. In this case, School Fire burned with greater severity than would have occurred had the species composition, stocking levels and fuel loads been within HRV. Rehabilitation is defined in VMS as “a short term management alternative used to return existing visual impacts in the natural landscape to a desired visual quality.” The Forest Plan does not require that pre-fire objectives of created openings and maximum percent of area treated be met in the event of catastrophic circumstances.

For purposes of this analysis, Visual Quality Objectives will be used to determine whether the alternatives meet the Forest Plan standards and guides by determining the degree of alterations compared to the existing landscape. Scenic Integrity Objective (SIO) definitions are included to understand the subtle differences between Visual Quality Objectives and Scenic Integrity Objective. Visual quality objectives are established for the project area in the Umatilla Forest Plan.

The objectives provide parameters that guide project design in a manner that maintains a specified degree of visual disturbance in specific areas. The visual quality objectives that are found in the project area are as follows:

- Retention VQO
  This visual quality objective provides for management activities which are not visually evident. Under retention activities may only repeat form, line, color, and texture which are frequently found in the characteristic landscape. Changes in their qualities of size, amount, intensity, direction, pattern, etc. should not be evident.

    - High SIO
      The valued scenic attributes of landscape character "appear" intact and unaltered. Visual disturbances are present, but they repeat valued form, line, color, texture, and

pattern so completely and at such scale that they remain unnoticed. This level should be achieved as soon after project completion as possible, or within 3 years maximum.

- Partial Retention VQO
  Management activities remain visually subordinate to the characteristic landscape when managed according to the partial retention visual quality objective.
  Activities may also introduce form, line, color, or texture which are found infrequently or not at all in the characteristic landscape, but they should remain subordinate to the visual strength of the characteristic landscape.

  - Moderate SIO
    The valued attributes of landscape character "appear slightly altered." Noticeable disturbances remain minor and visually subordinate. This level should be achieved as soon after project completion as possible, or within 3 years maximum.

- Modification VQO
  Under the modification visual quality objective management activities may visually dominate the original characteristic landscape. However, activities of vegetative and land form alteration must borrow from naturally established form, line, color, or texture so completely and at such a scale that its visual characteristics are those of natural occurrences within the surrounding area or character type. Additional parts of these activities such as structures, roads, slash, root wads, etc., must remain visually subordinate to propose composition.

  - Low SIO
    The valued attributes of landscape character "appear moderately altered." Disturbances dominate the scenery, and may create a focal point of moderate contrast. Disturbance may reflect, introduce or “borrow” valued attributes from outside the landscape being viewed (such as the size, shape, edge effect and pattern of natural openings, vegetative type changes or architectural styles). Valued attributes borrowed from outside the viewed landscape should appear compatible with or complimentary to those within. This level should be achieved as soon after project completion as possible, or within 3 years maximum.

The effects analysis will consider how each alternative meets these visual quality objectives.

AFFECTED ENVIRONMENT

Currently, the scenery resources in the project area have been affected by a fire that burned with excessively high severity. HRV analysis for pre-fire vegetation composition shows that cover types of Ponderosa pine and Douglas-fir were significantly outside of the historical range of variability (Appendix E). HRV analysis for tree density shows significantly high tree density in dry upland acres. The scenery has undergone a fire that was outside of the HRV. Approximately 74 percent of the affected environment burned at a high burn severity (tree mortality of 75 percent or more). Areas of high burn severity are in need of rehabilitation.

While mortality on the majority of the northern slopes is almost 100 percent, the riparian zone is still intact. Grassland ridges burned over. This landscape was once a landscape resistant to stand replacement fire, then became overstocked with mixed conifer; and consequently experienced high burn severity.

Views from Tucannon River Road #4712 are currently of blackened forest, and scorched barren soils, rock outcrops and remaining riparian vegetation.

The views from the Pomeroy-Grouse Flat road #40, also known as the Mountain Road, are of the upper reaches of the steep canyons that incise the plateau. Timber stands in those canyons are burnt, but as the viewer travels along the route, the fire effects are seen at intervals of approximately an eighth to quarter mile stretches. Long vistas across the Willow Springs Inventoried Roadless area are primarily of burnt stringers of timber on north slopes and burnt grasses on the ridges.

Figure 3-10 Photo - View into Willow Springs Inventoried Roadless Area from Tucannon River Road

Some viewsheds are impacted by high burn severity while other viewsheds retain similar landscape aesthetic. Some of the dominant valued attributes of the landscape character of this area are currently retained in the view shown above. Patterns of open grass slopes and masses of timber, small stringers of timber still remain. The strong topographic elements of the scene still provide the viewer with resemblance of the view prior to the fire. The color of the scene is what is most affected. Viewing this scenes color of scorched trees and blackened hillside is not just an impact to the sense of color, but also an abrupt experience of a changing landscape. What was once a view of green forest and grass slope is now a view of dead trees and scorched earth. There is not only an understanding of change of the scene, but that of loss. In the view above, this experience is tempered by distance and the live trees and vegetation in the foreground. In the scene below, however there is no visual relief from the stark visual experience of a forest of dead trees. The scene is dominated by blackened trees and scorched earth. The only resemblance of what formerly existed is the form created by the vertical tree trunks and landforms. But even the tree forms are deformed by the loss of needles, only the skeletal frame remains.

The existing scenic condition will continue to change rapidly as trees defoliate, debark and fall to the ground. This landscape will be in transition for the next decade. The scenery during this transition will get worse before it gets better. Much of this landscape will be very stark for the next few years. As grasses and shrubs begin to sprout and grow the impacts will be softened. However, the form and line of this landscape will be dominated by vertical tree trunks until those trees have fallen and new growth fills in around them. The pattern that now remains of grass slopes and masses and stringers of timber will change as trees defoliate and the slope below can be seen under those tree masses. Small groupings or individual trees on the grass slope and draws will provide a texture that is slight and less dominant. The color will change as trees defoliate and debark. Much of the grass slopes will green up during the next growing season, and the blacked tree trunks will turn silver gray during the next several years. As these changes occur the aesthetics will improve. Although different from the past, the views will become a less stark and harsh reminder of the fire.

Figure 3-11 Photo - View from road 4022070 looking north

ENVIRONMENTAL CONSEQUENCES

Alternative A – No Action

Direct /Indirect Effects – Alternative A:

Alternative A proposes no action, therefore, creates no direct effects to existing scenery. However, the fire has caused a number of conditions that will have and will create effects to visual resources in the future. Where the forest was blackened and probable mortality exceeds 85 percent the visual condition is not preferred, and in many areas will not regenerate in a preferable manner due to lack of seed source, or dense thickets that create too much “dead shade." In other areas there are standing and down fuels that preclude regeneration of tree species that create visually preferred open stands with high visual access and clear forest floor. Fuels loads that exist due to the result of the fire also are in many areas; uncharacteristically high, exceeding HRV, which is an additional risk to the stability of scenery resources in the future.

Alternative A does not utilize tree removal or planting and therefore does nothing to move the area toward reestablishing the valued landscape character. This alternative does not take any action to rehabilitate conditions that were created by a stand replacement fire that created effects outside of the historical range of variability, therefore it is expected that the species composition and stand density would not be favorable to scenery resources for many decades.

Alternative A would meet the visual quality objectives throughout the project area because it does not create any unnaturally appearing elements of form, line, color, texture or scale. However the scenic condition that currently exists does not meet high scenic integrity because the fire burned with excessive severity, creating a burn pattern that is visually out of scale.

Cumulative Effects – Alternative A:

This alternative would perpetuate conditions and trends that put scenery attributes at risk, therefore the cumulative effects would degrade scenic stability.

Alternative A does nothing to rehabilitate scenery resources in Viewsheds 1 and 2 designated management areas, and therefore, does not meet Forest Plan standards and guidelines.

Past Actions:

- **Fire Suppression Activities**
  The fire suppression activities have created some short-term effects including 50-foot wide swaths cut through vegetation, and 18-foot wide dozer line of ground disturbance which is expected to be visible from foreground, middleground and background views. Ground disturbance has been recontoured and seeded and effects are expected to be rehabilitated within 3 years. The safety zone swaths would require a longer period of time to recover. The linear element introduced into the landscape would remain until tree height of 20 ft is established.

- **Burned Area Emergency Response (BAER) Activities**
  BAER activities include culvert replacement, native seed application, rolling dips, riparian planting and cleaning of catch basins. Effects to visual resources are negligible.

- **Timber Harvest and Fuels Treatment**
  Past timber harvest activities have created some unnatural appearing openings and uncharacteristic linear features as well as other effects to visual resources. Fuels treatment activities have caused negligible effects to scenery. Effects of these activities have been somewhat softened by the forest fire. Edges and lines created by regeneration harvest and skyline operations have been muted by consumption of adjacent vegetation.

- **Wildfire**
  Effects from past wildfire events are negligible.

- **Grazing – Pomeroy Allotment**
  Grazing operations have caused negligible effects to scenery.

Present Actions:

- **Timber Salvage Harvest (State and Private)**
  State owned lands along Tucannon River Road would be logged in conjunction with NFS lands. These State lands are within the foreground view of the road and all aspects of the logging operations would be very evident to the viewer. It is expected that this logging activity would be the most evident to the viewers in the entire project area. The expected effects are those associated with forward logging systems, stumps and landings. The short term effect would be very evident. It is expected that long term effects would be limited. Regrowth of grasses and forbs would screen some

stumps and as trees grow the views would be rehabilitated. There may be skid trails that remain visible for 10 to 20 years. Viewers would not discern the difference between state and NFS lands and the associated treatments. It is expected that short term effects of logging would be evident.

Salvage operations on private lands adjacent to and within the project areas are expected to cause effects such as skid trails, ground disturbance and stumps to foreground views. Created openings visible from middleground views are not expected to appear unnatural or dominate views.

Reasonably Foreseeable Actions:

- **West Patit Prescribed Fire**
  The West Patit Fire Project is expected to occur in late fall or late winter to early spring. This project would create an additional 1,600 acres affected by fire. The prescribed fire project is expected to create a mosaic pattern of understory mortality and scorching. Visual effects in patches would include blackened trunks, and ground cover, scorched needles along with consumption of existing ground and ladder fuels that would create a more open forest floor appearance that is preferred. It is expected that in some areas there would be overstory mortality where the fire could flare up and burn small pockets (less than 2 acres) of trees.

- **Stevens Ridge ATV Complex Project**
  The Stevens Ridge ATV Complex Project is not expected to cause any visual effects other than minimal signage from foreground views in the immediate area of the project.

- **BAER Activities**
  BAER Activities include reforestation efforts in Willow Springs IRA and is expected to add visual interest and stability in those areas.

- **Other Projects**
  Other projects include culvert removal, reforestation and road decommissioning. These projects are expected to cause no negative effects and some beneficial effects.

Summary of Cumulative Effects - Alternative A:

Cumulative effects to scenery resources in School Fire Salvage Recovery project area are not expected to meet the visual quality objectives of the Forest Plan. In retention or high scenic integrity areas, cumulative deviations would be present, but those deviations would repeat the form, line, color, texture and pattern in such a manner that appears natural. In partial retention areas, there is expected to be noticeable deviations however, they would be subordinate to the natural landscape character.

Scenery resources of this area have been affected tremendously by School Fire, and are in need of rehabilitation. Due to uncharacteristic fuel loads, stand density, and species composition the fire burned excessively hot causing greater mortality than would have occurred had the vegetation and fuels been with HRV.

Effects Common to Action Alternatives (B and C)

Action alternatives propose a number of treatments that cause effects to scenery resources. This section discloses the effects in a general manner unrelated to quantity or viewing distance and/or visibility. Effects caused by action alternatives need to be considered in relation to the existing appearance and desired landscape character.

Effects to existing appearance - "In general, natural forest disturbances that result in extensive areas of dead or dying trees (Haider and Hunt 2002, Ribe 1990,) such as the destruction of the forest by fire or flooding are perceived negatively (Daniel 2001: Fanariotu and Skuras 2004; Gobster 1994, 1995)". In a landscape that is already perceived negatively, additional effects may be perceived as astronomical, or they can be perceived as mute, depending on the viewers understanding how the effects might help or hinder recovery. Effects that are evident as unnatural appearing in form, line, color, texture, and scale are considered negative to the resource.

Effects to desired landscape character -Effects that will move the vegetation toward the desired landscape character are beneficial to scenery resources. These effects are often realized over a long time period and have lasting effects to the sustainability of scenery attributes. Effects that improve conditions and/or trends that pose potential risk to scenery attributes are considered beneficial to the resource. Those that perpetuate or increase conditions that pose potential risk are considered detrimental to the resource. The desire landscape character is closely related to the appearance of a forest in which species composition and stand structure are within HRV. These conditions create an environment in which scenery attributes are highly sustainable.

Common aspects of visually preferred settings - Paul Gobster (1994) summarized visually preferred settings as having four common aspects: (1)Large trees; (2)Herbaceous, smooth groundcover; (3) Open midstory canopy with high visual penetration; and (4) Vistas with distant views and high topographic relief.

Visual access or visual penetration into a forested landscape is preferred. "In other words there is a strong inverse correlation between tree stand density and scenic beauty" (Brown and Daniel 1986, Buhyoff et al. Ribe 1990, Ruddell et al. 1989, Silvennoinen et al. 2001). There is in many areas of this landscape, a great degree of visual access due to the loss of foliage and understory vegetation. Long-term visual resource will have higher scenic quality if visual access is achieved.

These aspects are most consistent with the warm dry upland forest plant association group (PAG). Other PAGs are more densely vegetated and do not provide high visual penetration. The landscape character for this area is a mosaic of large patches of open pine stands and small pockets of more dense stands of fir. Actions that help to recover these aspects are considered as beneficial to scenery resources.

Tree Removal - The visual effects of removing trees from a landscape can vary from nearly unnoticeable to dominant modification. In a landscape that has been completely burned and mortality is greater than 85 percent removing dead trees changes the visual structure. Removing dead trees would create a more open landscape. A landscape that is currently populated with blackened tree trunks has linear, vertical structure (in foreground views) that has a higher degree of interest to the eye than a landscape where all the trees are removed. Perceptions may differ in regard to what is desired, but preference is greater when there is coherence and diversity in the view. (Kaplan et al. 1998: 14) In middle and background views, the appearance of an open grass slope and an expanse of dead trees both appear natural, however, perceptions of forest health or wastefulness of forest products can affect the preference of the view. A mosaic or mixture of openings and clumps and expanses is more natural appearing to the eye and maintains a greater degree of interest than all dead trees or no trees at all.

Tree stumps remaining also creates a negative visual image from foreground views, however as grasses and forbs revegetate the ground, stumps become less visible (if they are cut low to the ground), so they create a short-term visual effect.

As dead trees remain and slowly fall down, the effect to the visual appearance is usually a negative jackstraw appearance. Tree trunks become crisscrossed and create an appearance that is not preferred by viewers. Large amounts of down wood can create conditions that are conducive to fires that would burn at higher severity than naturally occurs, and would create negative visual effects once again.

Logging Systems:

- **Forwarder -** Using a forwarder creates effects that are primarily evident from foreground views. Effects include skid trails, and ground disturbance caused by the equipment moving on soils. Slash left behind is also a visual effect in foreground views. Effects visible from middle ground views are the skid trails that often are evident until a vegetation canopy is reestablished. The effect does not usually dominate the view, but it is visually evident for 10 to 20 years.

- **Skyline -** Using a skyline creates effects that are visible from foreground to background views. The long linear openings that radiate from a single point are usually dominant in the view especially during the winter when snow highlights the exposed ground. However, in landscapes where greater than 85 percent of the trees are removed, the linear openings are less apparent because there are fewer remaining trees to create linear edges along the line corridors.

- **Helicopter -**Helicopter logging causes the least amount of effects to scenery. Trees are yarded out to a landing where slash is piled. Once the slash is burned and the landing is reseeded, the visual impact is minimal. Stumps remain in these areas and can be seen from a foreground view.

Fuels Treatments:

- **Lop and scatter** fuels treatment can cause effects to scenery. It is completely dependent on the amount of woody debris that is left on the ground. If the amount of woody debris becomes dominant and detracts from valued scenic attributes, then the treatment causes a negative effect to scenery. Excess fuels left on the ground can create conditions that can put scenery resources at risk of future fire.

- **Jack pot burning** is expected to create minimal effects to scenery. Effects would be visible from foreground views only, and would be a short term effect, being reduced substantially after the first growing season. There is beneficial effect to this treatment because it reduces woody debris and helps create a cleaner forest floor that is generally preferred by viewers, (Social Science to improve Fuels Management) and reduces conditions that increase risk of future fire.

- **Yarding tops** out of the forest improves immediate views into the forest by reducing woody debris and reduces fuels that could cause conditions conducive to fire in the future.

Roads and Temporary Roads:

Where roads are constructed, expected effects include, foreground views of road cuts, exposed soils, and low stumps along the edges. At middleground and background views, a linear opening would be created. Foreground views are expected to have short term effects that would be rehabilitated after the logging operations have been completed. The effects of the linear openings would be longer lasting, but planted trees would fill these corridors within 10 years.

Reforestation:

- **Planting** where there is an insufficient seed source would help expedite rehabilitation of scenery resources. Planting fire resistant species would improve species composition and create a forest that can withstand low intensity fire.

- **Slash and broadcast burning** would improve scenic views by decreasing the amount of woody debris that is on the forest floor. It is not expected that all woody debris would be consumed by fire, so a mosaic pattern of woody debris would exist and appear natural throughout the project area.

Danger trees:
Removing danger trees from along roads and around recreation site would create greater visual access into the forest. Stumps would remain but be cut low to the ground so grasses and forbs would grow taller than the stumps once a growing season has occurred. Danger trees are generally removed by cable from the road so impacts are minimal and short term in nature.

Alternative B – Proposed Action

Direct /Indirect Effects – Alternative B:

Alternative B proposes to harvest dead and dying trees from 34 percent of the analysis area totaling 9,432 acres. Approximately 47 percent of these acres are in warm dry sites that support pine and larch forests. This treatment is expected to increase the potential for regeneration of early seral species such as ponderosa pine and larch, and reduce post fire fuel loading that exceeds the HRV and poses an uncharacteristic risk to tree regeneration should a reburn occur during the next 20-30 years. This treatment would reduce conditions that pose risk to scenic attributes of the dry pine type forests. However, the harvest efforts would create some unnatural effects to the scenery.

Tucannon River Road 4712 is a designated Viewshed 1 with retention VQO in the foreground areas. Middleground areas, 0.5 to 4 miles from the road; have a partial retention VQO. From Tucannon River Road there would be 4,986 acres of visible treatment.

> Foreground effects - In the foreground views there would be 120 acres of visible NFS treatment. Treatments would remove dead and dying trees from 16 visible units, ranging in size from 0.5 acres to 21 acres. Average unit size (7.8 acres) would exceed the standards for retention in the foreground. However, “exceptions to created opening size and maximum percentage in openings at one time are permitted under uncharacteristic circumstances such as blow down, insect and disease attacks, wildfire, and others” (Forest Plan p. 4-101).
>
> Views to the west/south west are predominantly foreground views of state lands, which would also be harvested along the lower portion of the slope. NFS lands are visible in the steep draws above state lands. Much of the NFS treatment in this alternative cannot be seen from Tucannon River Road 4712.
> Foreground view to the east are of the Tucannon River RHCA, where no salvage harvest is proposed. Burned trees, blackened areas and scorched trees would remain. In the riparian area there is currently a mix of blackened and green live trees and shrubs.
>
> Middleground effects - In the middleground views there would be 2,240 acres of visible NFS treatment. Treatments would remove dead and dying trees from 98 units that have some portion visible, ranging in size from 0.3 acres to 267 acres. The average unit size (23 acres) would exceed the standards for retention middleground. However, “exceptions to created opening size and maximum percentage in openings at one time are permitted under uncharacteristic circumstances such as blow down, insect and disease attacks, wildfire, and others” (Forest Plan p.4-101)

Middleground views to the west/southwest are limited by slope and aspect, giving period views into the upper portions of the draws. Much of what would be treated would not be seen from the Tucannon River Road.

Middleground views across the river are primarily of the steep grassy slopes of Willow Springs Inventoried Roadless Area (IRA), where no treatment is proposed. Blackened slopes and burned timbered stringers would remain. Grass slopes would begin to “green up” within a year’s time. The upper portion of slopes would be treated and are visible from the Tucannon River Road. Three treatment areas would be visible. The largest area of contiguous acres of treatment (907 ac.) would be at the head of Grub Canyon and Hixon Canyon. This area is in a Modification VQO. In the area east of Huckleberry Butte there would be 87 contiguous acres visible in the middleground view, in a Modification and Partial Retention. In the area east of Ruchert Springs there would be 155 contiguous acres visible from the Tucannon River Road., in Modification and Maximum Modification.

Background Effects -This alternative would treat 2,626 visible acres in the background, in units averaging 16 acres in size. Treatments would remove dead and dying trees from 166 visible units, ranging in size from <1 acre to 124 acres. These treatment acres are in Modification and Maximum Modification. Visible effects would be skyline corridors creating lines radiating from a single point and large openings created by tree removal. Openings are not expected to appear unnatural in shape.

Pomeroy-Grouse Flat Road 40 is a designated Viewshed 2 route with Partial Retention VQO in foreground views. This alternative proposes forwarder and skyline logging systems in this area. There would be a total of 5,833 visible treatment acres from Road 40.

Foreground effects -This alternative would treat 1,403 visible acres in the foreground, in units averaging 19 acres in size. Treatments would remove dead and dying trees from 74 visible units, ranging in size from 1.9 acre to 142 acres. The average opening size would exceed the standards for partial retention foreground. However, “exceptions to created opening size and maximum percentage in openings at one time are permitted under uncharacteristic circumstances such as blow down, insect and disease attacks, wildfire, and others.” (Forest Plan p. 4-109) Logging activity would be very evident in foreground views for the first 3 years. The foreground views from the road would not be continuous logging and burn areas. Live stands along the road do break up the blackened stands of burned timber. Stumps and ground disturbance would dominate the view for the first season. As forbs, shrubs and grasses regenerate, the effects would lessen.

Middleground effects -This alternative would treat 4,119 visible acres in the middleground, in units averaging 33 acres in size. Treatments would remove dead and dying trees from 124 visible units, ranging in size from <1 acre to 205 acres. However, “exceptions to created opening size and maximum percentage in openings at one time are permitted under uncharacteristic circumstances such as blow down, insect and disease attacks, wildfire, and others.” (Forest Plan p. 4-109)

Middleground views would be affected by some effects such as skid trails and pattern openings. Pattern openings are not expected to appear unnatural in line, or shape. Openings would be larger than is expected in a desired landscape character for this area. In skyline units there is expected to be visible lines opened up that would be co dominant with the natural scenery.

Background Effects - This alternative would treat 311 visible acres in the background, in units averaging 8 acres in size. Treatments would remove dead and dying trees from 40 visible units, ranging in size from <1 acre to 40 acres. These treatment acres are in Modification and Maximum Modification. Visible effects would be skyline corridors creating lines radiating from a single point and large openings created by tree removal. The openings are not expected to appear unnatural in shape. The effects from these systems would be evident but would not dominate the view and would not create unnatural elements of form, line, color or texture that would remain beyond 5-10 years.

Harvesting techniques used would create some short-term effects to the scenery. During the following 3-5 years after harvesting takes place, there would be visual evidence of logging that would appear unnatural. The effects related to trees being removed is not expected to appear unnatural. It is not expected that the forwarder and helicopter logging would create patterns that are unnatural appearing in form, line, color, or texture. There would be foreground effects of ground disturbance and stumps in units where forwarders are being used, which would be short term in nature. Middleground effects of skyline corridors are expected to be apparent but not dominant from viewer platforms. Fuels treatment would remove concentrations of ground litter that give the forest floor a cluttered and messy appearance. Much of the harvesting would open up forest stands that once were overstocked and crowded causing poor visual access beyond the immediate foreground.

There would be increased visibility of existing roads due to opened stands and dead tree removal. It is expected that this effect would be minimized as planting becomes established and new tree heights reach 6 -10 feet.

Planting:
Alternative B proposes planting areas where seed sources are deficient. This effort would help rehabilitate the valued scenic attribute of a forested landscape on 9,432 acres.

Danger Tree Removal:
Dead and dying trees that pose a safety hazard to the public would be removed along 71 miles of road within the project area. Danger trees would be removed via cable from the road. Expected effects are limited to minimal ground disturbance and stumps remaining in the immediate foreground. Slash related to the tree removal would be piled and burned so that there is no further “cluttering” of the forest floor in the immediate foreground.

Temporary road construction, decommissioning:
Approximately 1.5 miles of temporary road construction would be visible from the Pomeroy-Grouse Flat Road #40. Construction is not expected to create any cuts and fills that would draw the viewer’s eye to the road. These roads would be decommissioned and back to their original state (a reasonably possible) when the project is complete. Effects to the scenery resource are expected to be minimal and short-term.

Indirect effects of this proposal related to the reduction of standing and downed dead material, and removal of dense thickets include improved stand composition in the future that would be more tolerant of fire and have a more open appearance with a “clean” forest floor. Fuels treatment would improve conditions that put valued vegetation at risk of loss due to stand replacement fire, therefore improving the scenic stability of future tree stands.

Summary of Direct /Indirect Effects – Alternative B:
This alternative would create effects that exceed opening size standards of the Forest Plan; however, due to the uncharacteristic nature of this fire, the exception for opening size and maximum percentage of treatment area applies. The scenic quality of the area would not meet moderate scenic integrity. The appearance would remain dominantly altered due to the severity of the fire. Rehabilitation efforts would require at least a decade to take effect and reestablish a scenic appearance that resembles the landscape character that is within HRV, which is considered sustainable.

This alternative would effect future species composition in a manner that would improve Scenic Stability in the dry forest sites by reseeding with species that are more fire resistant. By reducing fuel loads, the potential for "reburn" is reduced, which also improves Scenic Stability in the area.

Cumulative Effects – Alternative B:

Past Actions: - Same as Alternative A

Present Actions: - Same as Alternative A

Reasonably Foreseeable Actions: - Same as Alternative A

Summary of Cumulative Effects - Alternative B
Cumulative effects to scenery resources in School Fire Salvage Recovery project area are not expected to meet the visual quality objectives of the Forest Plan. In retention or high scenic integrity areas, cumulative deviations would be present, but those deviations would repeat the form, line, color, texture and pattern in such a manner that appears natural. In partial retention areas, there is expected to be noticeable deviations however, they would be subordinate to the natural landscape character.

Scenery resources of this area have been affected tremendously by School Fire, and are in need of rehabilitation. Due to uncharacteristic fuel loads, stand density, and species composition the fire burned excessively hot causing greater mortality than would have occurred had the vegetation and fuels been with HRV. Salvage efforts combined with the past, present, and foreseeable actions would for the most part create short-term negative effects in order to create long-term positive effects to scenic integrity and scenic stability.

Alternative C

Direct /Indirect Effects – Alternative C:
Alternative C proposes to harvest dead and dying trees from 15 percent of the analysis area totaling 4,188 acres, in areas. This alternative would treat 5,244 acres less than Alternative B.

Tucannon River Road 4712:

> Foreground effects - Effects are expected to be similar to Alternative B at a lesser scale. This alternative would treat 100 visible acres in the foreground, averaging 7.6 acres in size. Treatments would remove dead and dying trees from 13 visible units, creating openings ranging in size from 1.1acres to 21 acres. The average opening size would exceed the standards for retention foreground. However, "exceptions to created opening size and maximum percentage in openings at one time are permitted under catastrophic circumstances such as blow down, insect

and disease attacks, wildfire, and others" (Forest Plan p. 4-101). The area at the head of Grub Canyon and Hixon Canyon would be less affected by this alternative.

Middleground effects - Effects are expected to be similar to Alternative B at a lesser scale. This alternative would treat 1,228 visible acres in the middleground, averaging 22 acres in size. Treatments would remove dead and dying trees from 57 visible units, creating openings ranging in size from <1 acre to 120 acres. The average opening size would exceed the standards for retention middleground. However, "exceptions to created opening size and maximum percentage in openings at one time are permitted under catastrophic circumstances such as blow down, insect and disease attacks, wildfire, and others" (Forest Plan p. 4-101).

Background effects - Effects are expected to be similar to Alternative B at a lesser scale. This alternative would treat 1,189 visible acres in the background, averaging 16 acres in size. Treatments would remove dead and dying trees from 73 visible units, creating openings ranging in size from <1 acre to 78 acres.

Pomeroy-Grouse Flat Road 40:

Foreground effects - Effects are expected to be similar to Alternative B at a lesser scale. This alternative would treat 817 visible acres in the foreground, averaging 20 acres in size. Treatments would remove dead and dying trees from 40 visible units, creating openings ranging in size from 3 acres to 87 acres. The average opening size would exceed the standards for retention foreground. However, "exceptions to created opening size and maximum percentage in openings at one time are permitted under catastrophic circumstances such as blow down, insect and disease attacks, wildfire, and others" (Forest Plan p. 4-109).

Middleground effects - Effects are expected to be similar to Alternative B at a lesser scale. This alternative would treat 2,071 visible acres in the foreground, averaging 30 acres in size. Treatments would remove dead and dying trees from 68 visible units, creating openings ranging in size from <1 acres to 205 acres. The average opening size would exceed the standards for retention and partial retention middleground. However, "exceptions to created opening size and maximum percentage in openings at one time are permitted under catastrophic circumstances such as blow down, insect and disease attacks, wildfire, and others" (Forest Plan p. 4-109).

Background effects - Effects are expected to be similar to Alternative B at a lesser scale. This alternative would treat 240 visible acres in the foreground, averaging 8.6 acres in size. Treatments would remove dead and dying trees from 68 visible units, creating openings ranging in size from <1 acres to 40 acres.

Danger Tree Removal:

Dead and dying trees that pose a safety hazard to the public would be removed along 63 miles of road within immediate foreground areas. The trees would be removed via cable from the road. Expected effects are limited to minimal ground disturbance and stumps remaining in the immediate foreground. Slash related to the tree removal would be piled and burned so that there is no further "cluttering" of the forest floor in the immediate foreground.

Temporary road construction, decommissioning:

Approximately 1.5 miles of temporary road construction would be visible from the Pomeroy-Grouse Flat Road 40. This construction is not expected to create any cuts and fills that would draw the viewer's eye to the road. These roads would be recontoured and seeded once the project is complete. The effects to the scenery resource are expected to be minimal and short term.

Summary of Direct/Indirect Effects for Alternative C:
Alternative C would create effects that exceed opening size standards of the Forest Plan; however, due to the uncharacteristic nature of this fire, the exception for opening size and maximum percentage of treatment area applies. The scenic quality of the area would not meet moderate scenic integrity. The appearance would remain dominantly altered due to the severity of the fire. Rehabilitation efforts would require at least a decade to take effect and reestablish a scenic appearance that resembles the landscape character that is within HRV, which is considered sustainable.

This alternative would effect future species composition in a manner that would improve Scenic Stability in the dry forest sites by reseeding with species that are more fire resistant. However, this alternative proposes to seed and plant fewer acres, therefore, the timeframe for regeneration of a forested landscape is considerably longer. By reducing fuel loads, the potential for “reburn” is reduced, which also improves Scenic Stability in the area. However, fewer acres would be harvested and less fuels treatment would occur, therefore, this alternative does less to reduce the potential for “reburn”.

Cumulative Effects – Alternative C:
The cumulative effects discussion for Alternative B also pertains to Alternative C, with any differences noted and explained below.

Comparison of Direct/ Indirect Effects by Alternative
The table below compares alternatives by visible treatment acres in the foreground, middleground, and background.

Table 3-95 Comparison of Visible Treatment Acres by Harvest System

	Alternative A		Alternative B		Alternative C	
Visible Treatment Acres	**Acres**	**Ave. Unit size**	**Acres**	**Ave. Unit size**	**Acres**	**Ave. Unit size**
Tucannon River Road 4712						
Foreground	None	N/A	120	7.5	99	20
Middleground	None	N/A	2240	23	1228	22
Background	None	N/A	2626	16	1189	16
Pomeroy –Grouse Flat Road 40						
Foreground	None	N/A	1402	19	817	20
Middleground	None	N/A	4119	33	2071	30
Background	None	N/A	310	8	240	8.6

Finding of Consistency:
Consistency with the Forest Plan for all alternatives is shown in Table 3-96.

Table 3-96 Visual Quality Consistency Finding for All Alternatives

	Alternative A	Alternative B	Alternative C
Visual Quality Objective.	Does not meet	Does not meet VQO, but fits exception	Does not meet VQO, but fits exception
Rehabilitation	No rehabilitation	Rehabilitation of 9,432 acres	Rehabilitation of 4,188 acres

AIR QUALITY

SCALE OF ANALYSIS

National Forest land, communities in Lewiston, Idaho, Clarkston, Washington, and the Walla Walla Valley.

AFFECTED ENVIRONMENT

Currently, all prescribed burning that occurs on the Pomeroy Ranger District adheres to state and federal air quality regulations. All prescribed burning is highly regulated by the Washington State Department of Natural Resources (DNR) as defined by the Washington State Clean Air Act and is done in accordance with the Washington State DNR Smoke Management Plan. Prescribed burning must be, and is, approved on a day by day basis by the DNR smoke management meteorologist. Using current and predicted air quality conditions, current and forecasted weather conditions, knowledge of the local topography and wind patterns, the DNR meteorologist determines if prescribed burning projects will meet state smoke management guidelines. Pomeroy Ranger District also takes the responsibility of monitoring the impacts of the smoke that is produced. They notify the DNR meteorologist if the smoke is having a negative effect, and discontinue ignition without having to be instructed to do so.

Within the area that would be impacted by the emissions of School Fire Salvage Recovery burning projects, there are no specially designated airsheds. The Wenaha-Tucannon Wilderness is not a mandatory Federal Class 1 airshed. Pomeroy Ranger District fire and fuels management staff is aware of potential negative influence that burning can have on the air quality and visibility in the wilderness and manage burning operations to minimize those effects.

There is a portion of Walla Walla County that is currently listed as a non-attainment area for PM10 particulate pollutants. The cities of Dayton, Washington (approximately 2,600 people) and Walla Walla, Washington (approximately 30,000 people) are largest population centers to the west of the School Fire Salvage Recovery project area. Dayton is located approximately 6 miles to the southwest of the project area. Walla Walla is located approximately 25 miles to the west of the project area. Both cities, as well as some smaller ones in between, are located in the Walla Walla Valley. The airshed of these cities will be of the highest concern in regard to air quality issues and smoke emissions when burning is being implemented on the west side of the School project area. The prevailing wind patterns (winds from the southwest to the northeast) would be utilized to minimize any impacts of smoke on these populations.

The cities of Lewiston, Idaho and Clarkston, Washington are largest population centers (approximately 40,000 people) to the east of the School Fire area. Located in the Lewis-Clark Valley, the airshed of these cities is of the highest concern in regard to air quality issues and smoke emissions when burning is being implemented on the north and east side of the project area. In the fall and winter, stable air masses tend to create temperature inversions and very little air movement in the valley. These factors, combined with the topography (the cities are located down Asotin Creek drainage) and the prevailing wind patterns, can combine to create a sink hole for smoke produced adjacent to the Asotin Creek watershed.

Pomeroy Ranger District fire and fuels management staff and Dave Grant of DNR smoke management, are keenly aware of the air quality situation of the Lewis-Clark and Walla Walla valleys and the potential influence that burning could have. In response to this situation, the Pomeroy Ranger District has developed a working relationship with the Lewis Clark Air Quality Advisory Commission. Pomeroy Fire Management meets early in the process, with this group, before prescribed fire implementation to inform them of prescribed fire plans including such information as project location, fuel types, and planned time of implementation. Constant communication between Fire Management and the leaders of this group is maintained throughout project implementation. The air quality group assists in monitoring if and when our smoke impacts the air within the Lewis-Clark valley.

Although there is no official ambient air quality monitoring data for the Lewis-Clark Valley, there is a radiance nephalometer that is maintained by the Oregon Department of Environmental Quality in place in Asotin, Washington. Asotin which is at the mouth of Asotin Creek where it enters the Snake River. The nephalometer in place for about 7 years and has created a baseline for different seasons of the year. The nephalometer is used as an early indicator that smoke from prescribed fire projects may affect Lewis-Clark Valley.

ENVIRONMENTAL CONSEQUENCES

Burning projects are not approved and/or shut down if:

- “Intrusion” of smoke into sensitive areas such as population centers is likely.
- Any state or federal air quality regulations, laws, or rules would be violated.
- Another state’s published air quality standards would knowingly be violated.
- Smoke is not expected to be dispersed in a timely manner

If a burning project is initiated and smoke emissions becomes a problem in populated areas for unforeseen reasons, ignition is discontinued and the fire is suppressed as necessary until the project is in compliance with smoke management regulations. Ignition is only re-initiated when environmental factors dictate that smoke produced will be in compliance with air quality regulations once again. Prescribed fire projects are implemented under a prescribed fire plan, which specify how and where prescribed fires can be put out to comply with smoke management regulations.

Alternative A - No Action

Direct /Indirect Effects - Alternative A:

There would be no effect on air quality if this project were not implemented at this time. However, the risk of a high intensity wildfire would increase over time until reaching a peak potential between 2035 and 2045. Fuel loadings would be extremely high at this time. Without treatment, a reburn in the School Fire area in 30 or 40 years could produce nearly twice as many total emissions as School Fire produced (on an average per acre basis). A wildfire is also likely to occur under weather conditions which limit smoke dispersal.

Cumulative Effects – Alternative A:

With no salvage or fuel management of large woody fuels, prescribed fires would be nearly impossible to implement as burn severity would be too high. Both small and large woody fuels would continue to accumulate. These fuels would not be able to be burned when weather conditions can aid in the dispersion of smoke and fire managers can control the amount of smoke produced each day. When the area does burn again, there would be a high potential for a fire of high intensity that would consume much of the down woody fuel and produce an abundant amount of smoke in a short amount of time likely during unfavorable conditions.

Effects Common to Action Alternatives (B and C)

Direct and Indirect Effects – Alternatives B and C:
Air quality would be affected on a short-term basis during the implementation of any of the prescribed fire projects. All burning would be done in accordance with the Washington State DNR Smoke Management Plan in order to ensure that clean air requirements are met. State and federal air quality regulations would be followed. Washington State DNR would approve burning on a daily basis.

Air turbulence, mixing heights, inversion depths, and smoke dispersion potential are all considered in the smoke management burn approval process. On days when current or predicted air quality conditions are not conducive to adequate smoke dispersal, burning would not occur.

Current and predicted air quality conditions would also be a major determinate of how many acres would be burned on a given day. It is not possible at this point in time to determine the size and fuel type to be burned on a daily basis. Using fuel loading information, the current air quality condition in the surrounding area, and the predicted weather, the number and location of units that could be ignited on a particular day will be determined on a daily basis.

The intensity of a prescribed fire is determined by environmental conditions and ignition methods. Burning would be done when fuel and weather conditions would produce lower intensity fires than wildfires. The late fall/early winter and later winter/early spring burning windows that would be utilized to burn the activity fuels in these units are also times of excellent smoke dispersion.

Effects Differing in Action Alternatives (B and C)

Direct and Indirect Effects – Alternatives B and C:
Alternatives B would mechanically remove large woody fuel on more acres than Alternatives C (9,436 acres as compared to 4,188 acres). If all proposed stands were to begin to move toward their historic fire return interval using the proposed methods, over time, Alternatives B would result in lower total smoke emissions because future prescribed fire entries and wildfires within the School Fire area would have lower smoke emissions on more acres

The caveat to treating large woody fuels for the long-term is that small, woody fuels are created. These small, woody fuels are the carriers of fire and where accumulations exceed desired ranges would be treated by jackpot or broadcast burning. Alternative B treats large woody debris on more acres. It also produces a need to burn a greater number of acres to manage the small woody debris. Table 3-97 below compares the acres to be burned in each alternative.

Table 3-97 Comparison of Acres to Be Burned By Alternative

TREATMENT	ALTERNATIVE B	ALTERNATIVE C
Broadcast Burning Acres	1,483	925
Jackpot Burning Acres	3,132	760
Total Burning Acres	4,615	1,685

These areas would be burned over a period of at least two years. Given usual smoke management and resource constraints, Pomeroy fire management personnel can usually burn about 70 to 100 acres of slash treatment area each burn day. Post salvage burn entry reduces fuels an average of 4 tons per acre. Burning 100 acres each day, a maximum of 8,000 pounds of PM 10 would be produced each burn day. Implementing Alternative B, there would be approximately 50 days of burning with about 15 to 20 days per year for a period of 3 to 4 years. Implementing Alternative C, there would be approximately 20 days of burning with about 10 days per year over a 2 year span.

Cumulative Effects – Alternatives B and C:

Emissions are determined by the size and intensity of the fire. Prescribed fires produce smoke, but less for the same acre than does wildfire, especially in areas without prior fuels manipulation. Implementing the proposed salvage harvest projects would reduce the amount of particulate emissions from wildfire. Because the proposed treatments reduce fuel loadings, the long term effect would be a decrease in the potential of very high particulate matter emissions in a wildfire scenario, when fire managers are unable to decide when (such as during favorable wind current patterns) and how much to burn.

Mechanically removing fuels from the site prior to prescribed fire treatment or wildfire reduces the amount of particulate produced during burning. Future prescribed fire entries in salvage areas would have far less fuel to consume and produce much less smoke. The particulate released from the prescribed fire would be during favorable smoke transport weather conditions.

Finding of Consistency:

Implementing either of the action alternatives (B or C) would remain consistent with the goals, objectives, and standards and guidelines of the Forest Plan. Air quality standards would be maintained at a level to meet state and federal standards (Clean Air Act) through the coordination and compliance with Washington DNR guidelines and approval process. Available predictive and management methods and models would be used to minimize the impacts of smoke on any smoke sensitive areas.

RECREATION

SCALE OF ANALYSIS

School Fire Salvage Recovery Project area, including state lands and facilities.

AFFECTED ENVIRONMENT

School Fire project area provides a wide range of recreation activities and opportunities for the visiting public. Activities include, but are not limited to, fishing, hiking, hunting, camping, horseback riding, sightseeing, mushroom picking, firewood cutting, and off-highway vehicle (OHV) use. Tucannon River drainage is a checkerboard ownership of Forest Service and Washington Department of Fish and Wildlife (WDFW) lands with fee campgrounds and artificial lakes that provide stocked fishing opportunities. The only federal fee campground in School Fire Salvage Recovery project area is Tucannon Campground. WDFW has approximately eight fee campgrounds situated mostly near lakes. Central and eastern sides of School Fire contain mostly dispersed campsites that have picnic tables, fire pits and vault toilets. Two summer home tracts also are located within School Fire perimeter, but neither was damaged. Winter sports recreation consists of widely used snowmobile and off-road vehicle program with groomed trails and/or designated areas.

Recreational activities occur in lands designated for a variety of management areas (MAs) as described in the Forest Plan. The Recreation Opportunity Spectrum (ROS) for various management areas included Rural, Roaded Natural, Semi-primitive Non-Motorized, Semi-primitive Motorized and Roadless. In general, a predominately naturally appearing environment characterizes the ROS categories for management areas in School Fire Salvage Recovery Project area (Table 1-1), with moderate to dominant evidence of the sights and sounds of humans.

Forest Service campgrounds located in School Fire Salvage Recovery project area include Boundary, Alder Thicket, Pataha and Tucannon. Boundary, Alder Thicket and Pataha are categorized as dispersed, although picnic tables, fire rings and vault toilets are available. Tucannon Campground is the only fee facility and contains two covered shelters and an open fireplace. The open fireplace was constructed prior to 1950 with CCC labor and is considered eligible for consideration in the Historic Register. All campgrounds received little to minor fire damage and are fully functional for upcoming summer use in 2006.

Facilities

Use is seasonal and cyclic for three dispersed campgrounds and no exact usage numbers are associated with them. Use in these areas is mostly by local residents early in the summer for mushroom picking, firewood cutting, and later in the season for huckleberry picking. All campgrounds are heavily used by hunters in late summer. Tucannon Campground is used constantly from early summer (June) through early fall (November). During the hot summer months, most user groups come from the more populated areas of Tri Cities (Pasco, Kennewick, and Richland, Washington) and Walla Walla, Washington. Easy access (mostly paved roads) and close proximity (about 60 to 90 minutes drive) make Tucannon River a favorite summer recreational destination.

Upper elevation access from Pomeroy south on Forest Highway 40 is a major access route to the south end of Pomeroy Ranger District, the town of Troy, Oregon, and major trail access points for the Wenaha-Tucannon Wilderness. Lower elevation access up the bottom of Tucannon River Road on Forest Highway 47 accesses other dispersed federal and WDFW campgrounds and several major trail access points for the Wenaha-Tucannon Wilderness.

There are no designated hiking trails located in the School Fire Salvage Recovery project area. As old logging roads are closed or rehabilitated, several hiking trails may result.

Stevens Ridge has a NEPA completed OHV trail system identified and is only awaiting funding. It will consist of approximately 24 miles of designated trails with future plans to establish day use and overnight campgrounds. A reasonably foreseeable action is a designated OHV trail from Boundary Campground south through the School Fire Salvage Recovery project area to Big Butte.

At upper elevations within the project area there is no sport fishing opportunities, because no major free-flowing streams or lakes exist. Tucannon River hosts a variety of fish species, but most are threatened or endangered resulting in a regulation fishery. WDFW constructed and stocks seven ponds along the river bottom to help accommodate public fishing opportunities.

Tucannon Guard Station is the only federal administrative facility located within School Fire Salvage Recovery project area. It was built in 1909, and it is the oldest known contract built guard station on NFS land in the Pacific Northwest Region (Region 6). A considerable amount of funding, coming mostly from Title II Resource Advisory Committee funded projects and some appropriated sources has been allocated to restore Tucannon Guard Station in the last four years. It was not damaged by School Fire and remains available for interpretive use for summer 2006.

During the winter months, snowmobile use is extensive along 50 miles of groomed trails. A snow groomer, operated by local District personnel, covers those 50 miles, approximately 40 times along Forest Road 40 (Mountain Road) through the center of the District. Approximately half (25 miles) of groomed trails pass through School Fire area and were affected by the fire.

Iron Springs Winter Recreation Area, along Forest Road 42 (Iron Springs Road), is designated for off road vehicles only during winter months. Road 42 was used as a fireline along much of the fire's east flank so was minimally affected by the fire.

Special Uses

An annual operating plan provides management direction for recreational summer homes within School Fire area. There are no other annual recreational special use permits issued. General convertible product permits are required for special forest products such as personal use firewood, commercial mushroom, pine cone, or huckleberry gathering, post and poles, transplants and pine boughs.

Rose Springs and Stenz Springs are two special use summer home tracts located within School Fire perimeter. Rose Springs consists of 21 summer recreational cabins and Stenz Springs has 14 cabins under permit. Both summer home tracts escaped any major damage from School Fire. Precautions were taken on both tracts, and some selective fire line building and back burning saved all 35 cabins and support structures.

Only occasional special forest product permits are issued for commercial mushroom, pine cone, or huckleberry gathering, post and poles, transplants and pine boughs. The largest single forest product in the area was personal use firewood cutting. As a result of School Fire and suitable habitat conditions, it is anticipated that a large number of morel (*Morchella sp*.) mushrooms may germinate and attract commercial interests.

There are no outfitter or guide permits issued within the School Fire Salvage Recovery project area.

WDFW leases an administrative site called Camp Wooten Environmental Learning Center to Washington State Parks and Recreation. Camp William T. Wooten State Park covers 40 acres and 4,100 feet of freshwater shoreline. Facilities include Environmental Learning Center buildings, an archery range, campfire circle, interpretive trail, indoor swimming pool, man-made lake, two outdoor interpretive shelters, and a multi-purpose field and athletic court. Youth groups, schools, and private groups use the park year round. There are literally thousands of individuals that pass through this facility each year. Last year the facility was closed in August 2005 because of School Fire. No infrastructure was damaged, but danger trees kept the facility closed until late March 2006.

ENVIRONMENTAL CONSEQUENCES

Landscape and recreational experiences have changed and the area would not likely meet visitor's expectations for at least the next five to ten years until vegetation begins to return and changes the landscape to a more forested, vegetative condition. All three federal dispersed campgrounds and one fee campground (Tucannon Campground) will probably see minor changes in numbers of users since neither burned severely.

There are some isolated dispersed hunting camps that are sure to be destroyed by School Fire. Use in fall 2006 would be dependent on condition and potential conflict with salvage operations.

Types of land management activities that may affect recreation use are salvage logging, slash disposal, reforestation and removal of danger trees occurring along designated Class 3, 4, and 5 Forest roads, along haul routs used for timber sale activity, and in developed recreation sites and in the Tucannon Guard Station area.

Alternative A– No Action

Direct/Indirect Effects – Alternative A:
Under a No Action alternative there would be no change to the recreational opportunities that exist post-fire. Custodial management such as danger tree removal along roads and in administrative sites and fire suppression would continue.

Access to the area would remain at its current levels and the visiting public my have an elevated level of risk of hazards from falling dead trees, especially adjacent to dispersed sites not tied to administrative sites and undeveloped sites.

Due to loss of natural barriers (down logs and thick patches of regeneration) there may be some unrestricted, inappropriate OHV use.

There will be no direct or indirect effects on winter recreational snowmobiling or off-road vehicle use in designated areas.

All snags would be retained, except for those identified as unsafe. Removal of danger trees along open forest travel routes, developed recreation sites, and administrative sites would be analyzed in a separate NEPA document. Alternative A would provide the least amount of protection from falling danger trees because salvage material would not be removed.

Cumulative Effects – Alternative A:
The recreation setting around and/or near recreation sites has changed due to the fire. It may not be as visually appealing, but it is not expected that the loss of vegetation would deter or reduce use at any of the campgrounds or summer cabins. If area closures are not deemed necessary for public safety, hunting opportunities would be greatly reduced due to reduced wildlife habitat, but not eliminated. A majority of personal-use products (firewood, huckleberry and mushroom picking) would still be available, but amounts would vary depending on habitat conditions. For example, there should be lots of firewood and mushrooms, but most huckleberry bushes were burned and may require a couple of seasons to rebuild.

Effects Common to Action Alternatives (B and C)

Direct/Indirect Effects – Alternatives B and C:
Most effects to recreation resources would be similar for each action alternative. The only difference would be in the amount of salvage, location of salvage unit polygons, and location and amount of road decommissioning proposed.

These alternatives would most likely have an effect for at least two or three years as a result of salvage activities. Due to the nature of large volumes of salvage material and numerous trucks and equipment, there may be some longer-term (one to two seasons) closures on arterial roads, and possible delays (30 to

60 minutes) on main system roads. Visual appearance would also be noticeable because of danger tree removal efforts that would produce wide strips with not much left standing along driving corridors.

For developed or improved dispersed settings, hazards such as falling snags would still be present into the next decade, but to a lesser degree due to salvage and danger tree removal efforts.

Decommissioning and restoration of user-created roads and unauthorized temporary roads would reduce effects to scenery and aesthetics, restore vegetation and provide for visitor safety. It may reduce the amount of open areas perceived to be available by OHV enthusiasts, but by implementing the new National OHV policy, all roads and areas would be considered closed unless otherwise designated open to OHV use.

Upon completion of salvage, brush disposal and reforestation activities, general public access would remain generally similar to pre-School Fire conditions. There would be a fewer unauthorized roads or tracks available to huckleberry and mushroom pickers, but campers and firewood cutters would still utilize areas 300 feet on either side of open roads for dispersed use.

There would be no direct or indirect effects on recreational special use cabins or Tucannon Guard Station.

There will be no direct or indirect effects on winter recreational snowmobiling or off-road vehicle use in designated areas.

Danger trees would be removed along designated Class 3, 4, and 5 Forest roads, along haul routes used for timber sale activity, in developed recreation sites (Boundary, Alder Thicket, 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 removed along an estimated 71 miles of road in Alternative B and 63 miles in Alternative C.

Cumulative Effects – Alternatives B and C:

If area closures are not deemed necessary for public safety, hunting opportunities would be greatly reduced due to reduced wildlife habitat, but not eliminated. A majority of personal-use products (firewood, huckleberry and mushroom picking) would still be available, but amounts would vary dependent upon habitat conditions. For example, there should be lots of firewood and mushrooms, but most huckleberry bushes were burned and may require a couple of seasons to rebuild.

Roaded access would remain open as part of the long-term management plan. A reduction in access would have no measurable effect to those who drive for pleasure or want access to popular places or areas. Though decommissioning would have a direct effect on access to areas that were once available to the general public with motorized vehicles, the amount of remaining open roads would still provide access to similar areas for the same type of activities sought.

Finding of Consistency:

All alternatives would be consistent with Forest Plan recreation standards and guidelines.

SOCIAL AND ECONOMIC ANALYSIS

SCALE OF ANALYSIS

The School Fire burned in Garfield and Columbia Counties of SE Washington from August 5 to August 25, 2005. This analysis looks at the structure of the pre-fire local economy and identifies the sectors that might be affected, makes estimates of the types and extent of effects. This analysis focuses on Garfield County. While a portion of the salvage will occur in Columbia County it was not analyzed separately. This does not affect this analysis, since the area affected by salvage harvest is immediately adjacent to Garfield County, and Columbia County's socio-economic structure is similar to Garfield County.

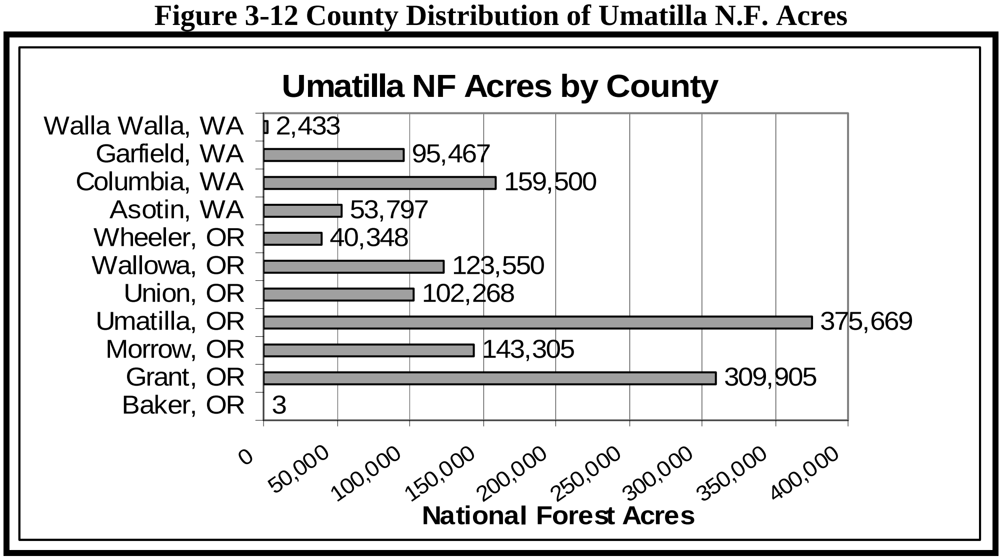
AFFECTED ENVIRONMENT

Socio-Economic Profile

The School Fire salvage sales would occur entirely within Garfield and Columbia Counties in Washington, but some economic effects could occur throughout the whole forest vicinity. The Umatilla National Forest contains acreage in Oregon (1,091,264 acres) and in Washington (311,203 acres). There are seven Oregon and four Washington surrounding counties that could feel effects. The distribution of acres by county is shown in Figure 3-11.[1] Some trade effects could occur in the nearest trade center, Lewiston, Idaho and social and political issues might be regional.

Most of these counties are predominantly rural, but their trade hierarchies have central place trade centers in Lewiston Idaho, Clarkston and Walla Walla in Washington, and La Grande and Baker City in Oregon.

Figure 3-12 County Distribution of Umatilla N.F. Acres



Demographic Description

All of the counties experienced population growth ranging from 1 percent to nearly 20 percent between the 1990 and 2000 censuses. However, in the period from 2000 to 2004, four of the Oregon counties (Grant, Union, Wallowa and Wheeler) and Garfield County in Washington experienced population declines ranging from - 0.5 to – 7.0 percent (Table 3-98). As is common in rural areas, educational

[1] Umatilla N.F. Forest plan data

attainment in these counties is lower that their respective state averages. Persons over age 25 who have high school diplomas range from about 74 to 87 percent. Percentages of residents with bachelor's degrees range from 16 to 28 percent, again this is below respective state averages.

Table 3-98 Umatilla NF Vicinity Population Dynamics

County	Population		Population Δ Percent	
	2000	2004	1990-2000	2000-2004
Asotin (WA)	20,551	20,831	16.7 %	1.4 %
Columbia (WA)	4,064	4,187	1.0 %	3.0 %
Garfield (WA)	2,397	2,311	6.6 %	-3.6 %
Walla Walla (WA)	55,180	57,354	13.9 %	3.9 %
Grant (OR)	7,935	7,380	1.0 %	-7.0 %
Morrow (OR)	10,995	11,681	44.2 %	6.2 %
Umatilla (OR)	70,548	73,436	19.1 %	4.1 %
Union (OR)	24,530	24,406	3.9 %	-0.5 %
Wallowa (OR)	7,226	6,976	4.6 %	-3.5 %
Wheeler (OR)	1,547	1,483	10.8 %	-4.1 %

Garfield County Demographics

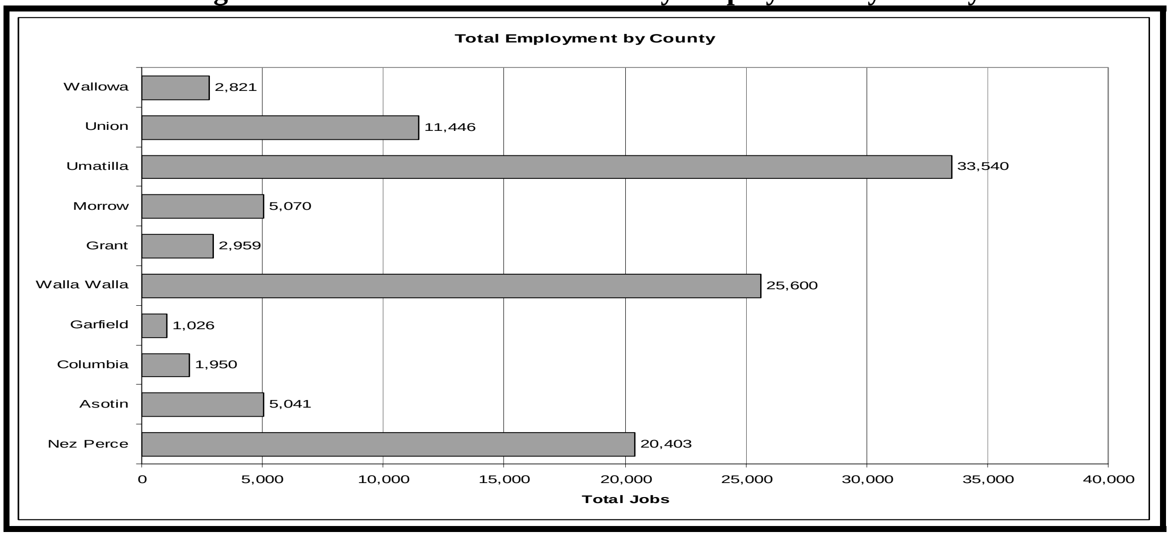
Its demographic characteristics are extreme. Garfield County is highly rural. With a population of 2,311 in 2004, Garfield County is one of the most lightly populated in the region. The biggest community, Pomeroy, with a reported population of 1,515, has 65.6 percent of the population.[2] The total land area of the county is 710, 500 acres with a population density of 3.4 people per acre. In the period from 2000 to 2003, the county had a net population increase of 3 people. This was accounted for by a net natural decrease (deaths vs. births) of 22 coupled with net immigration of 25 (County profile). The county has one school district with a K-12 enrollment of approximately 409 in the 2002-2003 school year. As of the 2000 census the county had a poverty rate of 12.0 percent as compared to the state average of 7.3 percent.[3] The median age in the county is relatively high and rising. It has climbed from 41.0 in 1990 to 44.1 in 2003.[4]

Umatilla NF Vicinity Employment

Figure 3-13 depicts total employment in the counties relevant for this analysis. The most populated counties (e.g. Umatilla and Walla Walla Counties) typically have the trade centers and the highest total employment.

2 Washington County Profile
3 Palouse Economic Development Council 2005
4 ibid

Figure 3-13 Total Umatilla NF Vicinity Employment by County

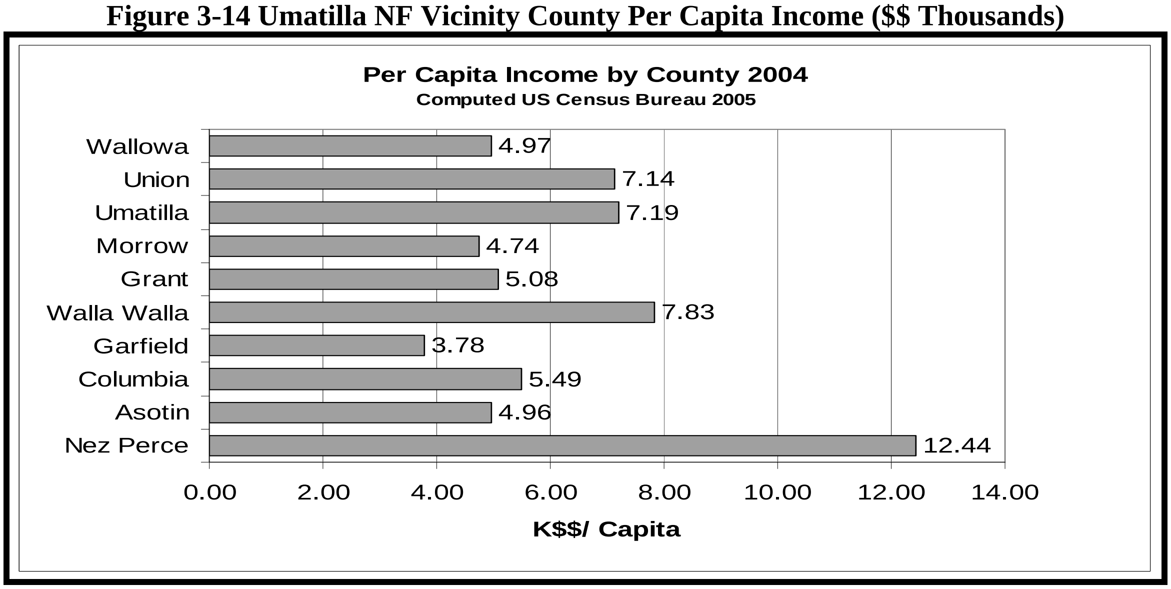


Many of these counties, including Garfield County, are rural agriculture economies and many are also extremely dependent on government employment. Many of these counties, especially Garfield County, typically have small wholesale retail and service sectors. Not categorized in the "other" employment is the dominance of Nez Perce, Walla Walla and Umatilla Counties in retail trade jobs while finance and insurance are particularly significant in Nez Perce, Walla Walla, and Umatilla Counties. .

<u>Local Income Distributions</u>

County income patterns demonstrate the same basic patterns as observed in the county employment data with manufacturing income being the most significant in Nez Perce, Walla Walla, Umatilla, and Union Counties and virtually non-existent in Garfield, Wallowa, and Grant Counties. Retail trade dollars are most significant in Nez Perce, Walla Walla and Umatilla Counties. While income in finance and insurance are particularly significant in Nez Perce, Walla Walla and Umatilla counties. Figure 3-14 demonstrates that income per capital at $3.78 thousand per capita annually is particularly low in Garfield County. However, the relatively large government sector is not reflected in these statistics.

Figure 3-14 Umatilla NF Vicinity County Per Capita Income ($$ Thousands)



Local Wood Products Firms

The direct effects of salvage logging should show up in logging and milling. There are a substantial number of wood products firms located in the Umatilla National Forest vicinity. Forestry consultants are usually employed in private forests and are unlikely to be affected by federal salvage logging, unless bidders hire local foresters to confirm Forest Service volume estimates. However, loggers and mills could be directly affected depending on who wins the sales bids and who is hired to log. Table 3-99 shows that none of these logging firms are located in Garfield County and most tend to be concentrated away from Garfield County. The highest concentrations are actually at some distance away in Grant, Union, and Wallowa Counties in Oregon. These firms employ approximately 775 people, mostly loggers.[5]

Table 3-99 Locations of Wood Products Firms

County	Forestry	Logging	Sawmills
Nez Perce	4	8	1
Asotin	1	2	1
Columbia	0	2	0
Garfield	0	0	0
Walla Walla	0	3	0
Grant	4	24	3
Morrow	0	6	0
Umatilla	5	11	3
Union	6	21	2
Wallowa	5	22	1
Total	25	99	11

Table 3-99 above does not show the plywood mill in Union County, the paper mill at Lewiston, or the paper mill at Wallula. Table 3-100 shows that mills producing wood product employ over 2,000 people, but none of these have a Garfield County place-of-work.

Table 3-100 Umatilla NF Vicinity Wood Products Employees[6]

Shifts	Employees	Payroll ($$ Million)	Payroll Taxes (Million)
36	2,249	$ 81.9	$ 28.6

Mills in the vicinity of Umatilla National Forest typically process 481.7 million board feet (MMBF) annually[7]. That is 80.2 percent of the theoretical capacity of 600.3 MMBF/year. This is close to the normal capacity utilization for sawmills. Although there have been recent log shortages at regional mills due to poor seasonal logging conditions, most mills are expected to temporarily substitute federal salvage volumes to displace an equal volume of green logs. Under that assumption, timber sales from School Fire Salvage Recovery project would generate no net job gain at area sawmills. The most probable influence is a small log price depression effect. If a marginal mill job increase does occur, it would be at the rate of

5 American Forest Resource Council. 1/30/2006. Forest Products Industry Infrastructure Blue Mountains Region

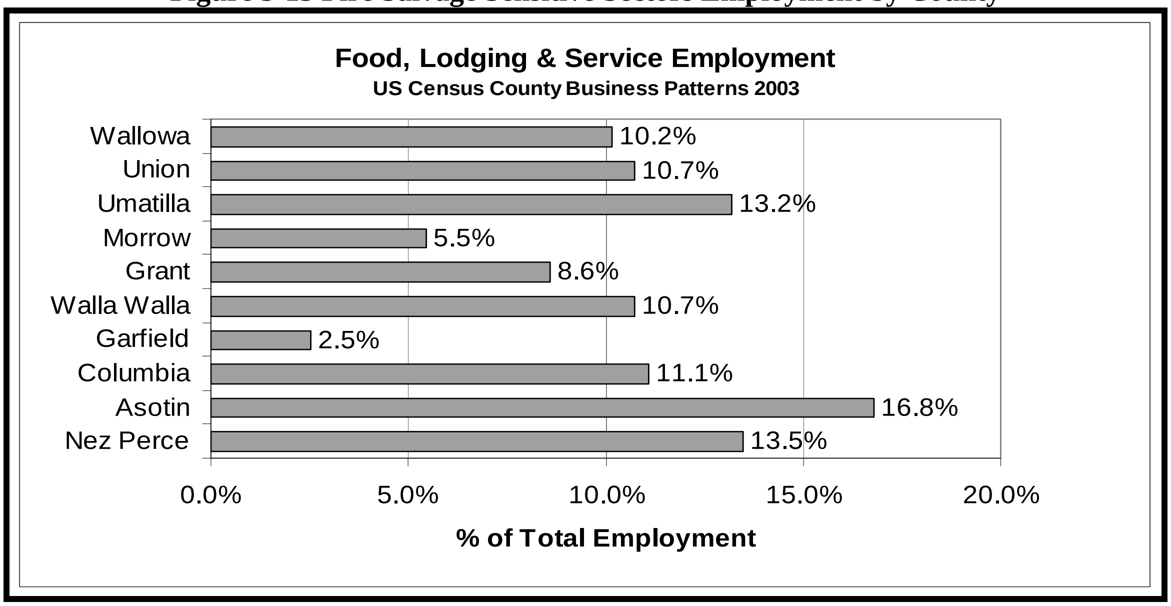
6 ibid

7 Keegan, Charles et al. 2005. Timber use, processing capacity, and capability to use small diameter timber within the USDA-Forest Service eastern Washington timber processing area. Draft report. Montana Bureau of Business and Economic Analysis. U of Montana, Missoula

about 3 jobs per MMBF sustained increase in production, but even that occurs outside of Garfield County.

For logging job and income effects, as a result of their spatial place-of-residence, any loggers employed on the School Fire Salvage Recovery project would have to commute to, or be temporarily relocated in, Garfield County. The most likely sectors that would receive indirect effects from their new place-of-work would be food, lodging, and service sectors. Figure 3-14 shows that these sectors are weak in most of these counties, and almost absent in Garfield County.

Figure 3-15 Fire Salvage Sensitive Sectors Employment by County



Salvage Potential

The School Fire burned across many stands of predominantly Douglas-fir (DF), grand fir (GF), and ponderosa pine (PP). In the most rugged terrain, these were residual stands that had never been logged. On more accessible stands, there had been a long history of logging that had converted natural stands to a managed condition. Only 9,432 acres (19.07 percent) within the entire School Fire perimeter were considered appropriate for possible timber salvage operations. The estimated volume of fire-killed standing dead timber on those acres is 130.5 MMBF.

A discussion of social issues related to salvage harvesting in this project is located in Appendix L of this document.

ENVIRONMENTAL CONSEQUENCES

Alternative A – No Action

Direct/Indirect Effects – Alternative A:

Alternative A would not recover any economic value of dead and dying timber burned in School Fire. There would be no net sale value and no jobs would be created or maintained. There would be no benefits to the local economy from salvage harvest.

Effects Common to Action Alternatives (B and C)

Direct/Indirect Effects – Alternatives B and C:

Estimating Stumpage Sale Effects

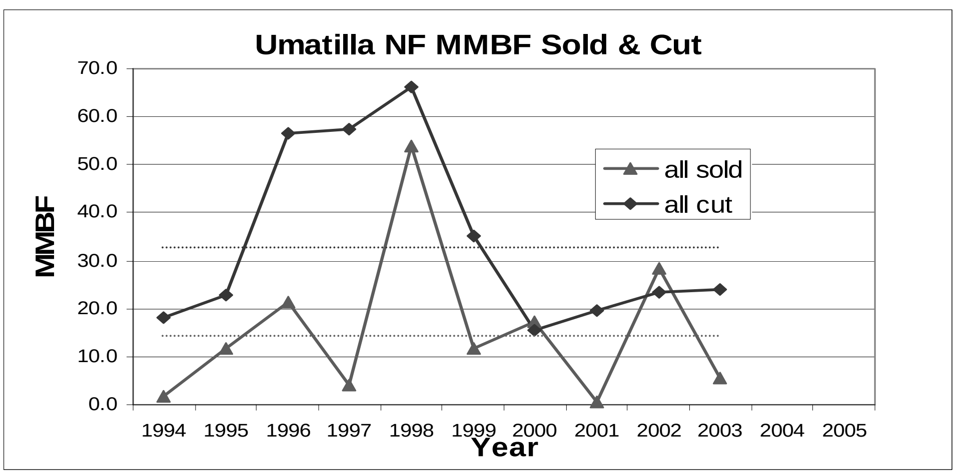
The proposed action, Alternative B, proposes salvage across 9,432 acres (8,262 operable acres). This alternative would provide an estimated timber salvage volume of 84.9 MMBF. To the extent that this is new volume harvested in the vicinity, it should generate some economic effects different from the historical baseline.

Two types of potential employment and income impacts are considered. The first consideration is the direct impacts of both increasing and relocating the Umatilla National Forest's annual timber harvest. An expected modest increase in the average annual timber sale quantity increases the employment of loggers and to some extent maintains the operations of sawmills. The fact that School Fire salvage harvest would substitute for new green sales elsewhere for up to two years also implies a relocation of existing employment. The second, consideration is the secondary (indirect and induced) effects of any new local employment in the vicinity of Garfield County. Estimates are approximate based on employment and income multipliers and inferences from coefficients in regional and state models. More precise estimates are technically possible by using spatially disaggregated input-output analyses, but the economic impacts are expected to be generally too minor and temporary to justify investment in this more expensive technology.

Estimating Net Timber Harvest Change

The Umatilla National Forest's timber sales over the last decade have been erratic as shown in Figure 3-16.[8] The calculated decade average of 15.7 MMBF per year was used as the historical sales program reference base. Under Alternative B, the potential salvage sales could generate an available volume of 84.9 MMBF. The policy implications of salvage replacement for forgone green sales simply substitutes one labor and income base for historical sales so that only excess salvage volume is new. The excess volume over the historical average is considered as a basis for estimating the wood products sector's new economic.

Figure 3-16 Umatilla NF Historical Timber Sales



8 Rudderman, Francis. 2004. Production, Prices, Employment and Trade in Pacific Northwest Forest Products. USDA-Forest Service Pacific Northwest Experiment Station. Portland

Alternative B volume would be expected to be harvested over two years (2006 and 2007). For impact estimation purposes, it is assume that 40.6 MMBF would be harvested in 2006 and the remainder, 44.3 MMBF is assumed would be harvested in 2007. Alternative C volume could be harvest in one year and is estimated to be 38.6 MMBF. The net recoverable volume does drop from year to year, but the loggers and mills have to process gross volume that remains relatively stable. So, relative to the average sales, new 2006 activity could be 24.9 MMBF and new 2007 volume would be 28.6 MMBF. New sale volume for Alternative C would be 22.9 MMBF.

Estimating New and Relocated Logging Incomes

There are two types of relocated logging activity. The first considers that new logging may be done by non-locals. The second recognizes that if the Forest replaces green sales in other portions of the forest with the salvage on the Pomeroy Ranger District, even local loggers shift place-of-work further away from place-of-residence. The reason for this spatial distinction is that the economic impact should vary considerably by place. New economic activity would cause benefits to loggers mostly at their place-of-residence. Income to non-locals should have considerably more leakage out of the local Garfield County economy and toward other counties around the Umatilla National Forest and out of region.

An example of the first job relocation type is when helicopter logging of large sales requires equipment and expertise that exceeds local capacity. The experience Washington Department of Fish and Wildlife on the salvage harvest of their land burned by School Fire was that the volume was sold to a local mill, but that the logging contractor used helicopters from the west coast, loggers from Montana, and slashing crews from Mexico.[9] It is equally likely that the helicopter portion (25.9 percent on a volume basis) of this project would be subcontracted by non-locals. However, there would be local capability to handle volume harvested using skyline and forwarder logging systems. Table 3-101 shows the assumed local and non-local new logging employment.

The 1.5 logging jobs estimates per MMBF are from wood products employment scalars generated in Mendocino County, California.[10] Transportation jobs are not usually included in logging job statistics, so estimated hauling jobs are based on a rate of 1 per MMBF using a 3-load daily rate of production to the nearest mill at Clarkston, Washington. Even though this work should be seasonal, the job counting protocol is that both seasonal and full-time jobs are accounted similarly.

Table 3-101 Assumed Local and Non-Local New Logging Employment

Alternative/ Year	New Total Volume (MMBF)	Helicopter Portion (MMBF)	Other Portion (MMBF)	Non-local Logging Jobs	Local Logging Jobs	Vicinity Direct Income Increase
Alt B 2006	24.9	6.4	18.5	16.0	46.3	$1,171,390
Alt B 2007	28.6	7.4	21.2	18.5	53.0	$1,340,900
Alt B Total	53.5	13.8	39.7	34.5	99.3	$2,512,290
Alt C 2006	22.9	5.9	17.0	14.8	42.5	$1,075,250

Some logging, such as felling, is well paid employment with high hourly rates. Other jobs, such as brushing and slashing can have low hourly wages. In addition, workday limitations (e.g., fire season, wet season, high wind days) greatly reduce average annual incomes. Using income estimates per job of $25.3

9 Douglas Washington Fish and Game forest manager

10 Taylor, Vince. 7/14/2004. Jackson State Forest Management Effects on County Income and Employment. Mendocino Co. California report

thousand/year[11] and only local job creation, the total local vicinity direct income increase should be approximately $2.5 million for Alternative B and $1.1 million for Alternative C. As noted above, milling employment is not expected to change markedly as local mills are regional mills and are operating at historical norms [12] and salvage log volumes would probably substitute for current green log volumes.

Garfield County Secondary Benefits

As far as Garfield County secondary benefits are concerned, all the place-of-work jobs associated with the total salvage volume are effectively new relocated spending for daily sustenance. Total direct income change estimates are less relevant as new place-of-work income is so temporary. Most of a logger's expenses for capital and personal equipment and clothing would occur at place-of- residence instead of place-of-work. Out of area loggers would temporarily relocate, but transient labor often brings food and housing with them (trailers, campers etc.). In the extreme case of loggers from adjacent counties, they would probably commute. As a result, calculated net local secondary income based on hypothesized total daily spending of $98/day with expected local spending patterns of $49/day as shown in Table 3-102

Table 3-102 Hypothetical Local Logger Spending

Item	Daily Rate (Dollars/Day)	% Local	Prorated (Dollars/Day)
Food	30	50%	15
Lodging	45	50%	22.5
Fuel	15	50%	7.5
Misc	8	50%	4
Total	98		49

Local income is limited to the locally retained proportion of new spending. In a low trade hierarchy community most goods are imported, so local spending retention is generally limited to the retail sales margin that includes local merchandizing costs as well as profits. Typically, retail fuel and groceries have extremely low retail margins often less than 3 percent. Retail lodging and restaurants may exceed 20 percent. Assume a return to capital of 5 percent and use a cost margin of 8 percent to estimate local new incomes (labor costs and profits).

This technique only captures some of the secondary effects and ignores recirculation effects (indirect and induced) of increased local spending locally. However, recirculation of monies within the community would also be small due to the few opportunities for locals to spend income locally. The secondary income effect mimics a chain of diminishing local sales percentages keyed to the initial local income margin. The approximation is sufficient as new net income is likely to itself high leakage to regional trade centers. Results are for an 8 percent initial local sales retention as shown in Table 3-103.

Table 3-103 Increases in Local Income due to School Fire Salvage Sales.

Alternative /Year	Total Volume (MMBF)	Logging Days	New Jobs	Work Days	Gross Income (dollars)	Net Income (dollars)
B (2006)	40.6	101.5	62.3	6,323.5	309,849	26,771
B (2007)	44.3	110.8	71.5	7,918.6	388,013	33,524
B (Total)	84.9	212.3	133.8	14,242.1	697,862	60,295
C (2006)	38.6	96.5	57.3	5,529.5	270,943	23,409

11 ibid

12 Keegan et al. 2006. ibid

A similar technique was applied to estimate the local income effects of slashing and planting crews. It was assumed that these activities would take place the following planting season and for simplicity that crews would be burning/slashing and planting simultaneously. This compresses what is normally a fall activity with a spring one. The daily expenditures are lower, but the local percentage of expenditures is higher as these crews typically stay in the vicinity for the short seasons (assumed 40 days). Table 3-104is based on acres accomplished instead of the volume base that the loggers had.

Table 3-104 Increases in Local Income due to School Post-Salvage Projects

Alternative	Total Area	Site Prep Days	Planting Days	Work Days	New Workers	Gross Income	Net Income
B	8,065	4032.5	2,688.3	6,720.8	168.0	344,443	29,760
C	3,663	1831.5	1221.0	3,052.5	76.3	156,441	13,516

Fire Date Salvage Values

While the estimated volume of fire-killed standing dead timber is 130.5 MMBF. The salvageable dead timber volume is significantly less than the volume killed. Three volume reduction factors were applied to estimate initial fire date recoverable volume. First, there is a charred and consumed volume reduction that is based on local estimates of volume loss by burn severity. Second, the forest inventory statistics showed that there was inherent pre-fire tree defect that reduced the net volume. Finally, the post-fire treatment prescriptions called for snag retention of at least 6 snags per acre for wildlife and stand structure. There is also a volume reduction caused by removing riparian acreage from any unit containing direct riparian influence. Table 3-105 shows adjusted estimated salvage volume by alternative. Note that acres used in this estimate differ from other areas of this document and have been reduced to estimated operable ground.

Table 3-105 Potential Salvage Volume

Alternative	Acres	Volume (MMBF)
B	8,262	84.9
C	3,860	38.6

Fire date value estimates were calculated in two steps. First, the stumpage market and logging cost factors are explored in detail, and then they are applied to the available volume by alternative. Planning polygons units were grouped in zones to facilitate analysis.

The market for stumpage is driven by the market value of logs which is in turn driven by the final demand for lumber and other wood products. Estimated stumpage prices are calculated as the net residual value after the cost of bringing those logs to market has been deducted.

This analysis uses a residual value appraisal (RVA). The RVA starting point is date-of-fire local reported. These log values are adjusted for the post-fire charred value degrade estimates computed from the R-6 TEA (transaction evidence appraisal) historical data. There is further adjustment for expected log size class distribution premiums.

Expected logging, hauling, road and timber sale costs are not species dependent and are drawn from a variety of sources. The RVA model uses a single base reference cost for the cheapest form of logging proposed (forwarder) and for the lowest cost hauling zone. When these costs are subtracted, the residual is a highest expected reference stumpage price by species.

The most valuable species are western larch and Douglas-fir. These have relatively low salvage initial degrade factors and significant log size premiums. Ponderosa pine in its old growth “yellow pine” form can be a relatively high valued species. Ponderosa pine in its second growth “bull pine” form has low values. The starting point for Ponderosa pine is an average of these types. Ponderosa has a very high salvage initial degrade factor. Values of recoverable pulp wood and biomass wood are also calculated, but they have such low delivered log values that the base costs drive their collection submarginal from the first calculation. As pulp base stumpage is (-$94/MBF [thousand board feet]), and biomass is (-86/MBF), those values are dropped from consideration even though loggers may occasionally collect it once on-site costs are amortized by positive valued sawlogs.

Most of the 321 planning polygon units (Appendix D) have unique combinations of species value composition and are subject to differing cost adjustments. The first step in unit specific value calculations is a zone and harvest system adjustment. This is a “penalty” cost adjustment (- $/MBF) applied to volumes in more distant haul zones or units that have more expensive helicopter or skyline logging required.

Helicopter logging is estimated to cost $135/MBF more than forwarding. Skyline logging typically costs $40/MBF more than forwarding. These logging systems are required for site protection reasons, but can markedly reduce on-site stumpage values. The haul zone adjustment looks at hauling cost differences between zones to an arbitrary central node as well as road reconstruction and maintenance costs that are zone associated.

The fire date valuation model generates a matrix of 189 different unique stumpage prices. Of these, 14 are for negatively valued pulp and biomass so they are discarded. For sawtimber stumpage the average price is $145.42/MBF. There is so much stumpage price variability that logging and haul cost adjustments are applied to each of the 321 planning polygon salvage units separately. Each unit species volume is multiplied by each unit’s species price to generate unit specific total fire date salvage values. Table 3-106 shows the aggregate fire date salvage values by alternative.

Table 3-106 Aggregate Fire Date Stumpage Values by Alternative

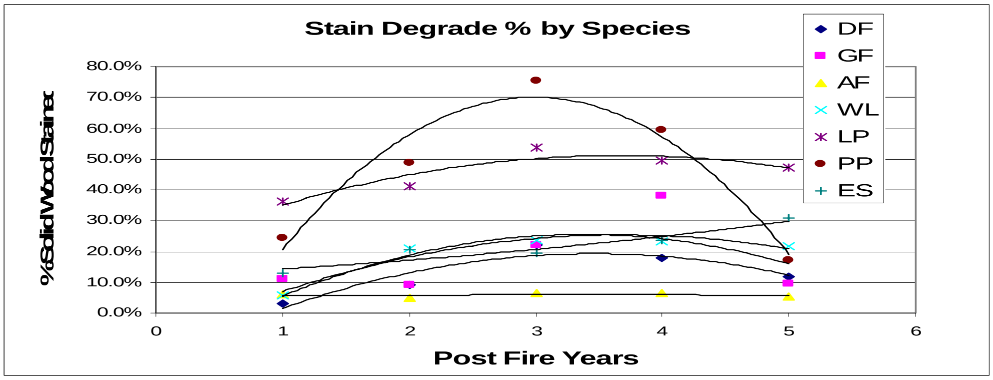
Alternative	Volume (MMBF)	Value ($ million)
Alternative B	84.9	$ 13.2
Alternative C	38.6	$ 5.9

Post-Fire Volume and Value Loss

Fire date salvage price differentials are identified in the stumpage values above. However, over time the volume and quality of dead standing timber deteriorates. The wood volume that is considered recoverable will steadily decline as will the delivered value. The rate that standing dead trees deteriorate over time has been widely studied. That literature identifies four significant factors affecting recoverable value and volume. Degrade from sapwood stains affects delivered log value particularly in the pines. There is actual recoverable volume loss from decay, weather checking, and dead falls. Although some dead falls do initially retain some recoverable volume, proximity to the ground accelerates deterioration.

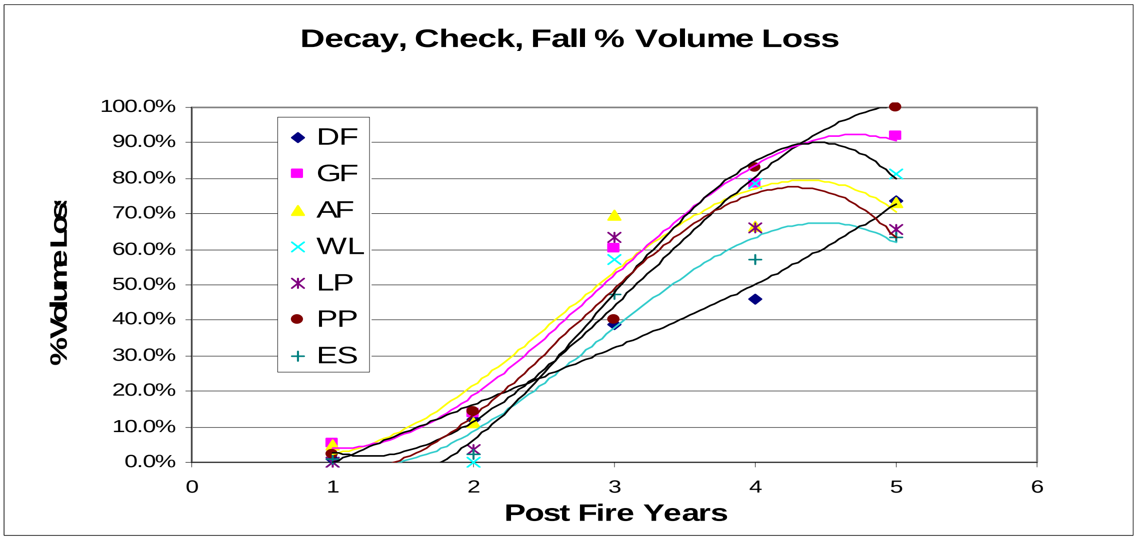
Deterioration factors affect various species differentially. The rates of post-fire mortality, recoverable volume decline, and wood grade decline vary extremely depending on initial tree condition, species, climate, and ecosystem conditions. Figure 3-17 shows rate of stain differentials. The pines, ponderosa (PP) and lodgepole (LP), get sapwood blue stained very quickly. The rate drops after 3 years as there is less sapwood remaining to be degraded. Grand fir (GF), Douglas-fir (DF), western larch (WL) and Englemann spruce (ES) are moderately degraded. Subalpine fir (AF) remains almost unstained.

Figure 3-17 Post-Fire Stain Degrade by Species



The physical deterioration (rot, check, and dead-fall) also varies considerably as shown in Figure 3-17. There is significant difference in the first two years, but then deterioration in all species accelerates. At the end of five years most species have almost zero percentage of net recoverable volume. However, DF, ES and AF would retain some minimal volume and value.

Figure3-18 Post-Fire Volume Loss by Species



Recoverable Salvage Value Over Time

Delays in the sale of salvage would cause value declines due to volume and log grade loss. A value-loss model was used to simulate the rate of recoverable volume loss in each polygon planning unit and at the same time calculates a new stumpage price for each incremented period. The value-loss model combines these physical and financial effects and calculates unit stumpage values over time. In addition, market conditions input tracks the expected change in wood products (log) market prices. It also generates a curve of aggregate date-of-sale stumpage value estimates for an entire alternative. Both alternatives behave similarly. In the first post-fire year there is a small value loss that accelerates rapidly in year two. From then the percentage net recoverable volume declines rapidly and it is applied to a smaller remaining base. The curve for Alternative B is shown in Figure 3-19 (see Economic Report in analysis for details on calculations).

Figure 3-19: School Fire Alternative B Value Loss by Year

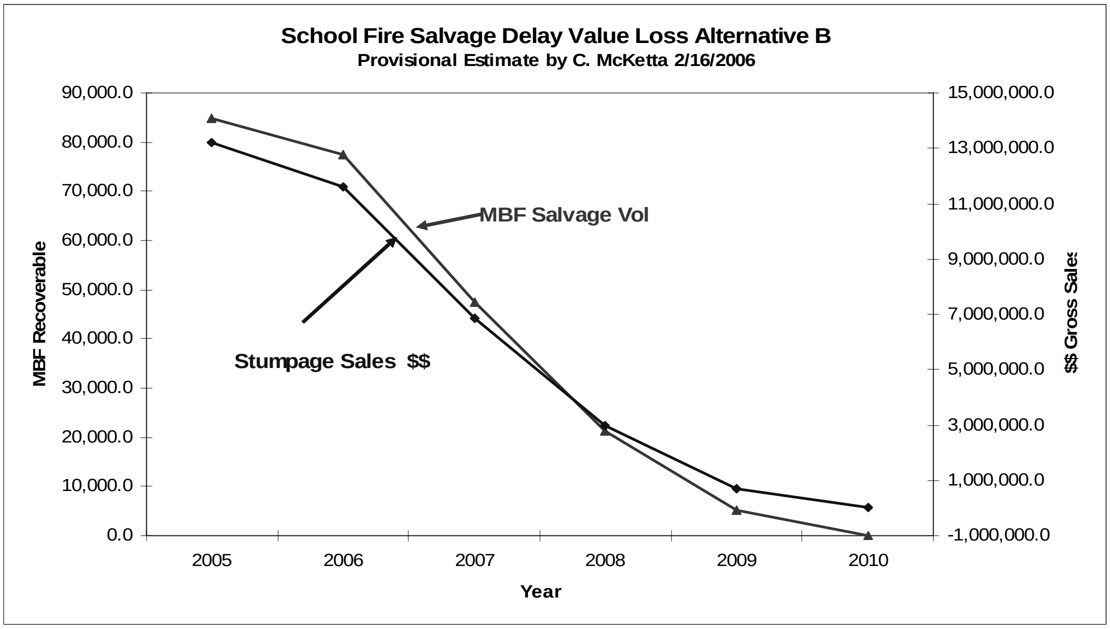


Table 3-107 shows the same data in tabular form.

Table 3-107 Alternative B Stumpage Value Loss over Time

Year	Calendar Year	MBF	Total Value $	MBF Loss %	Value Loss %
0	2005	84,907	13,207,874	0.0%	-0.0%
1	2006	77,505	11,597,258	-8.7%	-12.2%
2	2007	47,399	6,851,744	-44.2%	-48.1%
3	2008	21,172	2,972,711	-75.1%	-77.5%
4	2009	5,094	700,163	-94.0%	-94.7%
5	2010	0	0	-100.0%	-100.0%

Figure 3-20 and Table 3-108 show a similar trend for Alternative C

Figure 3-20 Dynamics of C Salvage Recoverable Volume and Value Loss

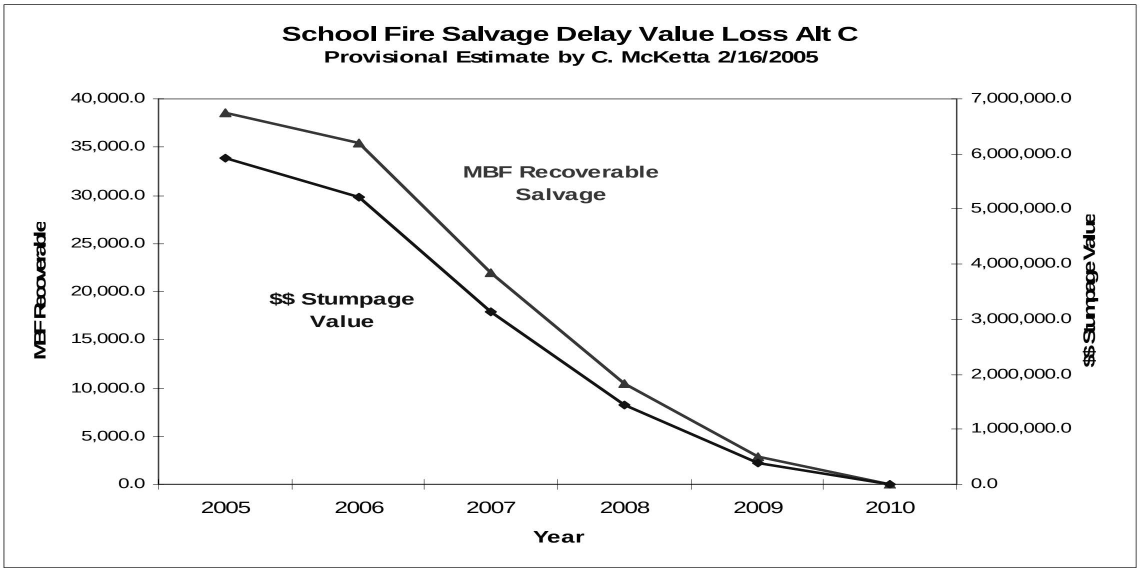


Table 3-108 Alternative C Stumpage Value Loss over Time

Year	Calendar Year	MBF (thousand board feet)	Total Value $	MBF Loss %	Value Loss %
0	2005	38,555	5,917,482	0.0%	-0.0%
1	2006	35,405	5,223,133	-8.2%	-11.7%
2	2007	22,002	3,127,475	-42.9%	-47.1%
3	2008	10,399	1,431,381	-73.0%	-75.8%
4	2009	2,878	387,448	-92.5%	-93.5%
5	2010	0	0	-100.0%	-100.0%

The data for both alternatives demonstrates that volume and value loss is commensurate with time. While the initial value loss in the first year after the fire is relatively small, it increases dramatically after that. Five years after the fire, there is no value remaining.

Costs

Since the fire date, the Pomeroy Ranger District has invested in post-fire damage estimations, standing dead timber assessment and a NEPA project evaluation and planning processes. Following Region 6 protocol, this analysis does not include any of these planning and preliminary costs. At the point that the sale offering is authorized, these costs are considered sunk. This report also ignores regional overhead costs. Timber sales layout and administration costs typically vary by the volume of sales being managed. In Table 3-109 the sales preparation effort and sale administration rates are combined into a single agency cost per MBF sold.[13]

[13] Siskiyou NF. 2003. Biscuit Fire DEIS

Table 3-109 Salvage Sale Administrative Costs

Alternative	MBF	$/MBF	Total Cost
B	84,907	$27	$2,292,489
C	38,555	$27	$1,040,985

Post-Salvage Fuel Treatment and Reforestation Costs
Table 3-110 shows the extent of the planned post-salvage operations that have been identified. Costs were based on district experienced cost for similar projects.

Table 3-110 Post Salvage Fuel and Reforestation Costs per Acre

Alternative	Slash/Broadcast ($200/acre)	Planting ($200/acre)	Jackpot Burning ($75/acre)	Total
B-Acres	1,483	9,432	3,132	
B Total Cost	$296,600	$1,886,400	$234,900	$2,417,900
C Acres	925	4,188	760	
C Total Cost	$185,000	$837,600	$57,000	$1,079,600

The potential returns to the treasury from School Fire timber salvage sale are significant, at up to approximately $11.6 million potentially spread over two years. These revenues could potentially be used to offset some or all of the costs associated with post sale activities. Funds collected through KV could also be used fund other restoration activities analyzed in this document.

Total increase job and income effects of School Fire timber salvage sales are also significant at almost $2,500,000 million over two years for Alternative B, and $1,075,250 for Alternative C. This is substantial even though it is assumed that logs would generally replace green volume at area mills so that job gains are limited to the logging and transportation sectors. The transient nature of new jobs and high income leakage in all economic sectors causes combined spending of approximately $1 million for Alternative B and $427,000 for Alternative C in Garfield County, with very low levels of locally retained new income, probably $40,000 or less per year. Even if there are errors of approximation in the techniques employed, the net local income effect remains small.

INVENTORIED ROADLESS AREA

SCALE OF ANALYSIS

Scale of analysis will be the School Fire area.

AFFECTED ENVIRONMENT

The term inventoried roadless area (IRA) refers to an area usually of at least 5,000 acres, without developed and maintained roads, and substantially natural condition that was inventoried as part of either the National Roadless Area Review Evaluation (RARE II) process or the Land and Resource Management Planning process (36 CFR 219.27 (c). Two IRAs are in or adjacent to School Fire

boundaries. Willow Springs IRA is within School Fire Salvage Recovery project area. Meadow Creek IRA is adjacent to the project area.
The Willow Springs Roadless Area (No. 14015) was inventoried for study as a potential wilderness during the development of the Oregon Butte Plan Environmental Impact Statement. At that time, it contained 14,000 acres and was allocated to non-wilderness use by the Record of Decision signed April 1977. By June 1990, when the ROD for the Umatilla National Forest Land and Resource Management Plan was signed, timber sales (Cummings Creek) reduced the un-roaded portion to 11,100. Following are criteria used in evaluating it for potential wilderness:

- Natural Integrity – Human influences have had limited impact on the natural appearance or long-term ecological processes of the Willow Springs area. Natural balances, even where altered in the past, are intact and operating.

- Opportunity for Solitude and Primitive Experience – Due to its shape and the way it lays, opportunities for a feeling of solitude, the spirit of adventure and awareness, serenity, and self-reliance do not really exist within this area. Roads to the east and west and timber harvest activities to the east present nonconforming sights and sounds to nearly the entire roadless area.

- Appearances, and Attractions – The Willow Springs IRA is that of one slope of a deep, rugged canyon (Tucannon River) which is appendaged with a section of another deep, rugged canyon (Cummings Creek), Both of which are rather sparsely covered with forest vegetation. Wenaha-Tucannon Wilderness lies about 0.25 miles south of the southern most point the IRA across Forest Road 4712. There are no primary attractions within the Willow Springs Area.

Meadow Creek Roadless Area (No. 14018) was also inventoried for study as a potential wilderness as part of the Oregon Butte Plan. At that time it contained 5,400 acres and was allocated to non-wilderness use. By 1990, management activities, primarily on the west and south sides, reduced the unroaded portion. However, the Umatilla National Forest Land and Resource Management Plan added portions of the Upper Tucannon area to compensate for the loss and its current size is about 5,000 acres. Following are criteria used in evaluating it for potential wilderness:

- Natural Integrity - Human influences have had limited impact on the natural appearance or long-term ecological processes of the Meadow Creek area. The area is free of disturbances; and natural balances, even where altered in the past, are intact and operating.

- Opportunity for Solitude and Primitive Experience – Due to its shape and the way it lays, opportunities for a feeling of solitude, the spirit of adventure and awareness, serenity, and self-reliance do not really exist within this area. Roads to the east, north and west and timber harvest activities to the north, west, and south present nonconforming sights and sounds to nearly the entire roadless area.

- Appearances, and Attractions – The look of Meadow Creek IRA is that of a long, steep, east-facing slope. There is no primary attraction within Meadow Creek. Its primary attribute is that it shares about 2.5 miles of common boundary with the Wenaha-Tucannon Wilderness.

ENVIRONMENTAL CONSEQUENCES

Alternative A – No Action

Direct/Indirect and Cumulative Effects:
There would be no direct, indirect or cumulative effects to Willow Springs or Meadow Creek IRAs, because no project activities would occur in either of the IRAs. Any changes to the IRAs would be through natural processes.

Effects Common to Action Alternatives (B and C)

Direct/Indirect and Cumulative Effects:
There would be no direct, indirect or cumulative effects to on-the-ground roadless resources for Willow Springs or Meadow Creek IRAs. No salvage recovery activities are proposed in either alternative. Effects to potential wilderness criteria would be as follows:

- Natural Integrity – Natural integrity would remain the same for both IRAs, as it currently exists. There would be no additional human influences on the natural integrity of either IRA.

- Opportunity for Solitude and Primitive Experience – This would remain the same for Willow Springs and Meadow Creek IRAs since roads to the north, south, east and west would continue to present nonconforming sights and sounds to nearly the entire roadless area for both IRAs.

  In the short-term, audio and visual effects from management activities of mechanical salvage removal and prescribed fire treatments would affect visitor's primitive recreation experience and opportunity for solitude. The presence of smoke would also have a short-term effect on visitors.

- Appearances and Attractions – There would no effect to appearances or attractions in the Willow Springs or Meadow Creek IRAs. There are no primary attractions in either IRA.

Finding of Consistency:
All alternatives, including the No-Action alternative, would be consistent with Umatilla National Forest plan standards and guidelines. There are no activities proposed in either Willow Springs or Meadow Creek Roadless areas, therefore there would be no change in roadless area character.

UNDEVELOPED CHARACTER

SCALE OF ANALYSIS

Scale of analysis will be the School Fire Salvage Recovery project area.

AFFECTED ENVIRONMENT

Analyzing the undeveloped character of any area does not have a specific definition or protocol. In general they might possess characteristics similar to inventoried roadless areas. There are no other areas within School Fire Salvage Recovery project area that meet or exceed the 5,000 acre size criteria for roadless.

A portion of School Fire Salvage Recovery analysis area was analyzed for potential undeveloped character relative to roadless characteristics in both the Oregon Butte Unit Plan and the Umatilla National Forest Land and Resources Management Plan. There are no other areas within School Fire Salvage Recovery area that were determined to be suitable for either wilderness or inventoried roadless designation. Based on that determination, some previously unroaded areas did receive management activities associated with road building and timber harvest.

School Fire left a very strong impression across the landscape. Areas that might have contained undeveloped or unroaded qualities generally experienced stand replacing fire because the largest unmanaged blocks of land are located in isolated canyons or on steep slopes. Those unroaded tracts of landscape did provide habitat for wildlife or did contribute to other resource cycles (nutrients, soil development, climax vegetation, etc.). Discussion of these relationships can be found under each specific resource section in other parts of this chapter. In terms of natural integrity; opportunity for solitude and primitive experience, and appearances and attractions, any remaining unroaded areas in School Fire Salvage Recovery project area have now been altered by past management activities, development of summer homes in Bakers Pond (private land adjacent to the area), checkerboard ownership with Washington State Department of Fish and Wildlife Service lands and federal lands in Tucannon River drainage, Pomeroy District dispersed camping sites and Rose and Stentz Springs summer home tracts.

ENVIRONMENTAL CONSEQUENCES:

Effects to undeveloped character must be view differently. Effects of project activities to other resources, such as vegetation, soils, water quality, fish, plants and wildlife, relative to undeveloped characteristics are disclosed in other sections of this chapter.

There are no large blocks of land where the undeveloped character of the area meets the minimum criteria of 5,000 acres or greater that might make them potentially designated as an IRA or wilderness area. Nor are there areas of undeveloped character adjacent to an existing IRA or wilderness area suitable for consideration. It should also be noted that any undeveloped areas have been analyzed twice in the past for these purposes and both times were deemed as unsuitable for IRA or wilderness designations. No proposed management activities would preclude any roadless area or unroaded areas from being considered an area of wilderness potential in the Umatilla Forest Plan revision process.

Alternative A – No Action

Direct/Indirect and Cumulative Effects:

There would be no direct, indirect or cumulative effects to alter the undeveloped character of any undeveloped lands because management activities are not proposed. Smaller areas that were previously unroaded would still experience effects from surrounding management activities in terms of visuals, noise and lack of primitive experiences. No additional temporary roads would be constructed, nor would any existing temporary roads be decommissioned. Effects to fish and wildlife are discussed in other sections of this chapter, but it can be surmised that wildlife trails will be difficult to navigate in future years due to downfall, blowdown or debris plugging travel routes. Because of School Fire, there are not many natural appearing landscapes with high scenic quality remaining as discussed in the visuals section, but over time, vegetation will respond and create screening or ground cover.

Effects Common to Action Alternatives (B and C)

Direct/Indirect and Cumulative Effects:

There would be no direct, indirect or cumulative effects to alter the undeveloped character of any land because there are no large blocks that meet the minimum criteria of 5,000 acres or greater. Nor are there areas of undeveloped character adjacent to an existing IRA or wilderness area suitable for consideration. A determination of areas of wilderness potential through the forest plan revision process would not be affected by either alternative. Effects to potential wilderness criteria are as follows:

- Natural Integrity – Commercial and non-commercial harvest in conjunction with prescribed fire would alter the natural integrity of the area in the short-term in all action alternatives. The visual impact of skid trails in forwarder harvest would have the most impact, but forwarder units are located in areas that have already been modified in the past. Skyline corridors would remain visible for a brief period of time, but would fade as vegetation re-establishes itself. The majority of skyline harvested units are located in previously roaded areas. Effects of helicopter salvage harvest would be limited to stumps, and for a short period of time treatment of activity fuels. The effect of prescribed burning would be associated with short-term smoke and noise and a burned appearance. This would not be out of character with the current existing condition in the surrounding area. Effects would be short-term and could appear as natural and would fade over time.

  New temporary road construction in Alternative B would not impact the natural integrity of the area. All temporary roads would be closed and rehabilitated when post-sale activities are complete. This would effectively return areas of disturbance back to natural processes and integrity. Selection of an action alternative would in fact result in more areas of undeveloped character and less open roads than the existing condition due to proposals for road decommissioning of unauthorized temporary roads.

- Opportunity for Solitude and Primitive Experience – Short-term, audio and visual effects from management activities of mechanical vegetation removal and prescribed fire treatments would affect a visitor’s primitive recreation experience and opportunity for solitude. The presence of smoke would also have a short-term effect on visitors.

  The long-term effect would remain the same as the existing condition. Activities on adjacent private lands such as development of summer homes in Bakers Pond, checkerboard ownership with Washington State Department of Fish and Wildlife Service lands and Federal Lands in Tucannon River drainage, District dispersed camping sites and Rose and Stentz Springs summer home tracts have altered the nature of any areas that previously were considered undeveloped. This presence of private and forest development severely limit opportunities for solitude and primitive experience.

- Appearances and Attractions – Other than noted above, there would no effect to appearances or attractions in the School Fire area. There are no primary attractions in the area.

Finding of Consistency:

All alternatives, including the No-Action alternative, would be consistent with Umatilla National Forest plan standards and guidelines. Activities proposed in all action alternatives are consistent with Forest Plan Management Area allocations. While undeveloped areas, in the context used here, were not specifically mentioned, the same effects to other resources can be described and discussions can be found under the specific effected resource area in other sections of this document. There are no planned activities that would change the wilderness potential, unroaded or undeveloped character of any area within School Fire.

SPECIFICALLY REQUIRED DISCLOSURES

This section describes how the action alternatives comply with applicable State and Federal laws, regulations, and policies.

National Historic Preservation Act – Before project implementation, heritage surveys will be completed. State Historic Preservation Office consultation will be conducted under the Programmatic Agreement among the United States Department of Agriculture, Forest Service, Pacific Northwest Region (Region 6), the Advisory Council on Historic Preservation, and Washington State Historic Preservation Officer regarding Cultural Resource Management on National Forests dated April 1997. Identified sites and any newly recorded sites will be protected from all project activities associated with School Fire Salvage Recovery project. Because heritage resources would not be affected by proposed activities under any action alternative, there would be no effect to any historic property listed in or eligible to the National Register of Historic Places.

Endangered Species Act and Regional Forester's Sensitive Species - The Endangered Species Act requires protection of all species listed as "Threatened" or "Endangered" by Federal regulating agencies (Fish and Wildlife Service and National Marine Fisheries Service). The Forest Service also maintains through the Federal Register a list of species which are proposed for classification and official listing under the Endangered Species Act, species which appear on an official state list, or that are recognized b the Regional Forester as needing special management to prevent their being placed on Federal or State lists. Biological Evaluations, Assessments and have been completed for all TE&S plant, aquatic and terrestrial wildlife. Determinations were made that none of the proposed actions would adversely affect, contribute to a trend toward federal listing, nor cause a loss of viability to listed plant, fish, and animal populations or species. Details are found in the Fisheries, TE&S Plants, and Wildlife sections of this document.

Consultation will be completed prior to signing of the Record of Decision (ROD). Agreement of findings will include Chinook Salmon Essential Fish Habitat (EFH), which satisfies requirements under the Mangnuson-Stevens Act.

Wild and Scenic River Act – There are no Wild and Scenic Rivers within the project area. No designated or potential wild and scenic river sections would be affected by implementation of any alternative.

Prime Farmland, Range Land and Forest Land - No adverse effects on any prime farmland, range land and forest land not already identified in the Final FEIS for the Forest Plan would be expected to result from implementation of any alternative.

Civil Rights, Women and Minorities - No adverse effects on civil rights, women, and minorities not already identified in the FEIS for the Forest Plan would be expected to result from implementation of any alternative. Alternatives B and C would be governed by Forest Service contracts, which are awarded to qualified contractors and/or purchasers regardless of race, color, sex, religion, etc. Such contracts also contain nondiscrimination requirements.

National Forest Management Act Compliance – The National Forest Management Act of 1976 (P.L. 94-588), including its amendments to the Forest and Rangeland Renewable Resources Planning Act of 1974 (P.L. 93-378), states that when trees are cut to achieve timber production objectives, the cuttings shall be made in such a way that "there is assurance that such lands can be adequately restocked within 5 years after harvest" (P.L. 93-378, Sec. 6, (g), (3), (E), (ii)).

In the School Fire analysis area, a reforestation need was created by wildfire rather than timber harvest because all of the trees proposed for removal in salvage units were killed or injured by fire, or by insects or diseases that attack and kill fire-injured trees.

Even though fire was the tree-killing agent in the School Fire analysis area (i.e., the trees were not killed by the proposed action of salvage timber harvest), Forest Service policy and interpretation is that NFMA requires salvage units to be reforested within 5 years of harvest (Kline 1995, Goodman 2002).

The only exception to this five-year reforestation requirement is for salvage timber harvest on unsuitable lands (Kline 1995), since those areas do not have a "timber production objective" according to suitability determination criteria established by the Umatilla National Forest's Land and Resource Management Plan (see appendix J to the final environmental impact statement for the Forest Plan (USDA Forest Service 1990b)).

For burned areas where the fire-killed trees are not salvaged, NFMA does not require that reforestation occur, whether within a 5-year timeframe or at all. Even so, the United States Congress and the U.S. Forest Service are interested in reforesting many of the burned areas promptly, particularly when tree planting could attain a Forest Plan desired future condition more quickly than by waiting for natural plant succession to restore appropriate forest cover (Kline 1995, Goodman 2002).

This reforestation policy is based specifically on language from the National Forest Management Act of 1976 (P.L. 94-588), including its amendments to the Forest and Rangeland Renewable Resources Planning Act of 1974 (P.L. 93-378): "Sec. 3 (d) (1) It is the policy of the Congress that all forested lands in the National Forest System be maintained in appropriate forest cover with species of trees, degree of stocking, rate of growth, and conditions of stand designed to secure the maximum benefits of multiple use sustained yield management in accordance with land management plans."

The objective of tree planting, hand scalping, animal damage control and other connected actions is to adequately restock the salvage timber harvest units and thereby reestablish appropriate forest cover for these activity areas.

Created openings resulting from the School Fire salvage timber harvest proposed action, particularly those where natural regeneration might not be sufficient to adequately restock the areas within 5 years of harvest (as required by NFMA), would be planted with tree seedlings to reestablish an ecologically appropriate mix of early- and mid-seral tree species and to ensure that minimum stocking objectives from the Forest Plan (Table 1-1) are met within 5 years of final harvest.

In situations where salvage timber harvest follows a high-severity disturbance event (such as the "natural catastrophic conditions such as fire, insect and disease attack, or windstorm" language used by NFMA amendments to the Forest and Rangeland Renewable Resources Planning Act of 1974; see Sec. 6, (g), (3), (F), (iv)), an area would not be classed as a created opening when the live-tree density, after salvage timber harvest, meets or exceeds the "minimum acceptable stocking" standards specified by Forest Plan working group (Table 1-1).

"Salvage timber harvest" refers to removal of trees that are already dead, plus any trees that are in imminent danger of being killed by insects or other injurious agents. "Imminent danger" refers to trees exhibiting symptoms such that they would reasonably be expected to die within 5 years, as based on a professional determination by entomologists and pathologists (Devlin 1998a, 1998b; Scott et al. 2002, 2003).

Treaty Trust Responsibilities - In this analysis, the primary focus of the federal government Trust Responsibility is the protection of the treaty rights and interests that tribes reserve on land included in this project. Both the Nez Perce Tribe and the Confederated Tribes of the Umatilla Indian Reservation have treaty rights and interests in the School Fire area. Members of the Tribes identified the rights they believed most at risk in the proposal. Of major concern are the potential impacts on fish habitat and populations and water quality, which are key components of aquatic habitat, and the protection of archaeological sites and Traditional Cultural Properties.

Cultural Resource surveys were conducted to locate cultural sites and gather the information necessary to evaluate historic properties. Before project implementation, State Historic Preservation Office consultation will be completed under the Programmatic agreement between the Forest Service, Advisory Council on Historic Preservation and the Washington State Historic Preservation Officer. Identified sites and any newly recorded sites will be protected from all project activities associated with the School Fire Salvage Recover Project.

Salvage harvest has the potential to negatively affect water quality and thus indirectly aquatic habitat. The effects of harvest and associated activities on water quality are discussed in the Hydrology/Water Quality section in this chapter. It was found that effects of the action alternatives would not adversely or measurably affect water quality. The action alternatives were designed to prevent damage to RHCAs. Riparian and channel components that protect water quality would be maintained. Other design criteria and BMPs would control disturbance that could lead to erosion and sedimentation.

Both Threatened and Sensitive aquatic species and Designated Critical Habitats are documented within School Fire Salvage Recovery project area. The effects of harvest and associated activities on aquatic species and habitats are found in the Fisheries section. It was determined that both action alternatives "May Affect Listed species and Designated Critical Habitats" in the affected sub watersheds. The majority of effects would come from ongoing state and private actions and from the proposed federal action. Neither of the action alternatives is expected to significantly add to effects of the School Fire and ongoing recovery processes.

Based on the analysis summarized above, it is reasonable to assume that treaty rights will be protected during implementation of the proposal.

Roads Analysis - A Forest Wide Roads Analysis was completed in March 2004 on the Umatilla National Forest. The forest scale analysis addressed only those National Forest System Roads maintained for passenger car traffic, arterial and collector roads. Only a few of these roads are located within the School Fire Salvage Recovery analysis area. Most roads located in the fire area are maintained for high clearance vehicle travel and use normally consists of vehicle travel for dispersed recreation, project and administrative purposes. Preliminary transportation planning for the School Fire area began in the fall of 2005, with inventories and surveys of existing roads within the burn area. Following Forest Service Transportation Policy direction, the ID Team conducted a Roads Analysis across the fire area, completing the analysis in February 2006. A copy of this report is contained in the project analysis file located at the Pomeroy Ranger District. The purpose of the School Roads Analysis was to identify opportunities for future road management actions based on the benefits, problems, and risk associated with the existing roads system. The plan addressed 85 miles of local Forest Service Roads within the analysis area.

Most of the School Fire Area is outside Inventoried Roadless Areas had previous harvest entries and many old unauthorized roads exist in the area, although many have been naturally reclaimed and decommissioned. These unauthorized roads were generally not designed and usually were built to provide temporary access for timber harvest or fire control. However in some cases these roads were the result of illegal recreation use.

The School Roads Analysis recommended that no permanent changes to the current road system be made. To facilitate implementation of the School Fire Salvage Recovery Project, 45 miles of open roads and existing closed system roads would be used for hauling. Previously decommissioned and unauthorized roads would be temporarily used and some new temporary road construction would occur (Table 2-4). After the project is completed, system roads would be restored to pre-activity condition. Open roads would remain open and closed roads would continue to be closed. All new temporary roads constructed and roads used in a temporary manner would be decommissioned after project activity use. The School Roads Analysis also identified other unauthorized roads which are not being used in this project, for decommissioning. This work will be accomplished as funding becomes available.

Wetlands and Floodplains - No adverse effects on wetlands and floodplains not already identified in the FEIS for the Forest Plan would be expected to result from implementation of any alternative. Wetlands associated with streams and springs would be protected using design features previously identified in Chapter 2.

Energy Requirements - No adverse effects on energy requirements would be expected to result from implementation of any alternative.

Public Health and Safety - Public health and safety would be improved with Alternatives B and C removing danger tree along open forest routes, haul routes, developed recreation sites and administrative sites withing the School Fire Salvage Recovery project area.

Environmental Justice – No local minority or low income populations were identified during scoping or effects assessment. No minority or low-income populations are expected to be impacted by implementation of any of the alternatives, in accordance with Executive Order 12898.

OTHER RESOURCE CONCERNS AND OPPORTUNITIES

Probable Adverse Environmental Impacts that Cannot be Avoided - There are no unavoidable adverse effects associated with implementing any of the alternatives that are not already identified in the FEIS for the Forest Plan (Chapter 4 pages IV 1- 15).

Congressionally Designated Areas - There are no Congressionally Designated Areas within the project area.

Research Natural Areas – Pataha Natural Research Area (RNA) is within the project area. No project activities are proposed with the RNA.

Relationship Between Short-Term Use and Long-Term Productivity - Maintenance of healthy soils in terms of organic matter and structure is a key prerequisite to maintaining healthy ecosystems (Forest Health Report). Long-term productivity depends on maintaining the basic ecosystem resources and their function. For this project, implementation of standards and guidelines as outlined in the FEIS for the Forest Plan are designed to provide for continued long-term site productivity. However, there would be some short-term impacts related to the implementation of any of the action alternatives.

Irreversible and Irretrievable Commitment of Resources – Irreversible commitment of resources refers to a loss of future options with nonrenewable resources. Irretrievable commitment of resources refers to a loss of production of renewable resources.

No irreversible or irretrievable effects are anticipated from any of the alternatives. No irreversible commitments of land would occur. No unavoidable adverse effects over and above those addressed in the Forest Plan FEIS (Chapter 4, pages IV-231-233) have been identified.

Potential Conflicts with Plans and Policies of Other Jurisdictions - There are no known conflicts with plans and policies of other jurisdictions associated with implementing the alternatives. The FEIS for the Forest Plan (Chapter 4, pages IV 226 - 227) discusses this in further detail.

Chapter 4

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School Fire

Salvage Recovery Project

Chapter 4

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GLOSSARY

Abbreviations and Terms

ASQ Allowable Sale Quantity

ATV All Terrain Vehicle

BA Biological Assessment

BAER Burned Area Emergency Response

BMP Best Management Practice

BIO Biological Opinion

CEQ Council on Environmental Quality

CFR Code of Federal Regulations

CTUIR Confederated Tribes of the Umatilla Indian Reservation

CY Calendar year

DBH Diameter Breast Height

DEQ Department of Environmental Quality

DFC Desired Future Condition

EA Environmental Analysis

EIS Environmental Impact Statement

EPA Environmental Protection Agency

ESA Endangered Species Act

ESD Emergency Situation Declaration

FR Forest Road

FSEIS Final Supplement Environment Impact Statement

FSH Forest Service Handbook

FSM Forest Service Manual

FY Fiscal Year

GIS Geographic Information System

HRV Historic Range of Variability

HUC Hydrologic Unit Code

IDT Interdisciplinary Team

KV Knutson Vandenberg Act

LOS Late Old Structure

LRMP Land and Resource Management Plan

MA Management Area

MBF Thousand Board Feet

MIS Management Indicator Species

MMBF Million Board Feet

MOU Memorandum of Understanding

NEPA National Environmental Policy Act

NF National Forest

NFMA National Forest Management Act

NFS National Forest System

NMFS National Marine Fisheries Service

NOI Notice of Intent

PAG Plant Association Group

RD Ranger District

RHCA Riparian Habitat Conservation Area

RMO Riparian Management Objective

RNA Research Natural Area

ROD Record of Decision

S&G Standard and Guideline

SRI Soil Resource Inventory

TES Threatened, Endangered or Sensitive

TMDL Total Maxim Daily Load

UMA Umatilla National Forest

USFS United States Forest Service

USFWS United States Fish and Wildlife Service

VQO Visual Quality Objective

WDFW Washington Department of Fish and Wildlife

A

Activity fuels – Fuels generated or altered by a management activity.

Affected environment - Natural environment that exists at the present time in the area being analyzed.

Age class - A group of trees that started growing (regenerated) within the same time frame, usually 20 years. A single age class would have trees that are within 20 years of the same age, such as 1-20 years or 21-40 years.

Air quality – The composition of air with respect to quantities of pollution therein; used most frequently in connection with "standards" of maximum acceptable pollutant concentrations.

Airshed - A geographic area that, because of topography, meteorology, and climate, shares the same air.

Allotment (range allotment) **-** Area designated for use by a prescribed number of livestock for a prescribed time period.

Alternative – In an EIS, one of a number of possible options for responding to the purpose and need for action.

Anadromous fish – Fish that hatch in fresh water, migrate to the ocean, mature there, and return to fresh water to reproduce; for example, salmon and steelhead.

Aspect - The direction a surface faces. A hillside facing east has an eastern aspect.

ASQ (allowable sale quantity) **-** Amount of timber that may be sold within a certain period from an area of suitable land. The suitability of the land and the time period are specified in the Forest Plan.

B

Bankful width – The width of a stream channel measured between the tops of the most prominent banks on either side of the stream. Also refers to the width of the stream at the normal flood flow.

Basal area - The area of the cross-section of a tree trunk near its base, usually 4 1/2 feet above the ground. Basal area is a way to measure how much of a site is occupied by trees. The term basal area is often used to describe the collective basal area of trees per acre.

Benchmark – The analytical basis from which the alternatives were developed; the use of assessed land capability as a basis from which to estimate the effects of alternative patterns of management on the land.

Beneficial uses – Any of the various uses which may be made of water including, but not limited to, domestic water supplies, industrial water supplies, agricultural water supplies, navigation, recreation in and on the water, wildlife habitat, and aesthetics. The beneficial use is dependent upon actual use, the ability of the water to support a non-existing use either now or in the future, and its likelihood of being used in a given manner. The use of water for the purpose of wastewater dilution or as a receiving water for a waste treatment facility effluent is not a beneficial use.

Best Management Practices (BMPs) – A practice or combination of practices that is the most effective and practical means (including technological, economic, and institutional considerations) of preventing or reducing negative environmental impacts to water pollution.that may result from resource management activities.

Big game - Large mammals, such as deer and elk, that are hunted for sport.

Big game summer range – A range usually at higher elevations, used by deer and elk during the summer. Summer ranges are usually much more extensive than winter ranges.

Big game winter range – A range usually at lower elevation used by migratory deer and elk during the winter months; usually more clearly defined and smaller than summer range.

Biological diversity - The number and abundance of species found within a common environment. This includes the variety of genes, species, ecosystems, and ecological processes that connect everything in a common environment.

Biological Assessment (BA) – A document prepared by a federal agency for the purpose of identifying any endangered or threatened species that is likely to be affected by an agency action. This document facilitates compliance with the Endangered Species Act.

Biophysical – The combination of biological and physical components in an ecosystem.

Board foot (bf) - A measurement term for lumber or timber. It is the amount of wood contained in an unfinished board 1 inch thick, 12 inches long, and 12 inches wide. Often expressed as MBF (thousand board feet) or MMBF (million board feet).

Broadcast burn - A prescribed fire that burns forest fuels as they are, with no piling or windrowing.

Browse - Twigs, leaves, and young shoots of trees and shrubs that animals (such as deer and elk) eat.

Buffer - A land area designated to block or absorb impacts to the area beyond the buffer. For example, a streamside buffer is often retained to reduce impacts of a harvest unit.

C

Canopy - In a forest, the branches of the uppermost layer of foliage. It can also be used to describe lower layers in a multistoried forest.

Canopy closure – The amount of ground surface shaded by tree canopies as seen from above. Used to describe how open or dense a stand of trees is, often expressed in 10 percent increments.

Capability – The potential of an area or land/or water to produce resources, supply goods and service, and allow resource uses under a specified set of management practices and at a given level of management intensity.

Catastrophic wildfire – An especially intense and widespread fire that usually, but not always, occurs in forests that are outside the historical range of variability in terms of forest structure and forest fuels due to fire suppression.

Classified road – See Road Definitions.

Cavity - A hole in a tree often used by wildlife species, usually birds, for nesting, roosting, and reproduction.

CCF - One hundred cubic feet (see CF).

CF - A measurement term for lumber or timber. It is the amount of wood contained in an unfinished block of wood 12 inches thick, 12 inches long, and 12 inches wide. Often expressed as CCF (hundred cubic feet).

CFR – Code of Federal Regulations. A codification of the general and permanent rules published in the Federal Register by the Executive departments and agencies of the federal government.

Channel (stream)– The deepest part of a stream or riverbed through which the main current of water flows.

Channelization - Human-caused alterations to a stream channel that cause the channel to be fixed in place, such as levees, dikes, trenching, and riprap.

Climax - The stage of plant development in which vegetation is thought to be stable, self-sustaining, and self-replicating.

Clearcutting - A regeneration harvest method that removes all merchantable trees in a single cutting except for wildlife trees or snags. A "clearcut" is an area from which all merchantable trees have been cut.

Closed system road – Classified system road closed to public use. Opened to administrative use. Not decommissioned.

Commercial thinning – Any type of tree thinning that produces merchantable material at least equal in value to the direct costs of harvesting.

Community - A group of species of plants or animals living and interacting at a particular time and place; a group of people residing in the same place under the same government.

Compaction – Making soil hard and dense, decreasing its ability to support vegetation because the soil can hold less water and air and because roots have trouble penetrating the soil.

Conifer - A tree that produces cones, such as a pine, spruce, or fir tree.

Consultation – A process required by Section 7 of the Endangered Species Act whereby federal agencies proposing activities in a listed species habitat confer with governing agencies about the impacts of the activity on the species. Consultation may be informal, and thus advisory, or formal, and thus binding.

Connectivity (of habitats) - The arrangement of habitats that allows organisms and ecological processes to move across the landscape; patches of similar habitats are either close together or linked by corridors of appropriate vegetation. The opposite of fragmentation.

Corridor - Elements of the landscape that connect similar areas. Streamside vegetation may create a corridor of willows and hardwoods between meadows where wildlife feed.

Cover - Any feature that conceals wildlife or fish, sometimes referred to as "hiding cover." Cover may be dead or live vegetation, boulders, or undercut stream banks. Animals use cover to escape from predators, rest, or feed.

Cover deficient area – Any forage area greater than 600 feet from the defined forage:cover edge.

Cover forage ratio - The ratio of hiding cover to foraging areas for wildlife species. Necessary in determining the effectiveness of the habitat an area provides.

Critical habitat - Areas designated for the survival and recovery of federally listed threatened or endangered species.

Crown - The part of a tree containing life foliage; treetops.

Crown fire – A forest fire that advances through the crown fuel layer normally in direct conjunction with a surface fire.

Cultural resource - The remains of sites, structures, or objects used by people in the past (at least 50 years old); this can be prehistoric or historical.

Cumulative effects - Effects on the environment that result from the incremental impacts of an action when added to other past, present, and reasonably foreseeable actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

D

DBH (diameter at breast height) **-** The diameter of a tree 4 1/2 feet above the ground measured on the uphill side of the tree.

Danger Tree – A hazard tree is considered to be any tree that is likely to fail within one and one-half tree lengths of an open class 3 or higher system road, any road designated for hauling, developed recreation or administrative site."

DecAid – An advisory tool that provides guidance to land managers evaluating effects of forest conditions and existing or proposed management activities on organisms that use snags, downwood, and other wood decay elements. DecAid is a statistical summary of empirical data from published research on wildlife and deadwood. Data provided in DecAid allows the user to relate the abundance of deadwood habitat for both snags and logs to the frequency of occurrence of selected wildlife species that require dead wood habitat for some part of their life cycle.

Decommission – Activity that results in the stabilization and restoration of unneeded roads to a more natural state. Removes the road segment from the Forest road inventory system. Decommissioning can involve: closing entrances; scarifying road surfaces, or decompacting (sub-soiling) to establish vegetation and reduce run-off.; seeding to control erosion; partial to full restoration of stream channel by removing culverts and fills; and removing unstable portions of embankments.

Desired future condition - A vision of the long-term conditions of the land.
Direct effects – Impacts on the environment that are caused by the action and occur at the same time and place.

Disturbance - Any event, such as flood, wildfire, insect infestations, or timber harvest, that alters the structure, composition, or functions of terrestrial or aquatic habitats.

Diversity - The distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan.

Duff – Organic matter in various stages of decomposition on the floor of the forest.

E

Early forest succession - The stage of vegetation or wildlife that inhabits an area immediately following removal or destruction of vegetation. For instance, grasses may be the first plants to grow in an area that was burned.

Eastside Screens – Regional Foresters's Forest Plan Amendment (June 1995) designed to maintain options for old growth related and other species.

Ecological approach - An approach to natural resource management that considers the relationships among all organisms, including humans, and their environment.

Ecology - The interrelationships of living things to one another and their environment or the study of these interrelationships. From the Greek Oikos meaning "house" or "place to live."

Ecological integrity – In general, ecological or biological integrity refers to the elements of biodiversity and the functions that link them together and sustain the entire system; the quality of being complete; a sense of wholeness. Absolute measures of integrity do not exist. Proxies provide useful measures to estimate the integrity of major ecosystem components (forestland, rangeland, aquatic, and hydrologic). Estimating these integrity components in a relative sense across the project area helps to explain current conditions and to prioritize future management. Thus areas of high integrity would represent areas where ecological functions and processes are better represented and functioning than areas rated as low integrity.

Ecosystem - A complete interacting system of living organisms and the land and water that make up their environment; the home places of all living things, including humans.

Ecosystem health – A condition where the parts and functions of an ecosystem are sustained over time and where the system's capacity for self-repair is maintained, such that goals for uses, values, and services of the ecosystem are met.

Ecosystem-based management – Scientifically based land and resource management that integrates ecological capabilities with social values and economic relationships, to produce, restore, or sustain ecosystem integrity and desired conditions, uses, products, values, and services over the long term.

Edge (habitat) **-** The margin where two or more vegetation patches meet, such as a meadow opening next to a mature forest stand or a ponderosa pine stand next to an aspen stand.

Endangered species - A plant or animal that is in danger of extinction throughout all or a significant portion of its range. Endangered species are identified by the Secretary of the Interior in accordance with the Endangered Species Act of 1973.

Environmental analysis - An analysis of alternative actions and their predictable long and short-term environmental effects. Environmental analyses include physical, biological, social, and economic factors.

Environmental Impact Statement (EIS) - A statement of environmental effects of a proposed action and alternatives. The Draft EIS is released to other agencies and the public for comment and review. A Final EIS is issued after consideration of Public and agency comments. A Record of Decision (ROD) is based on the information and analysis in the Final EIS.

Ephemeral streams - Streams that flow only as the direct result of rainfall or snowmelt. They have no permanent flow.

Erosion - The wearing away of the land surface by wind, water, ice, gravity, or other geological activities. Erosion can be intensified by human activities (such as road building) that may reduce the stability of soils or slopes.

ETA – Equivalent Treatment Acres –is a watershed cumulative effects model that calculates the acres of created openings in forested areas based on harvest prescription or other mortality. It is used as an index to represent the potential for increased water yield and peak flows as a consequence of reducing water loss by interception and evapotranspiration, or by changing snow distribution and melt rates.

Even-aged management - Method of forest management in which trees, usually the same species, are maintained at the same age and size and harvested all at once so a new stand may grow.

Even-aged stands – Stands of trees of approximately the same age. Silvicultural methods that generate even-aged stands include clearcutting, shelterwood, and seed tree.

Exotic - A plant or animal species introduced from a distant area; not native to the area, often particularly aggressive.
Extirpation – Localized disappearance of a species from an area.

F

Fauna - The vertebrate and invertebrate animals of an area or region.

Fine fuels – Fast-drying fuels, generally with a comparatively high surface area-to-volume ratio, which are less than ¼ -inch in diameter and have a time lag of one hour or less. These fuels readily ignite and are rapidly consumed by fire when dry.

Fire behavior – How fire reacts to the influences of fuel, weather, and topography.

Fire cycle (mean fire interval) - The average time between fires in a given area.

Fire-dependent - Forests, grasslands, and other ecosystems historically composed of species that evolved with and are maintained by periodic fire.

Fire-intolerant – Species of plants that do not grow well or die from the effects of too much fire. Generally these are shade-tolerant species.

Fire regimes – The ecological effects of frequency, intensity, extent, season, and synergistic interactions with other disturbances, such as insects and disease, classified into generalized levels of fire severity.

Fire severity or Burn severity –Severity describes the fire-caused damage to the soil. The severity ratings (high, moderate, and low) are based on standards in Forest Service Handbook 2509.13.

Fire-tolerant – Species of plants that can withstand certain frequency and intensity of fire. Generally these are shade–intolerant species.

First-order stream – Stream channel with no tributaries.

Fisheries habitat - Streams, lakes, and reservoirs that support fish or have the potential for supporting fish.

Flood plain - The portion of a river valley or level lowland next to streams which is covered with water when the river or stream overflows its bank at flood stage.

Flora - The vegetation of an area.

Forage - Vegetation (both woody and non-woody) eaten by animals, especially big game and livestock.

Forage area – All areas that do not meet the definition of either satisfactory cover or marginal cover.

Forage deficient area – Any total cover farther than 600 feet from the defined forage:cover edge.

Forb - A broadleaf plant that has little or no woody material in it, including plants commonly called wildflowers and weeds.

Foreground - The part of a scene or landscape that is nearest the viewer.

Forest health – The condition in which forest ecosystems sustain their complexity, diversity, resiliency, and productivity while providing for human needs and values. It is a useful way to communicate about the current condition of the forest, especially with regard to resiliency, a part of forest health that describes the ability of the ecosystem to respond to disturbances. Forest health and resiliency can be described, in part, by species composition, density, and structure.

Forest plan (Umatilla Land and Resource Management Plan) – A document that guides natural resource management and establishes standards and guidelines for a National Forest; required by the National Forest Management Act.

Fragmentation - The breakup of a large land area (such as a forest) into smaller patches that are isolated from the original area. Fragmentation can occur naturally (as by stand-replacing wildfire) or from human activities (such as road building).

Fuel(s) – Combustible material that includes vegetation such as grass, leaves, ground litter, plants, shrubs, and trees. Includes both living plants; dead, woody vegetative materials; and other vegetative materials which are capable of burning.

Fuel break – A zone in which fuel quantity has been reduced or altered to provide a position for suppression forces to make a stand against a wildfire. Fuel breaks are designated or constructed before the outbreak of a fire. Fuel breaks may consist of one or a combination of the following: natural barriers, constructed fuel breaks, man-made barriers.

Fuel ladder - Shrubs, small trees, and low growing branches that allow fire to move from the ground to the tree crowns.

Fuel load – The dry weight of combustible materials per unit area; usually expressed as tons per acre.

Fuels management - The treatment of fuels that would otherwise interfere with effective fire management or control. For instance, prescribed fire can reduce the amount of fuels that accumulate on the forest floor before the fuels become so heavy that a natural wildfire
in the area would be explosive and impossible to control.

Function - The processes within an ecosystem through which the elements interact, such as succession, the food chain, fire, weather, and the hydrologic cycle.

G

Geographic Information System (GIS) – Computer software that provides database and spatial analytic capabilities.

Geomorphic processes - Processes that change the form of the earth, such as volcanic activity, running water, and glacial action.

Geomorphology - The geologic study of the shape and evolution of the earth's landforms.

Ground fire - A fire that burns along the forest floor and does not affect trees with thick bark or high crowns.

Ground fuels – All combustible materials below the surface litter layer. These fuels may be partially decomposed, such as forest soil organic layers (duff), dead moss and lichen layers, punky wood and deep organic layers (peat), or may be living plant material, such as tree and shrub roots.

Groundwater - Water that sinks into the soil and is stored in slowly flowing and slowly renewed underground reservoirs called aquifers.

H

Habitat - The place where a plant or animal finds what it needs to survive, either year-round or seasonally.

Habitat capability - The ability of a habitat to support a given species of wildlife.

Habitat diversity - The variety of different types of wildlife habitat within a given area.

Habitat type - A way of defining land areas potentially capable of producing similar plant communities at climax. In Forestry, habitat types are named for the predominant climax tree species. For example, the Pinus Ponderosa habitat type series is habitat that typically supports climax Ponderosa Pine. A number of other habitat features can be identified using habitat types, such as aspect, elevation, climate, and use by wildlife species.

Harvest – (1) Felling and removal of trees from the forest; (2) removal of game animals or fish from a population, typically by hunting or fishing.

Headwaters – Beginning of a watershed; unbranched tributaries of a stream.

Hiding area/cover - Vegetation capable of hiding 90 percent of an adult elk or deer from a human's view at a distance of 200 feet or less.

Historical Range of Variability (HRV) – The natural fluctuation of components of healthy ecosystems over time. In this EIS, it refers to the range of conditions and processes that are likely to have occurred prior to settlement of the project area by people of European descent (approximately the mid 1800s), which would have varied within certain limits over time.

Hydrologic Unit Code (HUC) – An area of land upstream from a specific point on a stream (designated as the mouth) that defines a hydrologic boundary and includes all of the source areas that could contribute surface water runoff directly and indirectly to the designated outlet point.

Hydrology - The study of water on the surface of the land, in the soil and underlying rocks, and in the atmosphere.

I

Indicator species - A plant or animal species that is presumed to be sensitive to habitat change. Its presence indicates specific habitat conditions are also present. Population changes in an indicator species can indicate the effects of land management activities.

Indirect effects – Impacts on the environment that are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable.

Individual tree selection - The removal of certain size and age classes of individual trees from a stand. Regeneration is allowed to naturally occur and an uneven-aged stand is maintained.

Instream flow - The natural flow of water in a stream channel.

Intensity (fire intensity) - The rate of heat release for an entire fire at a specific time.

Interdisciplinary team (IDT) - A team of individuals with skills from different disciplines that focuses on the same task or project, referred to as ID Team.

Intermediate harvest - The removal of trees from a stand between the time of its formation and harvest cutting. Thinning, liberation, and improvement cuts are all types of intermediate harvest. Sometimes salvage harvests and sanitation harvests are termed intermediate.

Intermittent stream - A stream that flows only at certain times of the year when it receives water from streams or some surface source, such as melting snow.

Irretrievable – A category of impacts that applies to losses of production or commitment of renewable natural resources.

Irreversible – A category of impacts that applies to non-renewable resources, such as minerals and archaeological sites. Losses of these resources cannot be reversed. Irreversible effects can also refer to effects of actions on resources that can be renewed only after a very long period of time, such as the loss of soil productivity.

Issue – A matter of controversy, dispute, or general concern over resource management activities or land uses. To be considered a "significant " EIS issue, it must be well defined, relevant to the proposed action, and within the ability of the agency to address through alternative management strategies.

L

Ladder fuels – Fuels which provide vertical continuity between strata. Fire is able to carry from the surface fuels by convection into the crowns with relative ease.

Landing - Any place where cut timber is collected before further transport from the timber sale area.

Landscape - All the natural features such as grasslands, hills, forest, and water, which distinguish one part of the earth's surface from another; usually that portion of land which the eye can comprehend in a single view, including all its natural characteristics.

Late forest succession - The stage of forest succession in which most of the trees are mature or overmature.

Lethal fire (stand replacement) - Fire that kills upwards of 70 percent of overstory trees.

Litter (forest litter) - The freshly fallen or only slightly decomposed plant material on the forest floor. This layer includes foliage, bark fragments, twigs, flowers, and fruit.

M

Mainstem – The main channel of the river in a river basin, as opposed to the streams and smaller rivers that feed into it.

Management action - Any activity undertaken as part of the administration of the National Forest.

Management area – An aggregation of capability areas that have a common management direction, and may be dispersed over the Forest.

Marginal cover – A stand of coniferous trees 10 or more feet tall with an average canopy closure equal to or more than 40 percent but less than 70 percent and generally capable of obscuring at least 90 percent of a standing elk from the view of humans at a distance of 200 feet..

Merchantable timber - Timber that can be bought or sold.

Middleground – A term used in visual management to descrive the portions of a view extending from the foreground zone out to 3 to 5 miles from the observer.

MIS (management indicator species) - A wildlife species selected by a land management agency to indicate the health of the ecosystem in which it lives and, consequently, the effects of forest management activities on that ecosystem (see "indicator species").

Mitigation - Measures designed to counteract environmental impacts or make impacts less severe.

Mixed stand - A stand consisting of two or more tree species.

MBF - Thousand Board Feet (see board foot).

MMBF - Million Board Feet (see board foot).

Monitoring - A process of collecting information to evaluate whether or not objectives of a project and its mitigation activities are being realized.

Mortality - The loss of a population due to all lethal causes, often referring to the rate of death of a species in a given population or community.

Mosaic - A pattern of vegetation in which two or more kinds of plant communities are interspersed in patches, such as a meadow between stands of old growth.

Multiple-use management – The management of public lands and their various resource values so they are used in the combination that best meets the present and future needs of the American people.

Mycorrhizae- The symbiotic relationship between certain fungi and the roots of certain plants; important for plants to take nutrients from soil.

N

Natural regeneration – Reforestation of a site by natural seeding from surrounding trees. Natural regeneration may or may not be preceded by site preparation.

Natural resource - Water, soil, wild plants and animals, air, minerals, nutrients, and other resources produced by the earth's natural processes.

NEPA (National Environmental Policy Act) - An act of Congress passed in 1969 declaring a national policy to encourage productive and enjoyable harmony between people and their environment. Section 102 of the NEPA requires a statement of possible environmental effects be released to the public and other agencies for review and comment.

NFMA (National Forest Management Act) - A law passed in 1976 requiring the preparation of Regional Guides and Forest Plans and regulations to guide that development.

No Action alternative - The most likely condition expected to exist in the future if management practices continue unchanged.

Non-game – Term for wild animals not commonly harvested for recreation, fur or subsistence.

Non-point source pollution - Pollution whose source is not specific in location. The sources of the discharge are dispersed, not well defined, or constant. Examples include sediments from logging activity and runoff with chemicals from agricultural lands.

Non-system road/unclassified road – Any continuous set of wheel tracks that exist for more than one season, and does not belong to the transportation system.

Noxious weed - A weed that causes disease or has other adverse effects on man or his environment and, therefore, is detrimental to public health and the agriculture and commerce of the United States. Noxious weeds are often aggressive and difficult to manage and non-native, new, or not common to the United States.

Nutrient cycle - Ecological processes in which nutrients and elements such as carbon, phosphorous, nitrogen, calcium, and others circulate among animals, plants, soils, and air.

O

Old growth - Old forests often containing several canopy layers, variety in tree sizes and species, decadent old trees, and standing and dead woody material.

Ongoing actions – Actions that have been implemented, or have contracts awarded or permits issued.

Open system road – Classified system road, open to public use.

Optimum cover – Any total cover within 600 feet of the defined forage:cover edge.

Optimum forage – Forage area within 600 feet of the defined forage:cover edge.

Overmature timber - Trees that have attained full development, particularly in height, and are declining in vigor, health, and soundness.

Overstory - The upper canopy layer; the plants below comprise the understory.

P

PACFISH – Interim strategies for managing Pacific anadromous fish-producing watersheds in eastern Oregon and Washington, Idaho, and portions of California.

Park-like structure - Stands with large scattered trees, few or no understory trees, and open growing conditions, usually maintained by frequent ground fires.

Patch - An area of uniform vegetation that differs in structure and composition from what surrounds it.

Perennial stream - A stream that flows throughout the year from its source to mouth.

Pre-commercial thinning - Removing some of the trees from a stand that are too small to be sold for lumber or house logs so the remaining trees will grow faster.

Predator - An animal that captures and feeds on parts or all of an organism of another species.

Preferred alternative – The alternative identified in a draft environmental impact statement which has been initially selected by the agency as the most acceptable resolution to the problems identified in the purpose and need.

Prescribed fire - The intentional use of fire under specified conditions to achieve specific management objectives.

Prescription – Measurable criteria that define conditions under which a prescribed fire may be ignited, guide selection of appropriate management responses, and indicate other required actions. Prescription criteria may include safety, economic, public health, and environmental, geographic, administrative, social, or legal considerations.

Present net value (PNV) [also called present net worth] **-** The measure of the economic value of a project when costs and revenues occur at different times. Future revenues and costs are "discounted " to the present by an interest rate that reflects the changing value of a dollar over time. The assumption is that dollars today are more valuable than dollars in the future. PNV is used to compare project alternatives that have different cost and revenue flows.

Public involvement - The use of appropriate procedures to inform the public, obtain early and continuing public participation, and consider the views of interested parties in planning and decision making.

R

Range of variability - The fluctuation, over time, in the population, size, and components of healthy ecosystems.

Rangeland (range) - Land on which the principle natural plant cover is composed of native grasses, forbs, and shrubs that are valuable as forage for livestock and big game.

Redd –Spawning nest made by salmon or steelhead in the gravel bed of a river.

Reforestation - The restocking of an area with forest trees by either natural or artificial means such as planting.

Regeneration - The process of establishing a new tree crop on previously harvested land. The term also refers to the young crop itself.

Regeneration harvest - A silvicultural treatment intended to regenerate a stand of trees. Shelterwood and seed tree harvests are forms of regeneration treatments.

Resident fish – Fish that spend their entire life in freshwater: examples include bull trout and westslope cutthroat trout.

Resilient, resiliency -The ability of a system to respond to disturbances. Resiliency is one of the properties that enable the system to persist in many different states or successional stages

Restoration (of ecosystems) - Actions taken to modify an ecosystem to achieve a desired, healthy, and functioning conditions and processes. Generally refers to the process of enabling the system to resume its resiliency to disturbances.

Revegetation - Establishing or reestablishing desirable plants on a site where they are absent or in few numbers. Revegetation can be accomplished through natural or artificial reseeding or transplanting.

Riparian area - The area along a watercourse or around a lake or pond. Area with distinctive soil and vegetation between a stream or other body of water and the adjacent upland; includes wetlands and those portions of floodplains and valley bottoms that support riparian vegetation.

Riparian conservation area (RCA) – Portions of watersheds where riparian-dependent resources receive primary emphasis and management activities are subject to specific standards and guidelines. RCAs include traditional riparian corridors, wetlands, intermittent headwater streams, and other areas where proper ecological functioning is crucial to maintenance of the stream's water, sediment, woody debris and nutrient delivery systems.

Riparian ecosystem - The ecosystems around or next to water areas that support unique vegetation and animal communities as a result of the influence of water.

Runoff - The portion of precipitation that flows over the land surface or in open channels.

S

Salvage – Salvage timber harvest is defined as "the removal of dead trees or trees damaged or dying because of injurious agents other than competition, to recover economic value that would otherwise be lost" (Helms 1998). When a fire front passes a tree, some of the resulting heat is transferred to the vascular cambium, foliage and roots. If the temperatures are high enough and the flame residence time is long enough, these tissues are killed. When a high proportion of the cambium, crown or fine roots are killed, the whole tree dies. Lower temperatures or shorter residence times will injure tissues rather than kill them (Dickinson and Johnson 2001).

Satisfactory cover – A stand of coniferous trees 40 or more feet tall with an average canopy closure equal to or more than 70 percent. Umatilla Forest Plan defines it as cover used by animals to ameliorate the effect of weather.

Scoping - The early stages of preparation of an environmental analysis to determine public opinion, receive comments and suggestions, and determine issues during the environmental analysis process. It may involve public meetings, telephone conversations, or letters.

Seasonally Closed Road – Classified system road closed to public use for part of the year.

Sediment – Solid materials, both mineral and organic, in suspension or transported by water, gravity, ice, or air; may be moved and deposited away from their original position and eventually will settle to the bottom.

Sensitive species - A sensitive species is one that has been designated by the Regional Forester because of concern for population viability. Indications for concern include significant current or predicted downward trends in population numbers or density or in habitat capability that would reduce an existing species distribution.

Seral - Refers to the sequence of transitional plant communities during succession. Early seral refers to plants that are present soon after a disturbance or at the beginning of a new successional process (such as seedling or sapling growth stages in a forest); mid-seral in a forest would refer to pole or medium saw timber growth stages; late or old seral refers to plants present during a later stage of plant community succession (such as mature or old forest stages).

Shade-intolerant species - Species of plants that do not grow well in the shade of others. They are species that develop on a site soon after a major disturbance. Ponderosa pine and western larch are shade-intolerant tree species.

Shade-tolerant species - Species of plants that grow well in the shade of others. Douglas-fir is a relatively shade-tolerant tree.

Shelterwood harvest - A regeneration cut designed to establish a new crop of trees under the protection of the old. This type of harvest typically occurs in stages with a second entry following the first after regeneration has occurred.

Silvicultural system - The cultivation of forests; the result is a forest of a distinct form. Silvicultural systems are classified according to harvest and regeneration methods and the type of forest that results.

Silviculture - The practice of manipulating the establishment, composition, structure, growth, and rate of succession of forests to accomplish specific objectives.

Site potential – A measure of resource availability based on interactions among soils, climate, hydrology, and vegetation.

Site preparation - The general term for removing unwanted vegetation, slash, roots, and stones from a site before reforestation. Naturally-occurring wildfire as well as prescribed fire can prepare a site for natural regeneration.

Slash - The residue left on the ground after timber cutting or after a storm, fire, or other event. Slash includes unused logs, uprooted stumps, broken or uprooted stems, branches, bark, etc.

Smolt – Young salmon or trout migrating to the ocean and undergoing biological changes to enable them to move from freshwater streams to saltwater.

Snag - A standing dead tree.

Soil compaction - The reduction of soil volume. For instance, the weight of heavy equipment on soils can compact the soil and thereby change it in some ways, such as in its ability to absorb water.

Soil productivity - The capacity of a soil to produce a specific crop. Productivity depends on adequate moisture and soil nutrients as well as favorable climate.

Soil Resource Inventory (SRI) – An inventory of the soil resource based on landform, vegetative characteristics, soil characteristics, and management potentials.

Spawning habitat – Areas used by adult fish for laying and fertilizing eggs.

Special use permit - A permit issued to an individual or group by the USDA Forest Service for use of National Forest land for a special purpose. Examples might be a special use permit for the Boy Scout Jamboree or a mountain bike race.

Species – A population or series of populations of organisms that can interbreed freely with each other but not with members of other species.

Stability – Ability of a living system to withstand or recover from externally imposed changes or stresses.

Stand - A group of trees in a specific area that are sufficiently alike in composition, age, arrangement, and condition so as to be distinguishable from the forest in adjoining areas.

Stand composition – The vegetative species that make up the stand.

Stand density – Refers to the number of trees growing in a given area, usually expressed in trees per acre.

Stand structure –The mix and distribution of tree sizes, layers, and ages in a forest. Some stands are all one size (single-story), some are two-story, and some are a mix of trees of different ages and sizes (multi-story).

Standards and guidelines - Requirements found in a Forest Plan which impose limits on natural resource management activities, generally for environmental protection.

Stream morphology – The study of the form and structure of streams.

Strongholds (fish) – Watersheds that have the following characteristics: (1) presence of all major life-history forms (for example, resident, fluvial, and adfluvial) that historically occurred within the watershed; (2) numbers are stable or increasing, and the local population is likely to be at half or more of its historical size or density; (3) the population or metapopulation within the watershed, or within a larger region of which the watershed is a part, probably contains at least 5,000 individuals or 500 adults.

Succession - The predictable, natural replacement of one plant community with another over time. The different stages in succession are often referred to as seral stages (see "seral").

Successional stage - A stage of development of a plant community as it moves from bare ground to climax. The grass-forb stage of succession precedes the woody shrub stage (see "seral").

Suitability - The appropriateness of certain resource management practices for an area of land. Suitability can be determined by environmental and economic analysis of management practices.

Sustainability – (1) Meeting the needs of the present without compromising the abilities of future generations to meet their needs; emphasizing and maintaining the underlying ecological processes that ensure long-term productivity of goods, services, and values without impairing productivity of the land. (2) In commodity production, refers to the yield of a natural resource that can be produced continually at a given intensity of management.

T

Thermal cover - Cover used by animals against weather. For example, thermal cover for elk can be found in a stand of coniferous trees at least 40 feet tall with a crown closure of at least 70 percent.

Thinning - A cutting made in an immature stand of trees to accelerate growth of the remaining trees or to improve the form of the remaining trees.

Threatened species - Those plant or animal species likely to become endangered throughout all or a specific portion of their range within the foreseeable future as designated by the US Fish and Wildlife Service under the Endangered Species Act of 1973.

Tiering – In an EIS, refers to incorporating by reference the analyses in an EIS of a broader scope. For example, a Forest Service project-level EIS could tier to the analysis in a Forest Plan EIS; a Forest Plan EIS could tier to a Regional Guide EIS.

Total cover – All coniferous tree cover 10 or more feet tall and with a canopy closure of equal to or greater than 40 percent (i.e. satisfactory cover plus marginal cover),

Tractor logging - A logging method that uses tractors to carry or drag logs from the stump to a landing.

U

Unauthorized or Temporary Road – Formerly also referred to as unclassified road. These are defined as Roads on National Forest System lands that are not managed as part of the forest transportation system, such as unplanned roads, abandoned traveled way, and off-road vehicle track that have not been designated and managed as a trail; and those roads that were once under permit or other authorization and were not decommissioned upon the termination of the authorization. Roads not authorized or necessary for long-term resource management.

Underburn - A burn by a surface fire that can consume ground vegetation and ladder fuels.

Understory - The trees and woody shrubs growing beneath the overstory.

Uneven-aged management - Method of forest management in which trees of different species in a given stand are maintained at many ages and sizes to permit continuous natural regeneration. Selective cutting is one example of an uneven-aged management method.

Uneven-aged stand – Stand of trees in which there are considerable differences in the ages of individual trees.

Unsuitable lands - Forest land that is not managed for timber production. Reasons may be matters of policy, ecology, technology, silviculture, or economics.

V

Vegetation management - Activities designed primarily to promote the health of forest vegetation for multiple-use purposes.

Vertical diversity - The diversity in a stand that results from the different layers or tiers of vegetation.

Viable population - The number of individuals of a species sufficient to ensure the long-term existence of the species in natural, self-sustaining populations that are adequately distributed throughout their range.

Visual quality objective (VQO) **-** A set of measurable goals for the management of forest visual resources.

W

Water yield - The runoff from a watershed including groundwater outflow.

Watershed - The entire region drained by a waterway (or into a lake or reservoir). More specifically, a watershed is an area of land above a given point on a stream that contributes water to the stream flow at that point.

Wetlands - Areas that are permanently wet or intermittently covered with water. Wetlands generally include swamps, bogs, seeps, wet meadows, and natural ponds.

Wildland Urban Interface (WUI) – Includes those areas of resident human population at imminent risk from wildfire, and human developments having special significance. These areas may include critical communication sites, municipal watershed, high voltage transmission lines, observatories, church camps, scout camps, research facilities, and other structures that if destroyed by fire, would result in hardships to communities. These areas encompass not only the sites themselves, but also the continuous slopes and fuels that lead directly to the sites, regardless of the distance involved.

Wildfire - A human or naturally caused wildland fire that does not meet land management objectives.

Wildlife habitat diversity - The distribution and abundance of different plant and animal communities and species within a specific area.

Windthrow - Trees blown over by the wind.

Winter range - That portion of big game's range where animals congregate for the winter.

X, Y, Z

Yarding – Hauling timber from the stump to a collection point.

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Carroll, M.S., A.J. Findley, K.A. Blatner and S. Rodriguez-Mendez. 2000. Social Assessment for the Wenatchee National Forest Wildfires of 1994: Targeted Analysis for Leavenworth, Entiat and Chelan Ranger Districts. US Forest Service, Pacific Northwest Station, Portland OR, General Technical Report. GTR-479. 114 pp.

Personal communication USDA Forest Service, Pomeroy District Ranger

Carroll, M.S., Cohn P.J. D.N. Seesholtz and L. Higgins. 2005 Fire as a Galvanizing and Fragmenting Influence on Communities: The Case of the Rodeo-Chediski Fire**.** *Society and Natural Resources*.18(4):301-320.

Index

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

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V

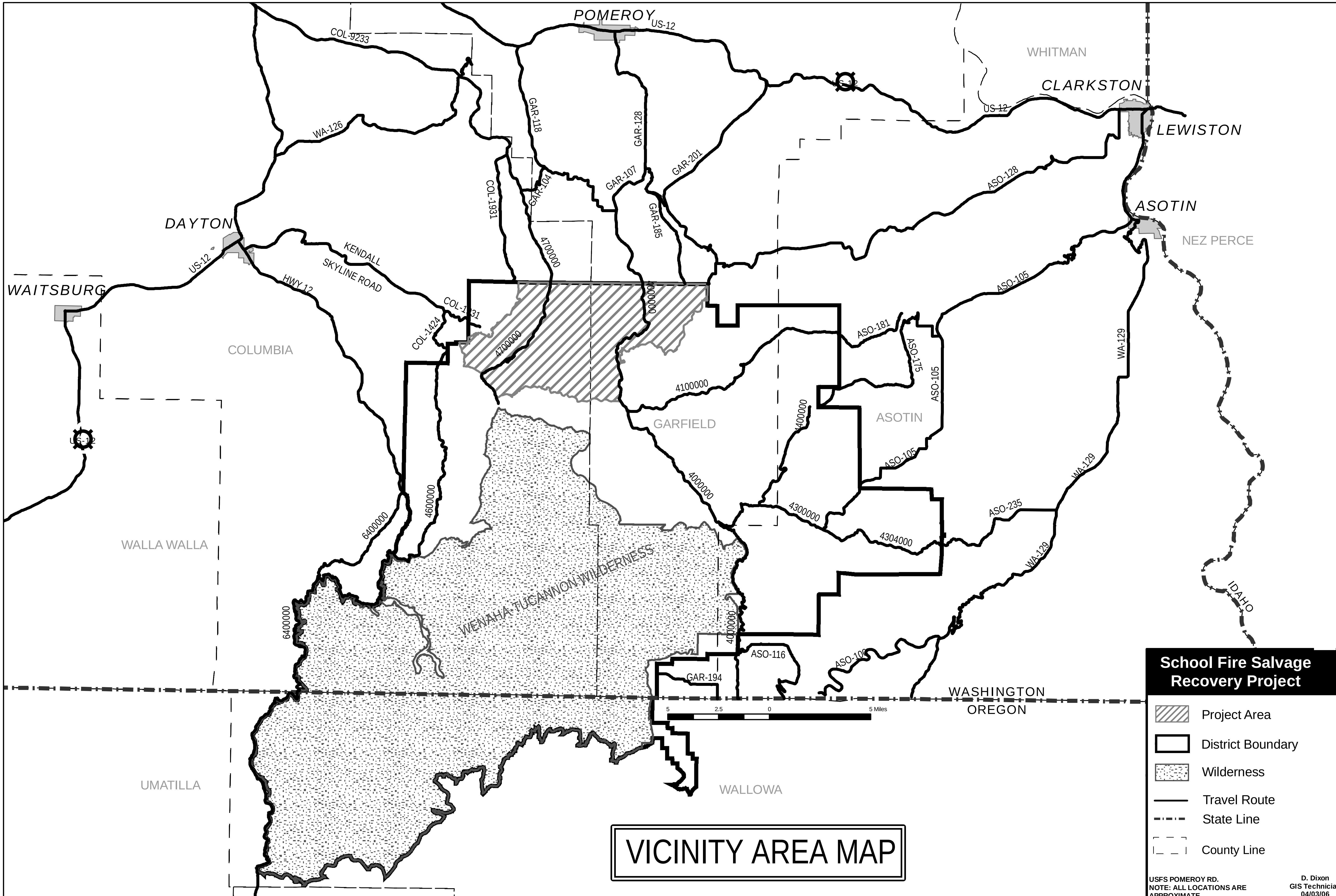
W

Appendix A

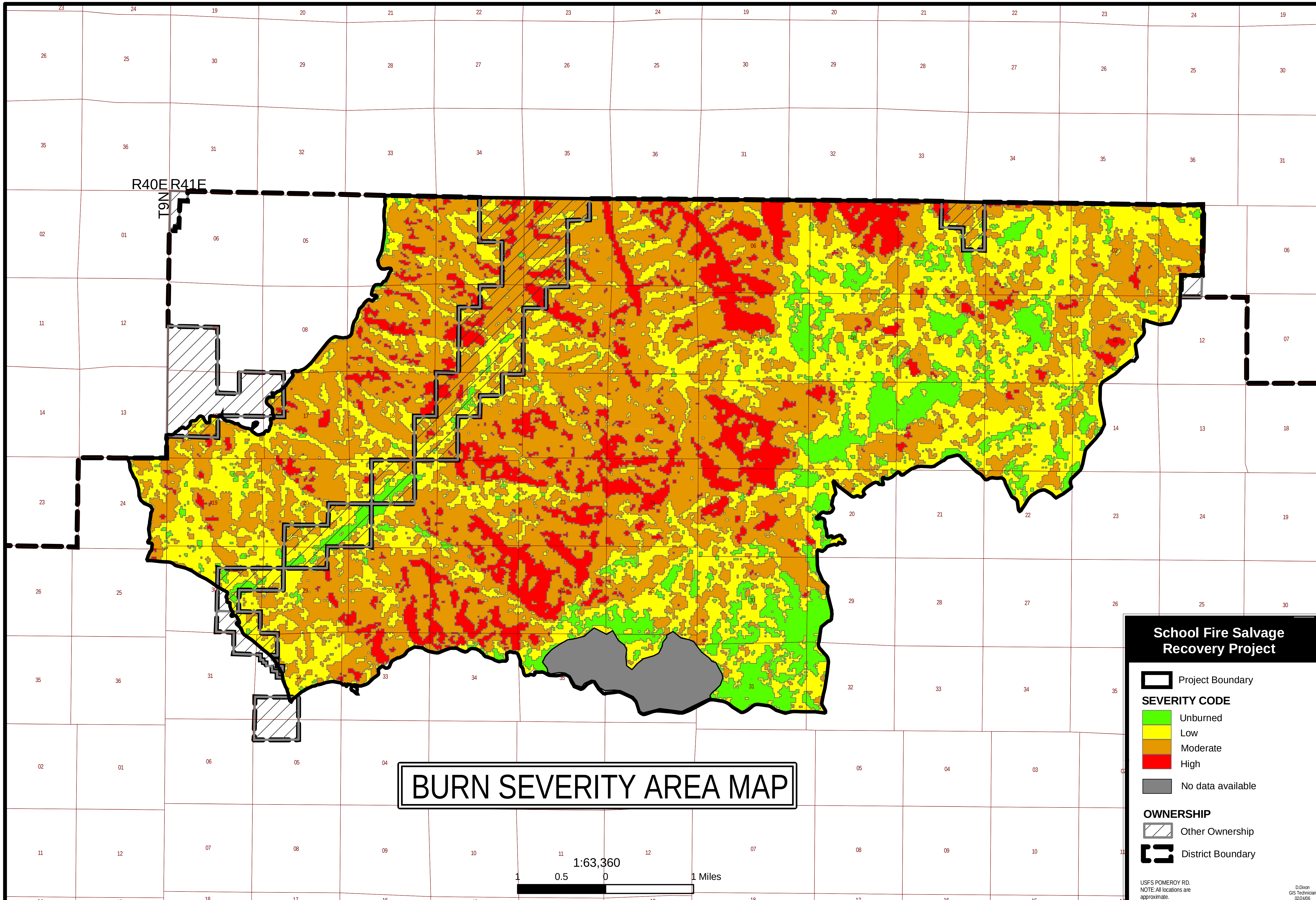
Maps

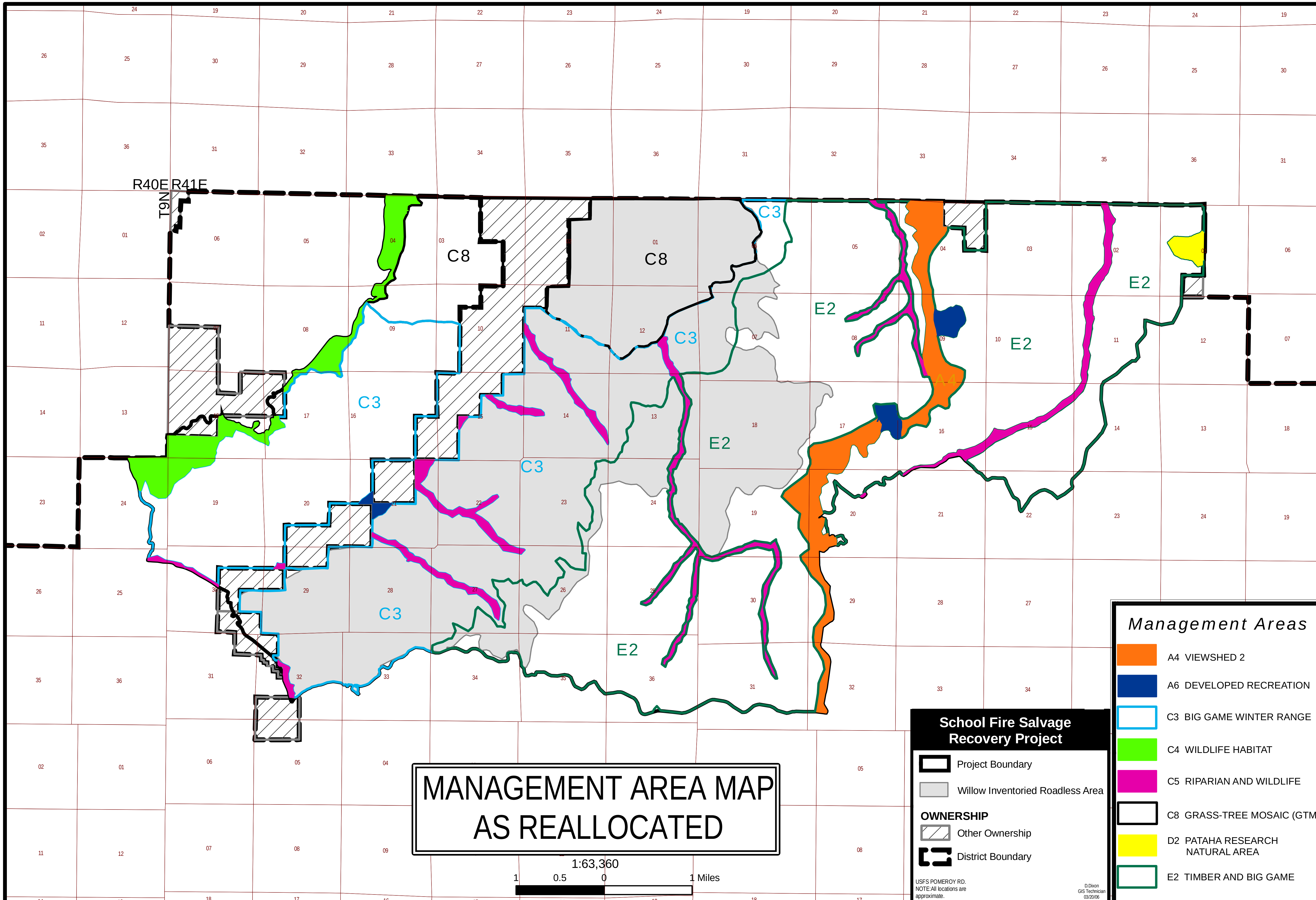
School Fire

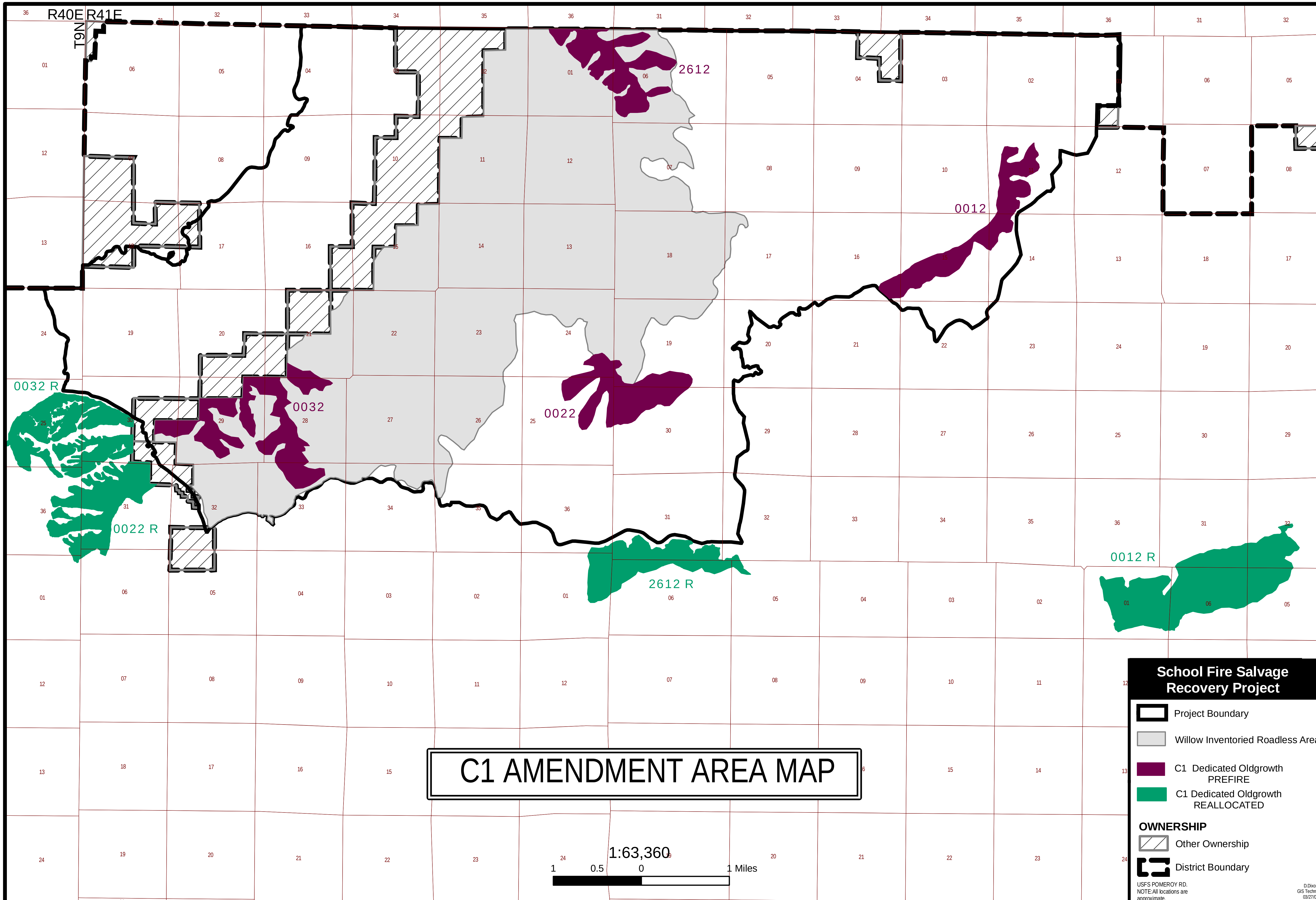
Salvage Recovery Project



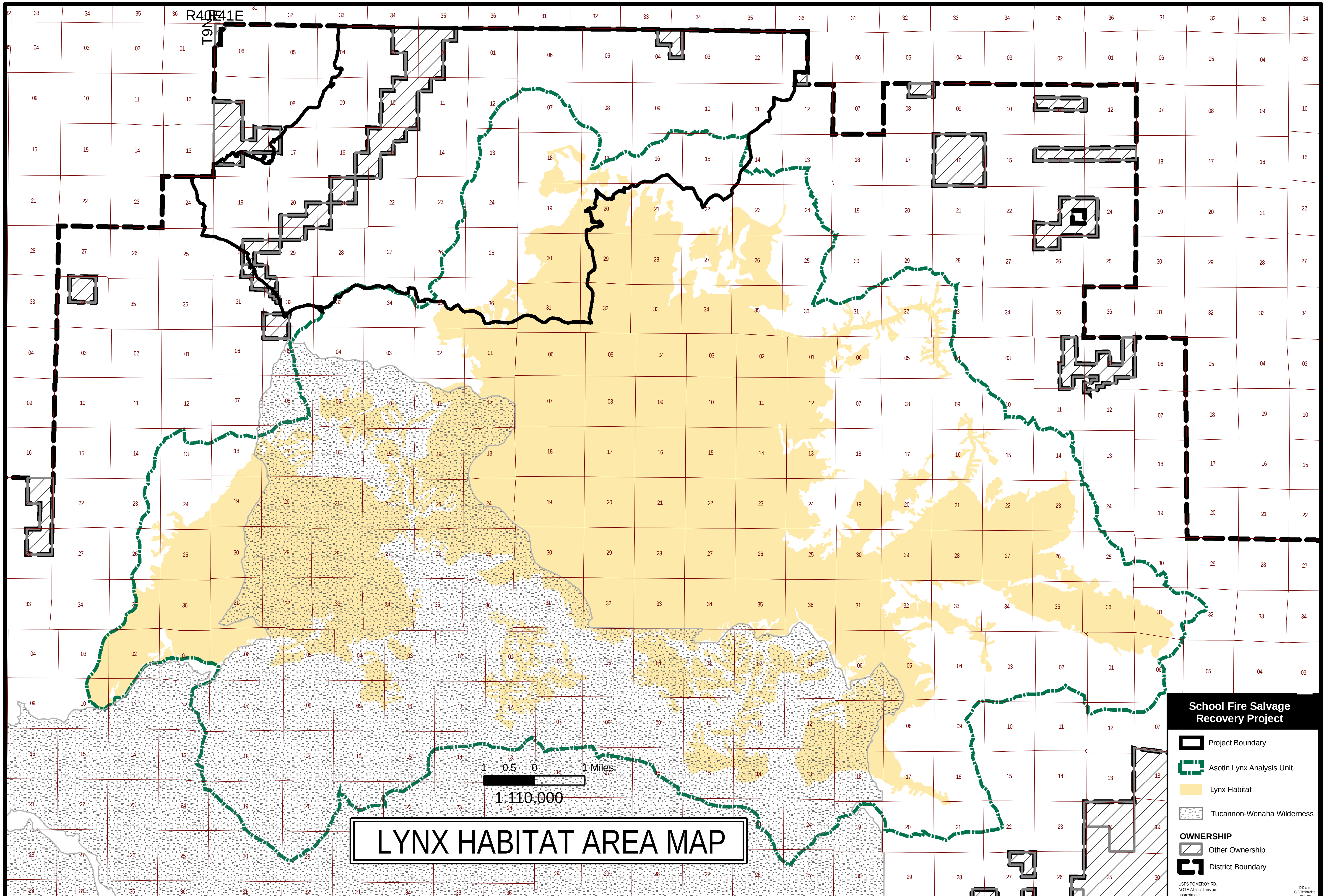
POMEROY
US-12
COL-9233
WHITMAN
CLARKSTON
LEWISTON
US-12
GAR-118
GAR-128
WA-126
GAR-107
GAR-201
ASO-128
COL-1931
GAR-104
GAR-185
ASOTIN
DAYTON
4700000
NEZ PERCE
KENDALL
SKYLINE ROAD
US-12
HWY 12
WAITSBURG
COL-1431
COL-1424
ASO-105
4700000
ASO-181
ASO-175
COLUMBIA
ASO-105
WA-129
4100000
GARFIELD
ASOTIN
4000000
US-12
ASO-105
WA-129
4000000
4600000
6400000
4300000
ASO-235
WALLA WALLA
4304000
WENAHA-TUCANNON WILDERNESS
WA-129
IDAHO
6400000
4000000
ASO-116
ASO-100
GAR-194
WASHINGTON
OREGON
5
2.5
0
5 Miles
UMATILLA
WALLOWA
VICINITY AREA MAP
School Fire Salvage Recovery Project
Project Area
District Boundary
Wilderness
Travel Route
State Line
County Line
USFS POMEROY RD.
NOTE: ALL LOCATIONS ARE APPROXIMATE
D. Dixon
GIS Technician
04/03/06


BURN SEVERITY AREA MAP
School Fire Salvage Recovery Project
Project Boundary
SEVERITY CODE
Unburned
Low
Moderate
High
No data available
OWNERSHIP
Other Ownership
District Boundary
R40E R41E
T9N
1:63,360
1 0.5 0 1 Miles
USFS POMEROY RD.
NOTE: All locations are approximate.
D.Dixon
GIS Technician
02/24/06


MANAGEMENT AREA MAP
AS REALLOCATED
1:63,360
1 0.5 0 1 Miles
School Fire Salvage Recovery Project
Project Boundary
Willow Inventoried Roadless Area
OWNERSHIP
Other Ownership
District Boundary
USFS POMEROY RD.
NOTE:All locations are approximate.
D.Dixon
GIS Technician
03/20/06
Management Areas
A4 VIEWSHED 2
A6 DEVELOPED RECREATION
C3 BIG GAME WINTER RANGE
C4 WILDLIFE HABITAT
C5 RIPARIAN AND WILDLIFE
C8 GRASS-TREE MOSAIC (GTM)
D2 PATAHA RESEARCH NATURAL AREA
E2 TIMBER AND BIG GAME
R40E R41E
T9N
C8
C8
C3
C3
C3
C3
C3
C3
E2
E2
E2
E2
E2
E2
A4



C1 AMENDMENT AREA MAP
School Fire Salvage Recovery Project
Project Boundary
Willow Inventoried Roadless Area
C1 Dedicated Oldgrowth PREFIRE
C1 Dedicated Oldgrowth REALLOCATED
OWNERSHIP
Other Ownership
District Boundary
1:63,360
1 0.5 0 1 Miles
R40E R41E
T9N
2612
0012
0032
0022
0032 R
0022 R
2612 R
0012 R
USFS POMEROY RD.
NOTE:All locations are approximate.
D.Dixon
GIS Technician
03/27/06



R40E
R41E
T9N
1 0.5 0 1 Miles
1:110,000
LYNX HABITAT AREA MAP
School Fire Salvage Recovery Project
Project Boundary
Asotin Lynx Analysis Unit
Lynx Habitat
Tucannon-Wenaha Wilderness
OWNERSHIP
Other Ownership
District Boundary
USFS POMEROY RD.
NOTE:All locations are approximate.
D.Dixon
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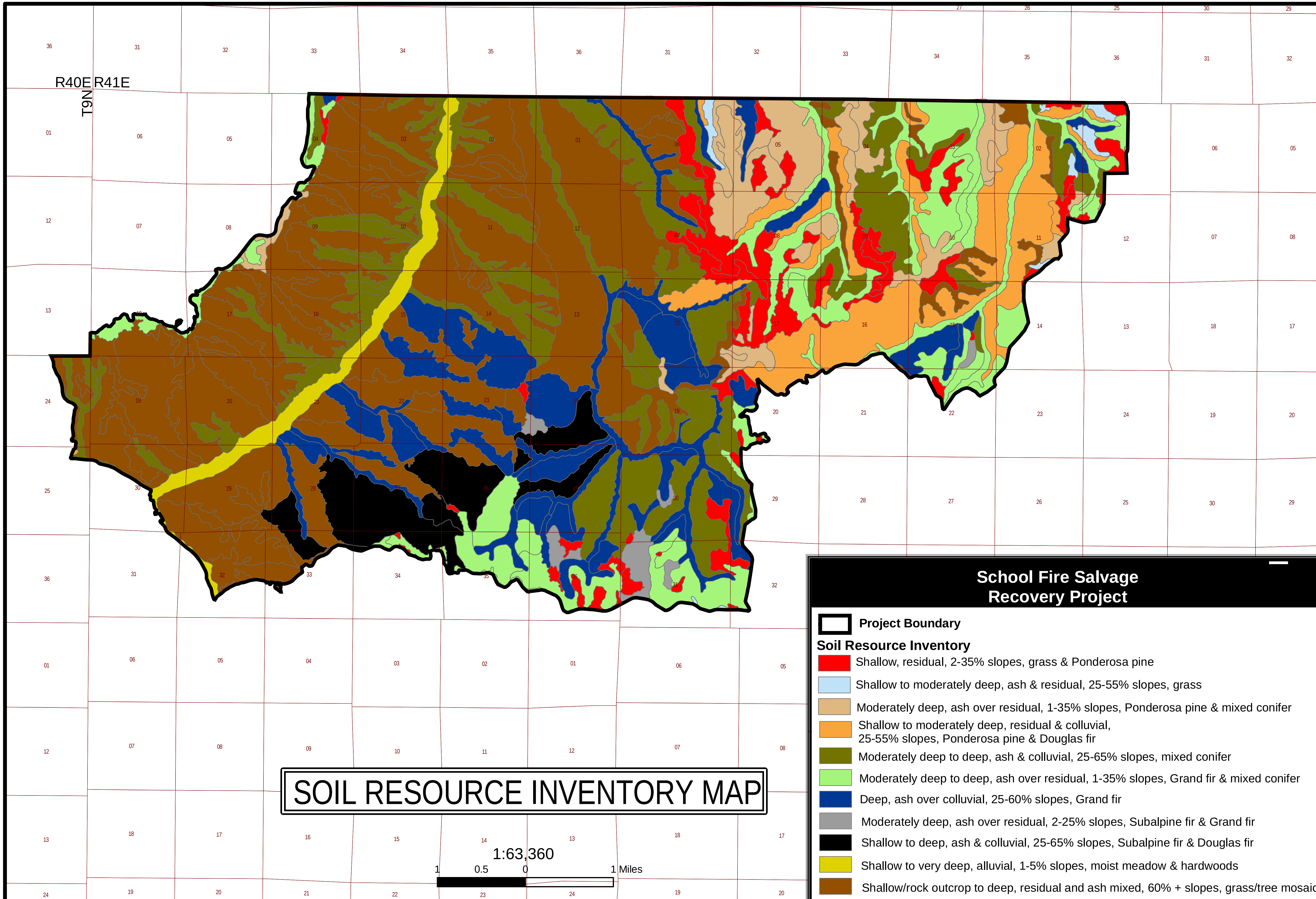
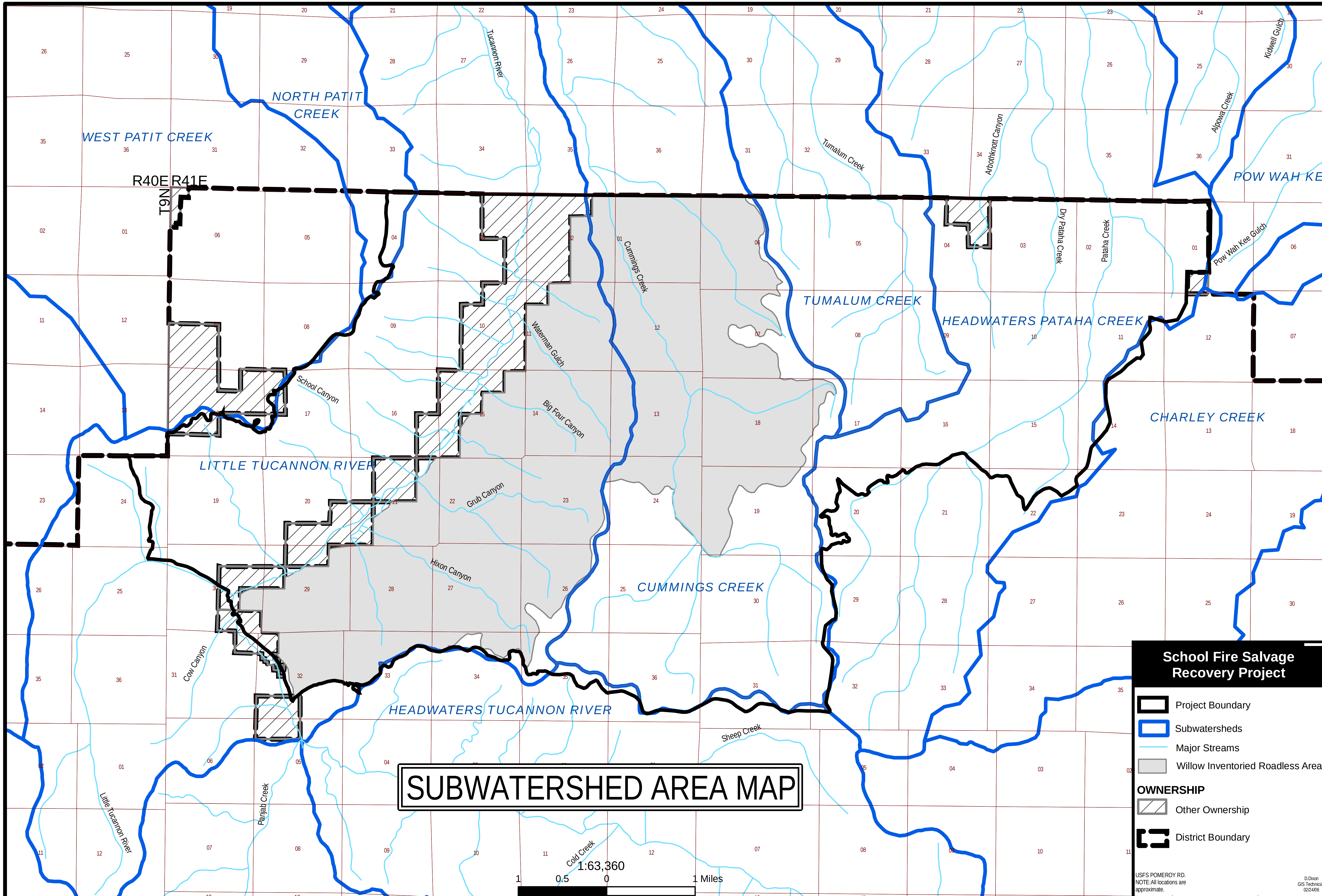
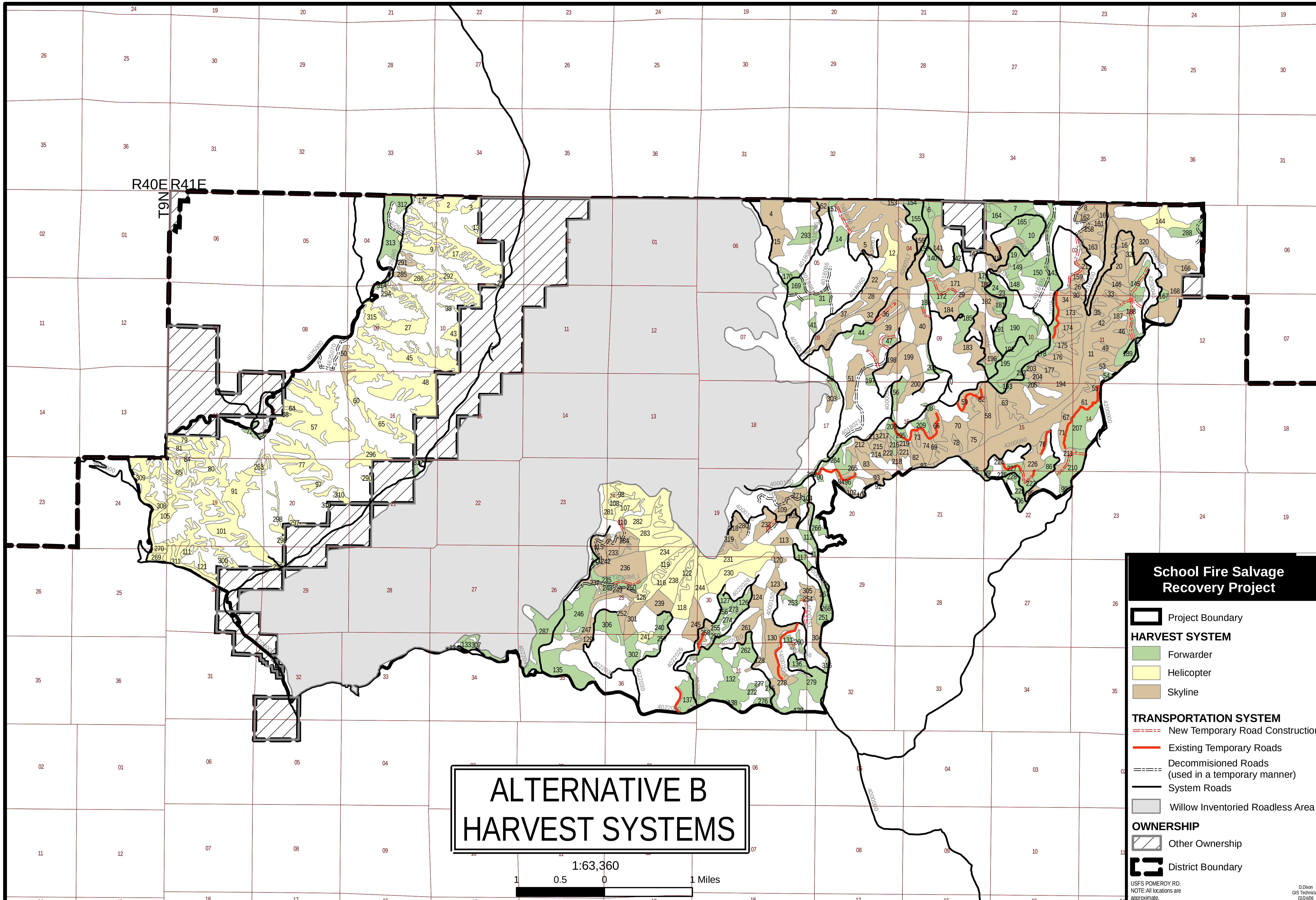
03/22/06

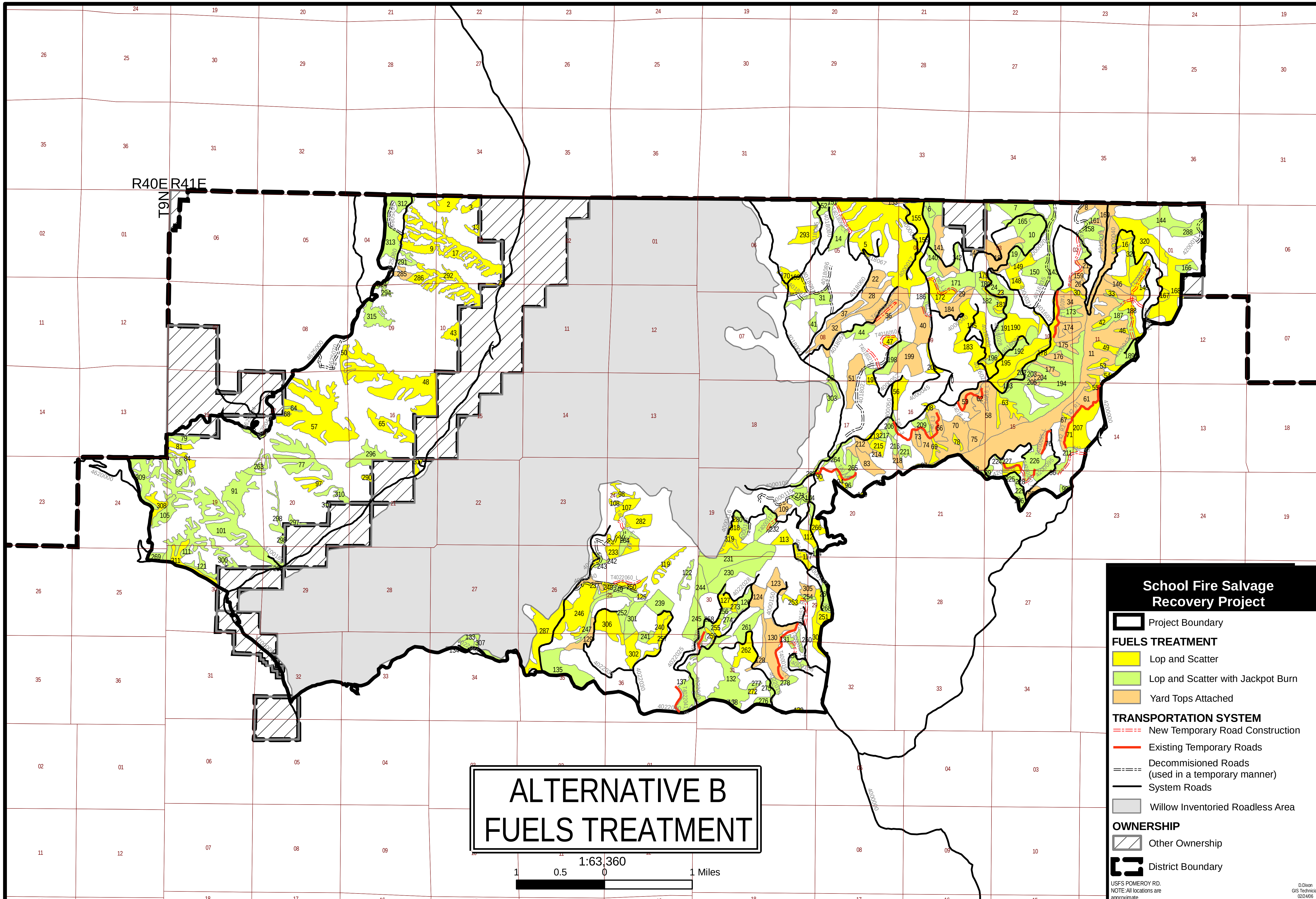


D.Dixon 03/16/2006
GIS Technician

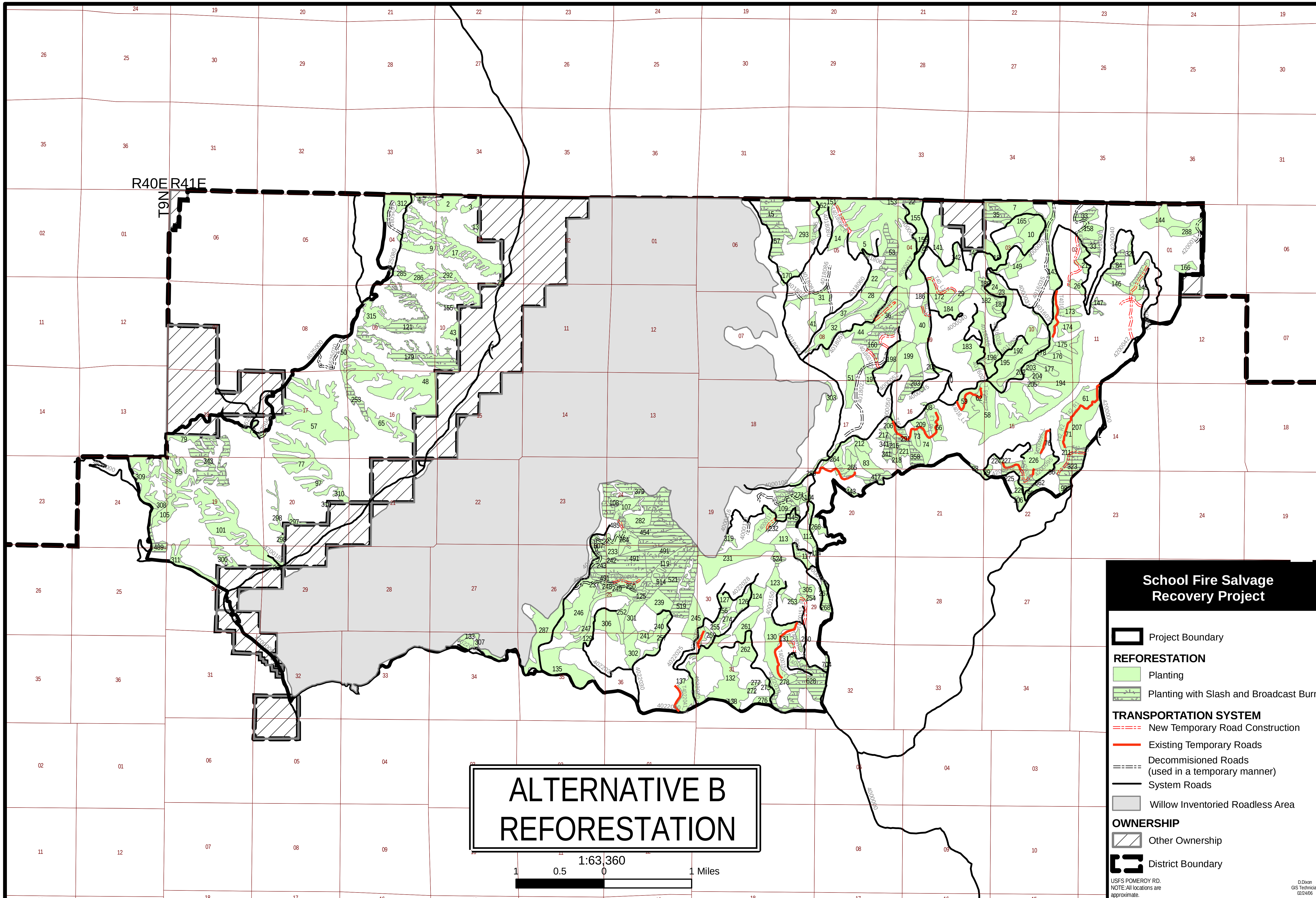


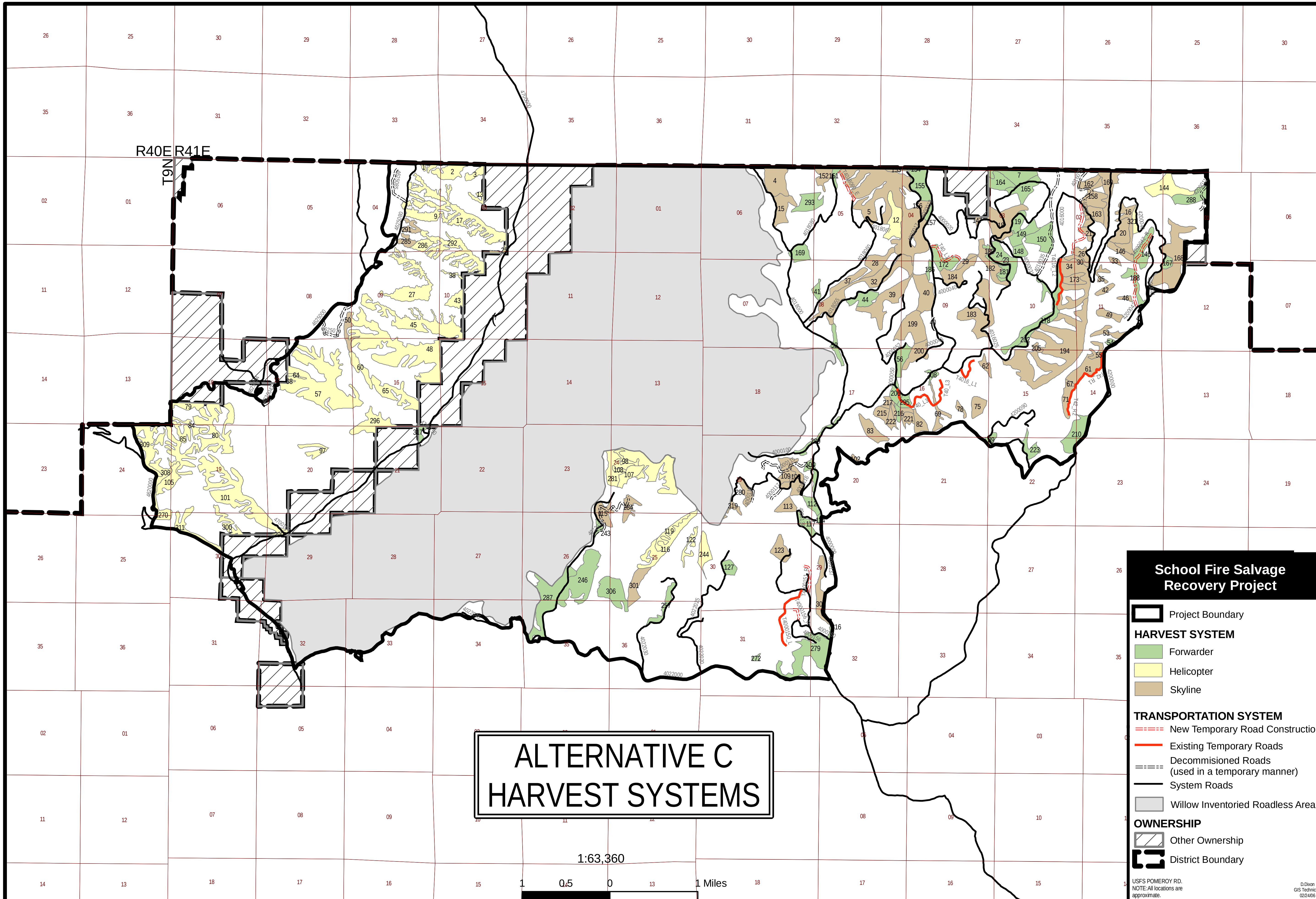
SUBWATERSHED AREA MAP
School Fire Salvage Recovery Project
Project Boundary
Subwatersheds
Major Streams
Willow Inventoried Roadless Area
OWNERSHIP
Other Ownership
District Boundary
USFS POMEROY RD.
NOTE:All locations are approximate.
D.Dixon
GIS Technician
02/24/06
1:63,360
1 0.5 0 1 Miles
R40E R41E
T9N
WEST PATIT CREEK
NORTH PATIT CREEK
LITTLE TUCANNON RIVER
HEADWATERS TUCANNON RIVER
CUMMINGS CREEK
TUMALUM CREEK
HEADWATERS PATAHA CREEK
CHARLEY CREEK
POW WAH KEE
Tucannon River
Cummings Creek
Waterman Gulch
Big Four Canyon
Grub Canyon
Hixon Canyon
School Canyon
Cow Canyon
Panjab Creek
Little Tucannon River
Cold Creek
Sheep Creek
Tumalum Creek
Arbothknott Canyon
Dry Pataha Creek
Pataha Creek
Pow Wah Kee Gulch
Alpowa Creek
Kidwell Gulch

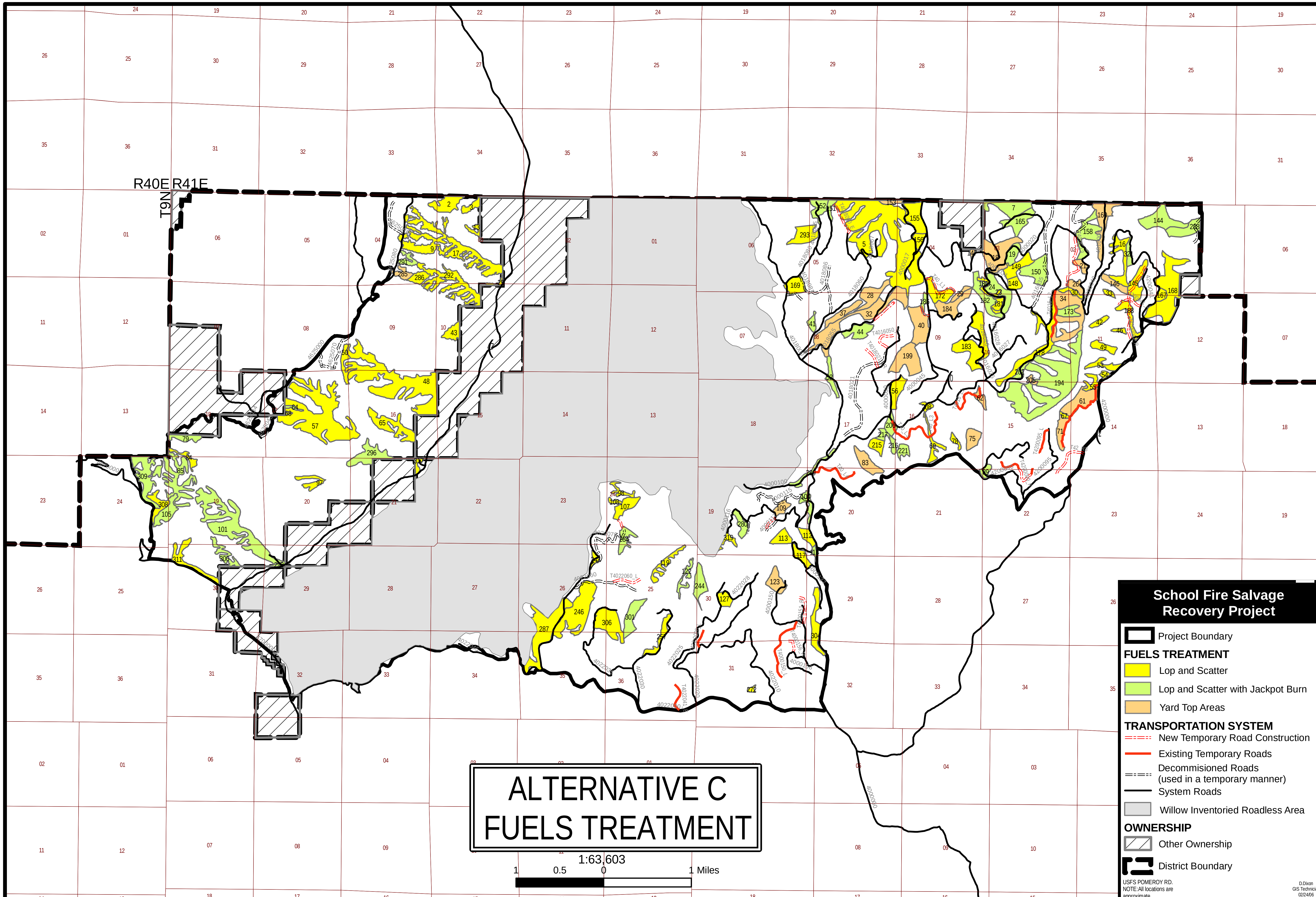

ALTERNATIVE B
HARVEST SYSTEMS
School Fire Salvage Recovery Project
Project Boundary
HARVEST SYSTEM
Forwarder
Helicopter
Skyline
TRANSPORTATION SYSTEM
New Temporary Road Construction
Existing Temporary Roads
Decommisioned Roads (used in a temporary manner)
System Roads
Willow Inventoried Roadless Area
OWNERSHIP
Other Ownership
District Boundary
USFS POMEROY RD.
NOTE: All locations are approximate.
D.Dixon
GIS Technician
02/24/06
1:63,360
1 0.5 0 1 Miles
R40E R41E
T9N

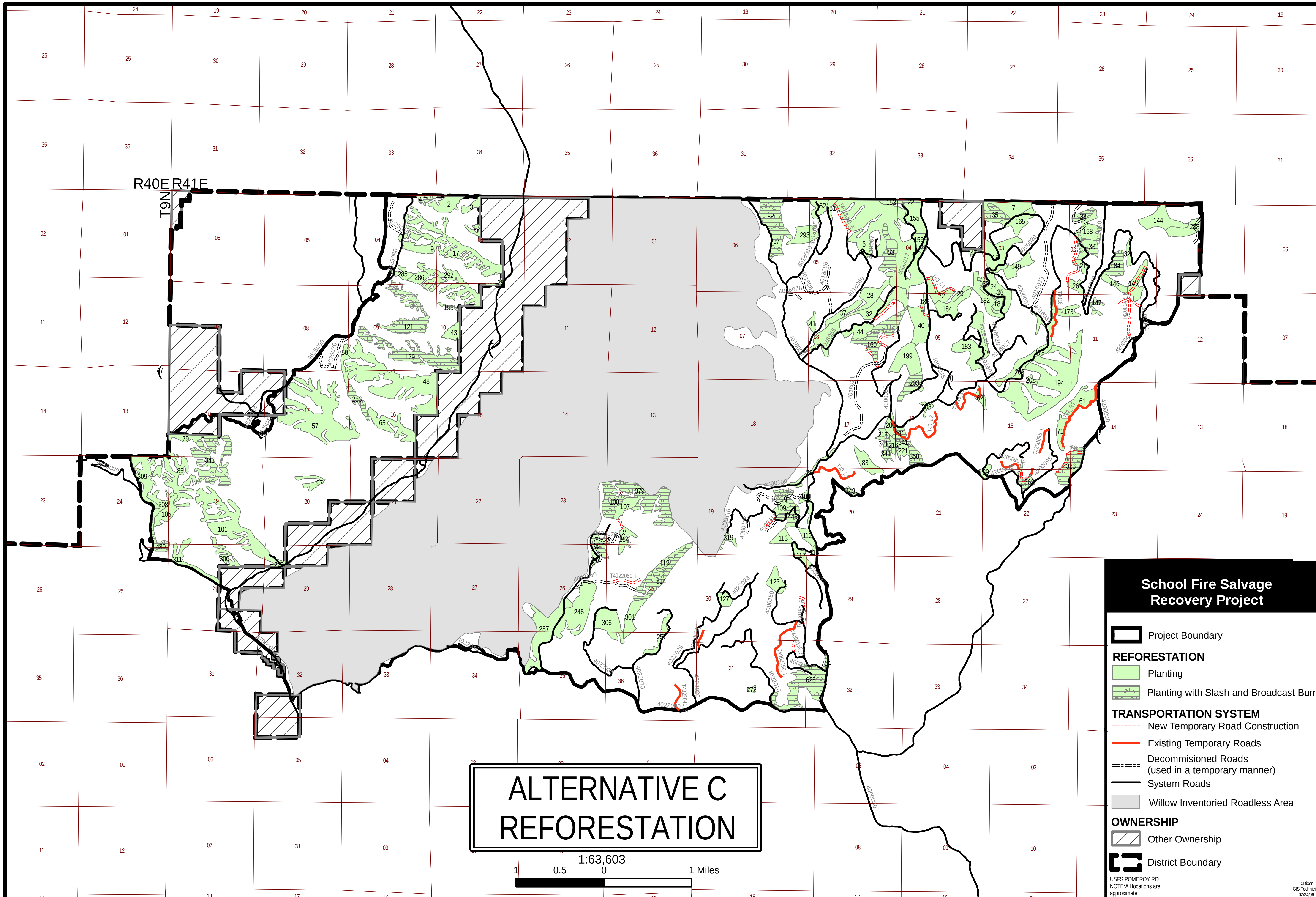


ALTERNATIVE B
FUELS TREATMENT
1:63,360
1 0.5 0 1 Miles
R40E R41E
T9N
School Fire Salvage Recovery Project
Project Boundary
FUELS TREATMENT
Lop and Scatter
Lop and Scatter with Jackpot Burn
Yard Tops Attached
TRANSPORTATION SYSTEM
New Temporary Road Construction
Existing Temporary Roads
Decommisioned Roads (used in a temporary manner)
System Roads
Willow Inventoried Roadless Area
OWNERSHIP
Other Ownership
District Boundary
USFS POMEROY RD.
NOTE:All locations are approximate.
D.Dixon
GIS Technician
02/24/06


ALTERNATIVE B
REFORESTATION
1:63,360
1 0.5 0 1 Miles
School Fire Salvage Recovery Project
Project Boundary
REFORESTATION
Planting
Planting with Slash and Broadcast Burn
TRANSPORTATION SYSTEM
New Temporary Road Construction
Existing Temporary Roads
Decommisioned Roads (used in a temporary manner)
System Roads
Willow Inventoried Roadless Area
OWNERSHIP
Other Ownership
District Boundary
USFS POMEROY RD.
NOTE: All locations are approximate.
D.Dixon
GIS Technician
02/24/06
R40E R41E
T9N


ALTERNATIVE C
HARVEST SYSTEMS
School Fire Salvage Recovery Project
Project Boundary
HARVEST SYSTEM
Forwarder
Helicopter
Skyline
TRANSPORTATION SYSTEM
New Temporary Road Construction
Existing Temporary Roads
Decommisioned Roads
(used in a temporary manner)
System Roads
Willow Inventoried Roadless Area
OWNERSHIP
Other Ownership
District Boundary
USFS POMEROY RD.
NOTE: All locations are approximate.
D.Dixon
GIS Technician
02/24/06
1:63,360
1 0.5 0 1 Miles
R40E R41E
T9N


School Fire Salvage Recovery Project
Project Boundary
FUELS TREATMENT
Lop and Scatter
Lop and Scatter with Jackpot Burn
Yard Top Areas
TRANSPORTATION SYSTEM
New Temporary Road Construction
Existing Temporary Roads
Decommisioned Roads (used in a temporary manner)
System Roads
Willow Inventoried Roadless Area
OWNERSHIP
Other Ownership
District Boundary
USFS POMEROY RD.
NOTE: All locations are approximate.
D.Dixon
GIS Technician
02/24/06
ALTERNATIVE C
FUELS TREATMENT
1:63,603
1 0.5 0 1 Miles
R40E R41E
T9N



R40E R41E
T9N
ALTERNATIVE C
REFORESTATION
1:63,603
1 0.5 0 1 Miles
School Fire Salvage Recovery Project
Project Boundary
REFORESTATION
Planting
Planting with Slash and Broadcast Burn
TRANSPORTATION SYSTEM
New Temporary Road Construction
Existing Temporary Roads
Decommisioned Roads (used in a temporary manner)
System Roads
Willow Inventoried Roadless Area
OWNERSHIP
Other Ownership
District Boundary
USFS POMEROY RD.
NOTE:All locations are approximate.
D.Dixon
GIS Technician
02/24/06

Appendix B

Implementation/Marking Guide

APPENDIX B

School Fire Salvage Recovery Project
Implementation/Marking Guides

SNAG RETENTION

The purpose of these marking guides is to implement the salvage harvest prescriptions for the School Fire Salvage Recovery Project. Objectives of the salvage harvest prescription is to remove merchantable fire-killed trees, and trees that are expected to die within 1 year (5 years for large ponderosa pine) as a result of fire injury sustained during the School Fire, while retaining all surviving trees and any dead or dying trees that are needed for wildlife snags or down woody recruitment.

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. At other 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, the “Rating Guide for Tree Survival for the School Fire Recovery Project” is included below.

<u>Landscape Snag Strategy</u>

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

<u>Criteria Common to All:</u>

- The minimum design criteria for snag retention is three snags/acre.
- Snags will be selected from trees that could potentially be designated as a “harvest trees” and meet “expected to die” criteria from the School Fire Recovery Salvage Harvest Implementation Marking Procedure (Scott 2002, 2003).
- If a snag and/or clump identified for retention is required to be felled for operational needs (i.e. hazard tree), and its loss moves snag density below minimum design criteria levels, a snag and/or clump of equal or larger size planned for harvest will be left as replacement.
- Retain all existing down (green or black) material greater than 10 inches in diameter at the large end unless excessive amounts are identified for removal by agreement with 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 the longest 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 snags available if none are available in the greater than 21 inch DBH size. Existing snags with high wildlife but low commercial value are preferred providing they do not create OSHA safety concerns.
- **Shape and Form –** Select those snags with largest limbs or broken tops and minimal lean (so they don't topple over prematurely) first. Do not select those snags with severe bole damage (i.e. fire consumed boles, especially in the first 30 feet), or significantly damaged/burned root systems.
- **Arrangement –** Spacing of multiple diameter snags will be preferable than just retaining larger diameter snags in one confined area. Scatter snags throughout the unit away from roads and landings. Some can be grouped in 15 acre grids if they can still maintain a good distribution across the unit.

Clumped Snag Guideline:

- **Objective –** To maintain all snag habitat within clumps across salvage harvest units. Clumps can incorporate a few of the larger trees (greater than 21 inches DBH).
- **Arrangement –** Accommodate logging systems, especially helicopter and skyline, while striving to meet the desired arrangement 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 (old clearcuts or meadows, etc.)
- **Clump Size –** Will vary by unit, but retain one clump for each 15 acre grid no smaller than one acre or no larger than three acres. Units smaller than 15 acres should have adequate clumped habitat adjacent and require no clumps within.

RATING GUIDE FOR TREE SURVIVAL

The rating or scoring guide 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). This report is referred to as the "Scott Guidelines."

Adaptations for the School Fire include incorporating changes suggested by the Scott Guidelines authors based on additional field work in 2003 (Scott et al. 2003), and the addition of the cambium sampling requirements (chopping) for trees that fall into the moderate range.

Use the following "Scoring Guide for Rating Tree Survival for the School Fire" to determine the probability for tree survival. Then use the following criteria to make a final determination about whether the tree can be expected to live or die within the next few years. Finally, leave the appropriate number of wildlife snags for that unit, as specified in the silvicultural prescription, to determine if a tree should be removed or left standing.

- ✎ If the rating score falls within the **High Probability to Survive** range, the tree should be marked for retention.
- ✂ 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.
- ✎ 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 2 to 4 inches below the ground level on the roots to obtain the most accurate results.

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

Trees that are uncertain to survive, regardless of whether they die in the near future or live for a number of years will be a source of future snag recruitment. This will prolong the time period that snags are available for wildlife habitat.

Additional mortality may occur after marking but prior to harvest. If the additional mortality is in excess of snag requirements, it is acceptable to harvest them.

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	
High Probability of Tree Surviving = Composite Rating Score	3-6
Moderate Probability of Tree Surviving = Composite Rating Score	7-12
Low Probability of Tree Surviving = Composite Rating Score	15-24
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

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 will be common to all trees in the unit.

2. Direction will be provided on using orange (leave tree) or blue (cut tree) marking paint for various units. In general those units with greater than 50 percent mortality of merchantable size trees will be marked orange; those with less than 50 percent mortality of merchantable size trees will be marked blue. 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 the crevices for tracking by sale administration.

3. Use the laminated copies of the survival guidelines (Scott et al. 2002) issued to each marker for every tree species included in the guidelines, and for parts A and B of the Scott Guidelines. Work through the two parts consecutively (A and then B), choosing the appropriate rating value given in parentheses next to each factor (as described by Don Scott during training on November 2, 2005; Scott 2005).

   This 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 Pomeroy Ranger District (see Scott 2005, 2006 for memoranda describing these trainings).

   Use grease pencils to rate out individual trees until the guides become familiar. When marking, carry the laminated guide sheets at all times for consistent application.

   - ✏ If the rating score falls within the **High Probability to Survive** range, the tree should be marked for retention.
   - ✂ 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.
   - ✏ 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 2 to 4 inches below the ground level on the roots to obtain the most accurate results.

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

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

   Tally the number of trees larger than 9 inches DBH by live and dead categories (including those 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 buffer zones, may substitute for other non-buffer-zone acres within the unit. Ephemeral buffers may count toward the number of clumps requirement, providing they are at least 1 to 3 acres in size.

5. Locate the necessary number of wildlife 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 those 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.

6. 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. Spacing of multiple diameter snags will be preferable to just retaining larger diameter snags in one confined area. Tally the number of trees by live and dead categories (including those 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 Environmental Impact Statement

Danger Tree Removal - Danger trees would be removed 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 removed 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 considered to be any tree that has 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, and developed recreation or administrative sites. 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.

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.*

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.

7. 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, Schmitt, and Speigel, 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.

- ✎ If the rating score falls within the **High Probability to Survive** range, the tree should be retained.
- ✂ If the rating score falls within the **Low Probability to Survive** range, the tree should be designated for removal.
- ✎ 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 2 to 4 inches below the ground level on the roots to obtain the most accurate results.
  - ✂ 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.
  - ✎ If dead cambium is 50% (2 out of 4 faces) the tree should be retained.
  - ✎ 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 C

Consistency With Eastside Screens

School Fire

Salvage Recovery Project

APPENDIX C

Consistency of Forest Vegetation Proposed Actions With Eastside Screens (Forest Plan amendment #11)

In March 1993, the Natural Resources Defense Council (NRDC) petitioned the U.S. Forest Service (Pacific Northwest Region) to halt all timber harvest activity in old growth forest occurring on national forest lands located east of the Cascade Mountain crest in Oregon and Washington (this geographical area is also known as the Eastside).

A month later in April 1993, a group of university and U.S. Forest Service research scientists released an "Eastside Forest Ecosystem Health Assessment" in draft form; this assessment is known as the "Everett Report" because it was directed by Dr. Richard Everett, a scientist located at the Wenatchee Forestry Sciences Laboratory (Everett et al. 1994).

In response to both the NRDC petition and the Everett report, the Pacific Northwest Region of the U.S. Forest Service issued interim direction in August 1993 requiring that timber sales prepared and offered by Eastside national forests be evaluated to determine their potential impact on riparian habitat, historical vegetation patterns, and wildlife fragmentation and connectivity.

This interim direction, known as the Eastside Screens, was used to amend Eastside forest plans when Regional Forester John Lowe signed a Decision Notice on May 20, 1994 to implement Regional Forester's Forest Plan Amendment #1 (USDA Forest Service 1994). Regional Forester's Forest Plan Amendment #1 is amendment #8 to the Umatilla National Forest Land and Resource Management Plan.

A slightly revised version of the Eastside Screens was issued as Regional Forester's Forest Plan Amendment #2 when Regional Forester John Lowe signed a Decision Notice on June 12, 1995 (USDA Forest Service 1995). Regional Forester's Forest Plan Amendment #2 is amendment #11 to the Umatilla National Forest Land and Resource Management Plan (decision notice approved on 6/12/1995).

The Eastside Screens consist of six items: three general items (items 1 to 3), a riparian standard (item 4), an ecosystem standard (item 5) and a wildlife standard (item 6). This section describes how proposed actions for the School Fire Ecosystem Maintenance Project will comply with the Eastside Screens.

General Standards (items 1-3 in FP Amendment #11)

Item 1 defines the scope of the Eastside Screens to be timber sales only.

> **Result**: The salvage timber harvest proposed action will be implemented using a commercial timber sale contract, so the Eastside Screens apply to the School Fire Salvage Recovery Project.

Item 2 exempts personal-use firewood sales, post and pole sales, sales to protect health and safety, and sales within recreation special use areas from the amendment.

Result: It is not anticipated that personal-use firewood sales, post and pole sales, sales to protect health and safety, or sales within recreation special use areas would be used when implementing the salvage timber harvest proposed action, so item 2 does not apply to the School Fire Salvage Recovery Project.

Item 3 exempts five categories of timber sales from the ecosystem standard (but not from the riparian and wildlife standards):

1. Precommercial thinning.

Result: The School Fire Salvage Recovery Project proposed action does not include precommercial thinning, so an exemption will not be claimed for this category.

2. Material sold as fiber.

Result: Wood products resulting from the School Fire Salvage Recovery Project proposed action will not be sold primarily as fiber, although incidental amounts of fiber material may be included depending on timber sale timing and how it affects wood decay status and associated timber merchantability. Since most of the salvage timber volume is not expected to be sold as fiber, an exemption will not be claimed for this category.

3. Dead material less than 7 inches in diameter, with incidental green volume.

Result: Wood products resulting from the School Fire Salvage Recovery Project proposed action will not consist primarily of dead material less than 7 inches in diameter. "Incidental green volume" refers to situations where live (green) trees are included in the treatment proposal to meet stocking or other silvicultural objectives.

Any "green volume" included in the salvage harvest areas involves trees that are alive now but are predicted to die within one year after experiencing fire-caused injuries (five years for "mature and overmature" ponderosa pines); these green trees have fire-caused injuries that predispose them to die in the near future(Schmitt and Filip 2005; Scott et al. 2002, 2003)..

Implementation of the Eastside Screens is largely directed by letters and memoranda produced by the Regional Forester's "Eastside Screens Oversight Team" after reviewing timber sale projects on Eastside national forests.

Two Eastside Screens oversight letters specifically address the circumstances under which dying trees can be considered to be dead (Devlin 1998a, 1998b). The Pacific Northwest Region Regional Forester has directed that these letters be considered when applying the Eastside Screens (Goodman 2005).

Whether a tree is live or dead is an important consideration because although dead trees are used to meet the snag and down wood standards from the wildlife screen, most of the Eastside Screens applies to live trees only (Norris 2005, USDA Forest Service 1995).

The two oversight letters referenced above allow dying trees to be "counted as snags" (dead trees) if there is a professional determination that the tree will definitely be dead in 5 years or less. Using the Scott Guidelines (Scott et al. 2002, 2003), which were prepared by professional entomologists and a pathologist, to predict the probability of tree survival is deemed a "professional determination" in this context (Goodman 2005).

Since the School Fire Salvage Recovery Project proposed action does not consist primarily of dead material less than 7 inches in diameter, and because it does not include incidental green volume (other than fire-injured trees that are considered to be dead in the context of the Eastside Screens), an exemption will not be claimed for this category.

4. Salvage sales located outside mapped old growth, with incidental green volume.

Result: "Mapped old growth" is defined to include both of the Forest Plan allocations for old growth (C1 and C2) and as depicted on published maps distributed with the Forest Plan (USDA Forest Service 1990a), as amended. This definition for mapped old growth follows written guidance and direction from the Pacific Northwest Region "Eastside Screens Oversight Team" (Lowe 1995).

The School Fire Salvage Recovery Project proposed action includes salvage timber harvest in portions of two C1 areas that experienced substantial fire effects. The proposed action (alternative B) also includes a Forest Plan amendment to re-designate four burned C1 areas by selecting replacements in close proximity to the original locations (designating replacements is mitigation for fire-caused damage, not for proposed impacts from salvage timber harvest).

Alternative C of the School Fire Salvage Recovery Project does not include salvage timber harvest in either of the existing C1 old growth areas.

Since the School Fire Salvage Recovery Project proposed action includes salvage timber harvest in currently mapped old growth, and because it also includes a Forest Plan amendment to designate new old growth areas to replace the existing burned ones, it is appropriate to claim an exemption using this category because no salvage harvest is proposed for the final (replacement) old growth areas.

5. Commercial thinning and understory removal sales located outside mapped old growth.

Result: The School Fire Salvage Recovery Project proposed action does not include commercial thinning or understory removal treatments, so an exemption will not be claimed for this category.

Final Result for Item 3: This item describes five timber sale categories that can be considered for exemption from the ecosystem standard (item 5) but not from the riparian (item 4) or wildlife (item 6) standards. Four of the five exemption categories do not apply to the School Fire Salvage Recovery Project, but one category ("salvage sales located outside mapped old growth") does apply and an exemption is claimed on that basis.

Riparian Standard (item 4 in Forest Plan Amendment #11)

Item 4 of the Eastside Screens directs that timber sales (green and salvage) will not be planned or located in riparian areas.

Umatilla National Forest policy is that amendment #10 (USDA Forest Service and USDI Bureau of Land Management 1994) to the Land and Resource Management Plan will be applied in lieu of the riparian standard from the Eastside Screens.

Result: This policy means that applying PACFISH also meets the Eastside Screens riparian standard.

Forest Plan amendment #10, commonly referred to as PACFISH, is interim direction designed to "arrest the degradation and begin the restoration of aquatic habitat and riparian areas on lands administered by the Forest Service and BLM; it applies to watersheds outside the range of the northern spotted owl that provide habitat for Pacific salmon, steelhead, and sea-run cutthroat trout."

PACFISH uses a buffer concept to establish riparian habitat conservation areas (RHCA) along both sides of streams, rivers, lakes and other wetlands. RHCA widths extend from the edge of the active stream channel and they vary with stream class and whether a stream is fish bearing or not.

RHCAs can be established using specified feet of slope distance (300 feet on either side of perennial, fish-bearing streams) or in numbers of "site potential tree heights" (2 site-potential tree heights for perennial, fish-bearing streams).

The interim RHCA widths established by the PACFISH environmental assessment could be adjusted during watershed analysis or after site-specific analysis presenting a rationale for RHCA modifications.

> **Result**: Neither of the forest vegetation proposed actions (salvage timber harvest, tree planting) will occur in riparian habitat conservation areas established using PACFISH (Forest Plan amendment #10).

Ecosystem Standard (item 5 in Forest Plan Amendment #11)

The ecosystem standard requires a landscape-level assessment of the historical range of variability (HRV) for structural stages, including a comparison of current structural stage amounts with their historical ranges.

> **Result**: An HRV analysis for structure classes (equivalent to "structural stages" in the Eastside Screens) is presented for the entire School Fire analysis area in Appendix E of this document. However, the ecosystem standard does not apply to the School Fire Salvage Recovery Project because it is exempt from meeting this standard as a result of item 3 (e.g., it is a "salvage sale located outside mapped old growth").

Wildlife Standard (item 6 in Forest Plan Amendment #11)

Item 6 (a) states that the wildlife standard has two possible scenarios to follow as based on HRV results for late-old structural stages (LOS), and it defines LOS to be the "multi-stratum with large trees" and "single stratum with large trees" structural stages.

> **Result**: Since the School Fire Salvage Recovery Project is exempt from meeting the ecosystem standard (see result for item 3 above), item 6 (a) is not applicable because the results of an HRV analysis are not used to determine which of the wildlife scenarios to follow.

Item 6 (b) directs that:

1. Scenario A (item 6 d) is to be used whenever either one of the LOS stages is below HRV. If both LOS stages occur within a single biophysical environment and one is above HRV and one is below, scenario A is to be used.
2. Scenario B (item 6 e) is to be used only when both LOS stages for a particular biophysical environment are within or above HRV.

> **Result**: Since the School Fire Salvage Recovery Project is exempt from meeting the ecosystem standard (see result for item 3 above), item 6 (b) is not applicable because the results of an HRV analysis are not used to determine which of the wildlife scenarios to follow.

Item 6 (c) requires that any of the five timber sales exempted from the ecosystem standard (see numbered list for item 3 above) must still meet the intent of the wildlife standards by following items 1-4 from the scenario A direction (scenario A is item 6 (d) of the wildlife standard).

> **Result**: Since the School Fire Salvage Recovery Project meets one of the five timber sale exemption categories described for item 3 above, item 6 (c) requires that scenario A direction from the wildlife standard be followed during project planning.

Item 6 (d) of the wildlife standard, which is scenario A, includes four major items and many sub-items as described below.

1. Item 1 allows some timber sale activities to occur within late/old structure (LOS) stages that are within or above HRV in order to maintain or enhance LOS in a particular biophysical environment.

   Result: This item refers to LOS and how manipulation of LOS could occur. The salvage timber harvest proposed action will not affect LOS because it applies to dead trees only (e.g., fire-killed and fire-injured trees that are determined to be dead as based on a professional determination meeting the requirements of the Eastside Screens (Devlin 1998a, 1998b; Goodman 2005)), and LOS involves live trees only (Norris 2005, USDA Forest Service 1995).

2. Item 2 states that many types of timber sale activities are permissible outside of LOS, with the intent of maintaining or enhancing LOS components, but that "remnant late and old seral and/or structural live trees greater than or equal to 21 inches in diameter" must be maintained; that manipulation of vegetative structure not meeting LOS standards should occur in such a way that conditions are moved toward LOS structure; and that maintenance or restoration of open, park-like structure should be emphasized whenever appropriate.

   Result: This item refers to LOS components, which are defined to be "remnant late and old seral and/or structural live trees ≥ 21" DBH." The salvage timber harvest proposed action will not affect LOS components because it applies to dead trees only (e.g., fire-killed and fire-injured trees that are determined to be dead as based on a professional determination meeting the requirements of the Eastside Screens (Devlin 1998a, 1998b; Goodman 2005)), and LOS components involve live trees only (Norris 2005, USDA Forest Service 1995).

3. Item 3 involves maintaining or enhancing the current level of connectivity between LOS stands and between Forest Plan old-growth areas, reducing fragmentation of existing LOS stands, and not applying even-aged regeneration cutting methods or group selection to non-LOS stands located within, or surrounded by, LOS stands.

   Result: This item refers to connectivity between LOS stands; and it prohibits certain cutting methods to avoid fragmentation and thereby maintain connectivity. The salvage timber harvest proposed action will not affect LOS connectivity because it applies to dead trees only (e.g., fire-killed and fire-injured trees that are determined to be dead as based on a professional determination meeting the requirements of the Eastside Screens (Devlin 1998a, 1998b; Goodman 2005)), and LOS connectivity involves live trees only (Norris 2005, USDA Forest Service 1995).

4. Item 4 involves retention of snags, green-tree replacements, and down logs. It also addresses goshawk habitat by requiring protection of every known goshawk nest (both active and historical), requires 30 acres of goshawk nesting habitat surrounding all active and historical goshawk nest trees, and provision of a 400-acre "post fledging area" around every known active nest site.

   Result: This item refers to dead wood and how it will be managed to meet the 100% potential population level for primary cavity excavators; and it stipulates that dead wood levels "should be determined using the best available science on species requirements as applied through current snag models or other documented procedures."

   The salvage timber harvest proposed action will affect dead wood levels by removing fire-killed and fire-injured trees from within the School Fire analysis area. However, the "best available science" is being used (e.g., Forest Vegetation Simulator, Fire and Fuels Extension, and the DecAID decayed wood advisor) to ensure that sufficient levels of standing dead and down wood will be reserved from salvage harvest to meet the 100% potential population level of primary cavity excavators (for specific details, see the wildlife specialist report dealing with dead wood).

Appendix B (Implementation/Marking guide documents how standing dead and down wood will be handled during preparation of the salvage timber harvest portion of the School Fire Salvage Recovery Project.

According to the wildlife specialist report, there are no known goshawk nests in the School Fire analysis area. If a nest is discovered during project preparation or implementation, most-suitable nesting habitat and post-fledging area standards from this item will be applied at that time.

Item 6 (e) of the wildlife standard is scenario B and it contains four major items.

Result: Items 6 (a) through (c) require that either scenario A or B of the wildlife screen is to be followed. Since the School Fire Salvage Recovery Project claimed an exemption because it is a "salvage sale located outside mapped old growth," item 6 (c) states that it must follow scenario A. Since only one of the two scenarios is to be used, this means that item 6 (e) (scenario B) is not applicable.

Appendix E

Specifications for Modeling Forest Vegetation and Characterization of Pre and Post-Fire Condition

School Fire

Salvage Recovery Project

APPENDIX E

Specifications For Modeling Forest Vegetation And Pre and Post-Fire Forest Vegetation Conditions

This appendix describes how vegetation databases were compiled to characterize both pre-fire and post-fire conditions for the School Fire analysis area. It also summarizes pre- and post-fire vegetation conditions using five indicators relevant to the upland forestland portion of the analysis area: potential vegetation, species composition, forest structure, tree density, and insect and disease susceptibility.

This section includes a detailed discussion of the modeling process and assumptions used with the Forest Vegetation Simulator (FVS) and the Fire and Fuels Extension (FFE) to FVS. The documentation, description, instructions and software for the FVS program are available on the internet at www.fs.fed.us/fmsc/fvs. FFE documentation is provided by Reinhardt and Crookston (2003).

Overview of Methods

Vegetative analysis and characterizations of stand conditions prior to and following the fire were based on stand examination information, photo interpretation, satellite imagery and the Most-Similar-Neighbor (MSN) imputation program (Crookston et al. 2002). MSN is a method for utilizing existing data to fill in missing data for similar stands (their most similar neighbors) across an analysis area.

MSN requires that general information be available for all stands, such as Landsat satellite imagery and physical site factors derived from a digital elevation model (DEM), and that detailed information be available for some stands, such as field-sampled stand examination data.

The general information available for all stands is used by the MSN program to identify stands without field-sampled data that are most similar to stands having field-sampled data. MSN then supplies, or imputes, the data for stands without field-sampled information. At the conclusion of this process, all forestland within the analysis area can be characterized using field-sampled data.

For the School Fire project, analysis was conducted at two different scales: a mid-scale area formed by combining subwatersheds that include and directly adjoin the School Fire perimeter, and a fine-scale analysis area consisting exclusively of National Forest System lands within the fire perimeter. Note that the mid-scale analysis area includes significant acreage outside the fire perimeter.

In order to examine the environmental effects associated with implementing the School Fire Salvage Recovery Project, it was desirable to have detailed stand examination data for both of the analysis areas.

To meet this need, the MSN program was used to impute field-sampled data for the north half of the Umatilla National Forest, including both the Pomeroy and Walla Walla Ranger Districts. The MSN imputations were completed in December 2004.

The MSN imputations used a photo-delineated polygon layer derived from aerial photography acquired in 2001 for the Walla Walla Ranger District and in 2002 for the Pomeroy Ranger District. The photo-delineated polygon layer, prepared under contract in 2003-2004, served as the base vegetation layer for the School Fire vegetation analyses.

Satellite imagery (a 2001 Landsat 7 thematic mapper scene) and the DEM variables were used as the general data for every stand, and to determine stand similarity for detailed data imputation. Stand exam data (acquired between 1986 and 2003) was the detailed data used for imputing field-sampled information for polygons without stand exam data.

The MSN program is a module within INFORMS, a nationally supported analysis framework provided with the Natural Resource Information System (NRIS). The field-sampled information used for MSN is stored in an NRIS database application called Field Sampled Vegetation (FSVeg).

The Pomeroy Ranger District has stand examination data for 21% of forestland in the mid-scale analysis area, and for 68% of forestland in the fine-scale analysis area delineated using the School Fire perimeter.

The reference and imputed data for both analysis areas was entered into the Forest Vegetation Simulator (FVS) model developed by the USDA Forest Service (Dixon 2003). In essence, the Forest Vegetation Simulator is a collection of forest growth and development simulation models. Since its initial development in 1973, FVS has evolved to a system of tightly integrated analytical tools.

These modeling and simulation tools, based on a growing body of scientific knowledge gleaned from decades of natural resources research, are built on the framework of the original Prognosis growth and yield model (Stage 1973).

The Fire and Fuels Extension (FFE) to FVS simulates fuel dynamics and potential fire behavior over time and can be used to simulate and predict snag falldown rates, fuel loadings, and parameters affecting fuels accumulation and decay (Reinhardt and Crookston 2003).

The FVS model was used to compare alternative effects for the School Fire Salvage Recovery Project, including salvage timber harvest, fuels treatment, reforestation by planting and natural regeneration, and development of forested wildlife habitat over time.

The FVS model has a variant calibrated for the Blue Mountains (Johnson 1990); it is based on local studies measuring stand characteristics throughout the Blue Mountains physiographic province.

The FVS program models growth and stand characteristics such as canopy cover, average diameter and trees per acre by size class and species composition. This information is used to compare the effects of treatment alternatives on future forest development. The FVS and FFE models were used to examine fuel loadings, habitat conditions, and plant succession scenarios

The growth algorithms in FVS vary by plant association; FVS has the capability to increase or decrease stand growth if measured tree-growth information is included with the input data. Growth projections within FVS are based on average plant association productivity.

The FVS model uses stand density index (SDI) to estimate tree mortality rates. SDI-based stocking level information for the Blue Mountains is used to calibrate the FVS tree mortality rates. The maximum SDI values used for this purpose are derived from Cochran et al. (1994) and Powell (1999, 2005a).

The FVS model also includes local information about snag falldown rates and decomposition (decay) in order to predict snag and down wood dynamics through time. These decay and falldown rates vary by tree species, size class and the current condition of snags or down logs.

The breaking and falling of snags are simulated in FVS/FFE and the resulting down wood is then added to other surface fuels where further decay modeling occurs. Falldown rates and resulting fuel loadings are important when comparing the environmental effects of removing fuel (or not removing it) on post-fire forest development.

Limitations of the Most Similar Neighbor (MSN) Analysis

MSN uses field-sampled stands to impute (or attribute) data for similar stands that do not have field-sampled data. Consequently, MSN results improve as the size of the analysis area increases because this results in a larger number of field-sampled stands for imputation purposes. For the School Fire analysis, MSN results from two neighboring Ranger Districts were used, an area of approximately 745,500 acres.

The MSN program produces "best match" imputations as based on a statistical analysis of specific stand attributes. Thresholds have been established for the normal range of statistical variability for each attribute and when the best match between a sampled and an unsampled stand falls within these thresholds, then the match is deemed "high". However, when the best match falls outside of these thresholds, then the match is deemed "low".

For the mid-scale analysis area (approximately 142,240 acres including all ownership categories), the field-sampled reference stands represented 7% of the forestland area, stands with a "high" imputation result represented 80% of the forestland area and stands with a "low" imputation result represented 13% of the forestland area. Many of the "low" imputation results are older regeneration harvest units (plantations) and they are poorly represented by field-sampled stands.

For the fine-scale analysis area (approximately 28,359 acres including all ownership categories within the School Fire perimeter), the field-sampled reference stands represented 9% of the forestland area, stands with a "high" imputation result represented 80% of the forestland area and stands with a "low" imputation result represented 11% of the forestland area. Many of the "low" imputation results are older regeneration harvest units (plantations) and they are poorly represented by field-sampled stands.

Effects of Wildfire

Fire effects modeling varied by whether the trees were alive or dead at the time of the fire.

1. Dead Trees

In the modeling process, trees that were dead (i.e., snags) at the time of the fire (2005) were either left standing or felled and left on site, depending on species, tree diameter and length of time as a snag. Existing snags that fell during the fire were then partially consumed (in the modeling process) by using the "fuelmove" keyword.

Refer to the Wildlife specialist report for further information about how the snags and down logs were modeled.

2. Live Trees

Live trees present at the time of the wildfire (2005) were variably killed based on the species, diameter size class and fire severity. The tree mortality rate was based on professional judgment using local knowledge about fire effects and how they vary by tree species. The type of fire effects information used in this phase of the process is presented in Table E-1.

All polygons within the School Fire analysis area were assigned to a fire severity level of low, moderate or high based on predicted tree mortality. Tree mortality ranges associated with the fire severity levels are: low (0 to 30% predicted tree mortality), moderate (31 to 74% predicted tree mortality) and high (75%+ predicted tree mortality).

Tree mortality predictions were based on interpretation of orthorectified, multispectral, sub-meter resolution satellite imagery (two QuickBird scenes acquired on September 15 and 20, 2005 by DigitalGlobe, Inc.), and on estimated stand mortality levels that vary by the type and amount of fire injury (Scott et al. 2002, 2003).

Table E-1 Fire resistance characteristics for common conifer trees of the Blue Mountains.

Tree Species	Bark Thickness	Rooting Habit	Bark Resin (Old Bark)	Branching Habit	Foliage Flammability	Overall Resistance
Western larch	Very thick	Deep	Very little	High and very open	Low	Very high
Ponderosa pine	Very thick	Deep	Abundant	Moderately high and open	Medium	High
Douglas-fir (interior)	Very thick	Deep	Moderate	Moderately low and dense	High	High
Grand fir	Thick	Shallow	Very little	Low and dense	High	Medium
Western white pine	Medium	Medium	Abundant	High and dense	Medium	Medium
Lodgepole pine	Very thin	Medium	Abundant	Moderately high and open	Medium	Low
Engelmann spruce	Thin	Shallow	Moderate	Low and dense	Medium	Low
Subalpine fir	Very thin	Shallow	Moderate	Very low and dense	High	Very low

Sources/Notes: Adapted from Flint (1925), Klinka et al. (2000) and Starker (1934). Species rankings reflect the predominant situation for each trait. Species traits can vary during the lifespan of an individual tree, and from one individual to another in a population. For example, grand fir's bark is thin when young, but relatively thick when mature.

Bark Beetle Mortality

Consultation with an entomologist from the Blue Mountains Service Center (Donald W. Scott), in conjunction with aerial sketch map information showing insect activity in the School Fire analysis area between 1990 and 2005 (Table E-2), formed the basis for modeling bark beetle mortality for ponderosa pine and interior Douglas-fir.

A wide variety of insects are now present in the School Fire analysis area, or they could be present in the near future as based on historical occurrence patterns: western pine beetle in ponderosa pine; mountain pine beetle in ponderosa, lodgepole or western white pines; pine engraver in lodgepole or ponderosa pines; red turpentine beetle in pines; Douglas-fir beetle in interior Douglas-fir; fir engraver in grand fir (primarily); ambrosia beetles in dead grand firs; and several wood borer species in recently killed trees.

Tree mortality associated with western pine beetle affecting ponderosa pine was included in the FVS modeling at variable rates differing by host-tree size and abundance. Tree mortality related to Douglas-fir beetle was also included at variable rates based on host-tree diameter and abundance.

Wildlife Habitat

Wildlife habitat, including snags and down wood, was simulated using FVS and the Fire and Fuels Extension. Refer to the Wildlife specialist report for detailed information about modeling wildlife habitat dynamics through time and the effects of the salvage timber harvest silvicultural activity.

Management Activities by EIS Alternative

Activities for each unit in each alternative were simulated using the FVS and FFE models. Post-fire conditions, and their evolution through time, were also simulated for all of the vegetation polygons regardless of whether they were included in a recommended activity unit. A description of the activities for each alternative is provided in chapter 2 of the EIS.

Fuel Activities

Fuel activities were simulated with the Fire and Fuels Extension to FVS. Refer to the Fuels specialist report for detailed information about modeling fuel dynamics through time and the fuel activities associated with the salvage timber harvest silvicultural activity.

Table E-2. Insect activity from aerial sketch mapping for the School Fire analysis area, 1990-2005.

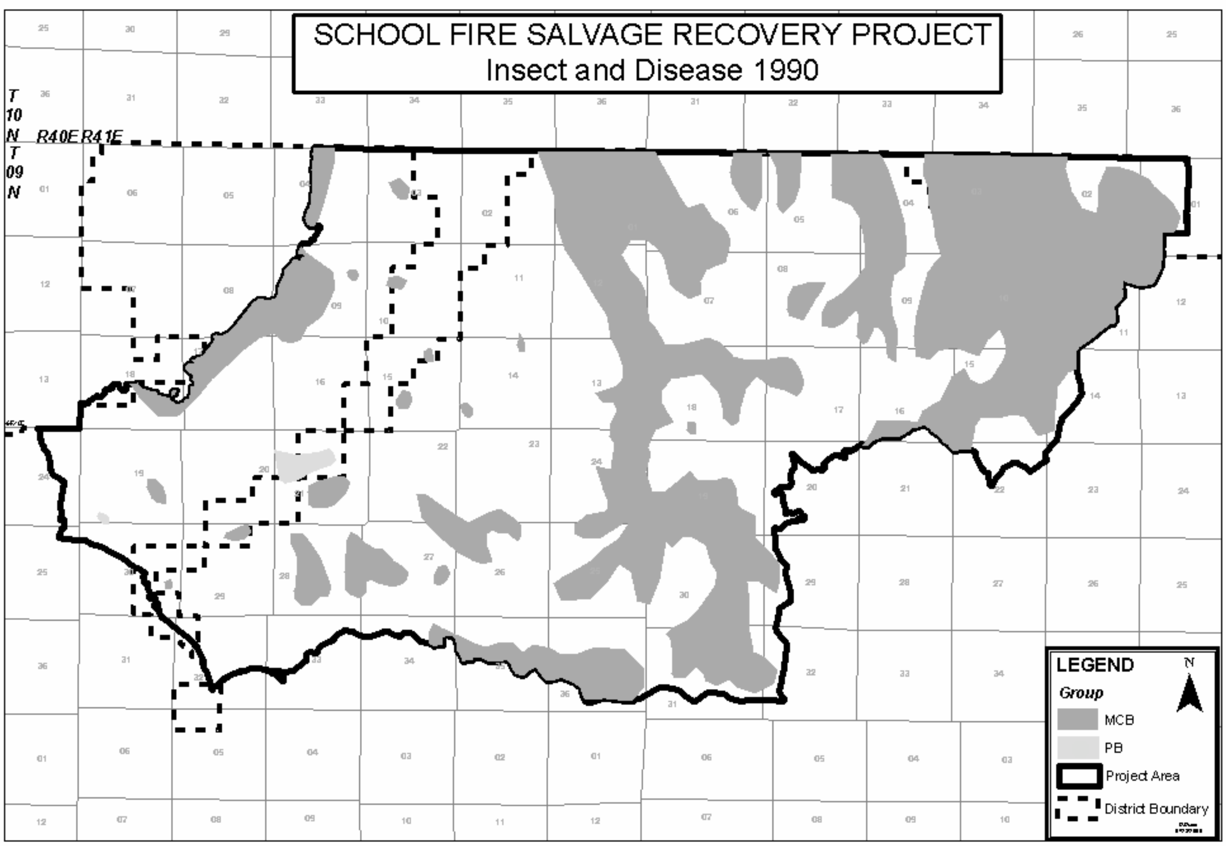
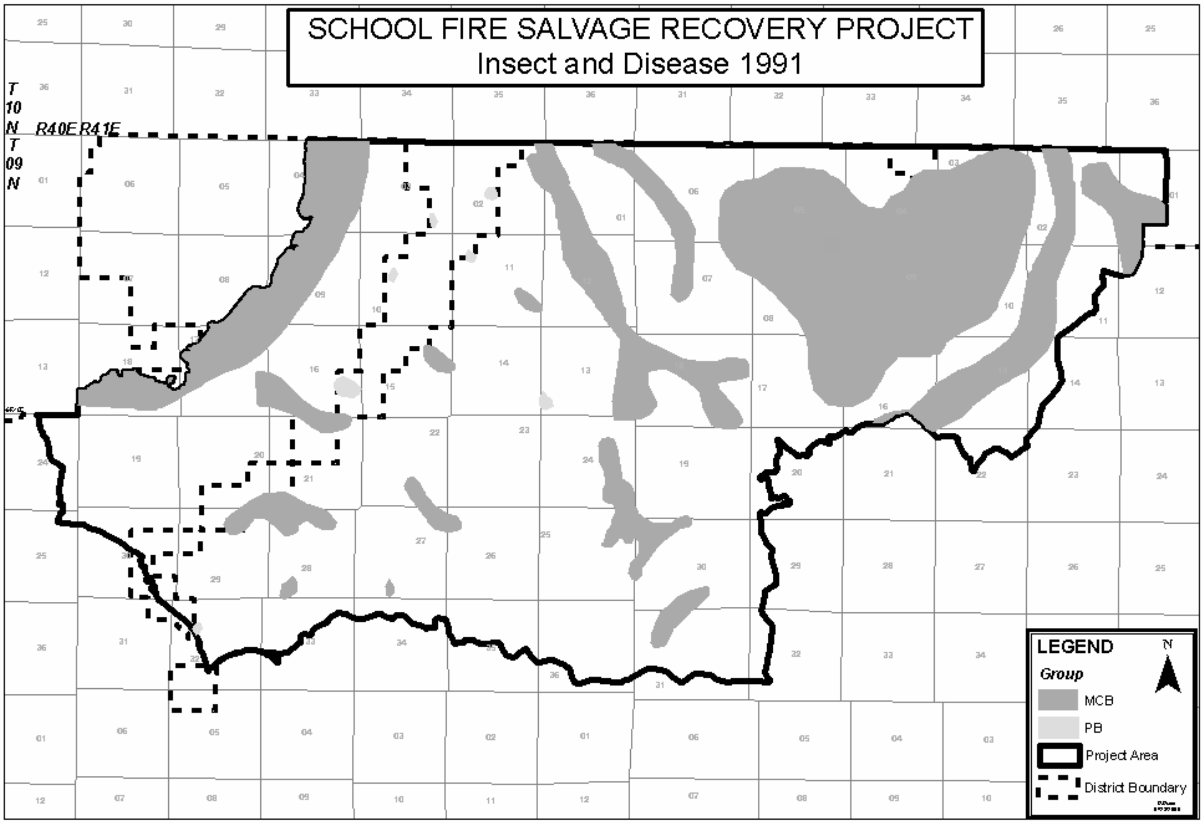
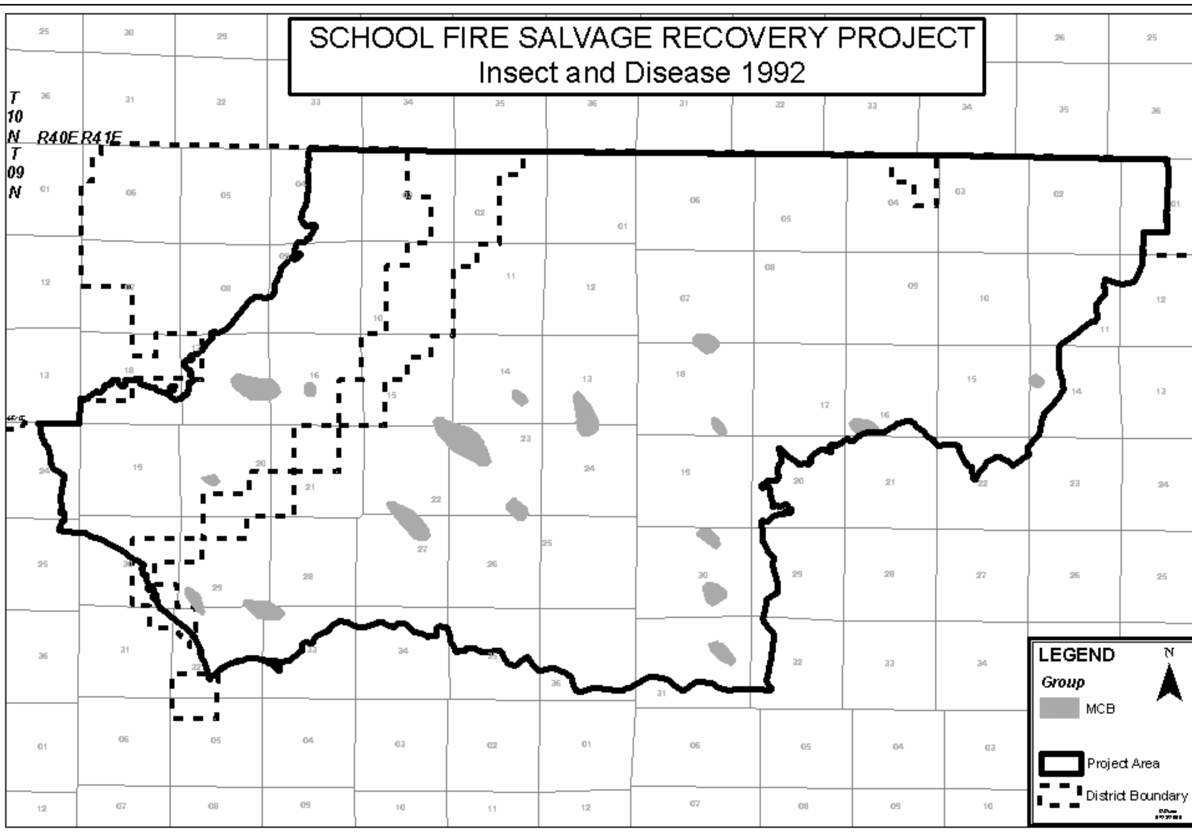


Table E-2. Insect activity from aerial sketch mapping for the School Fire analysis area, 1990-2005.





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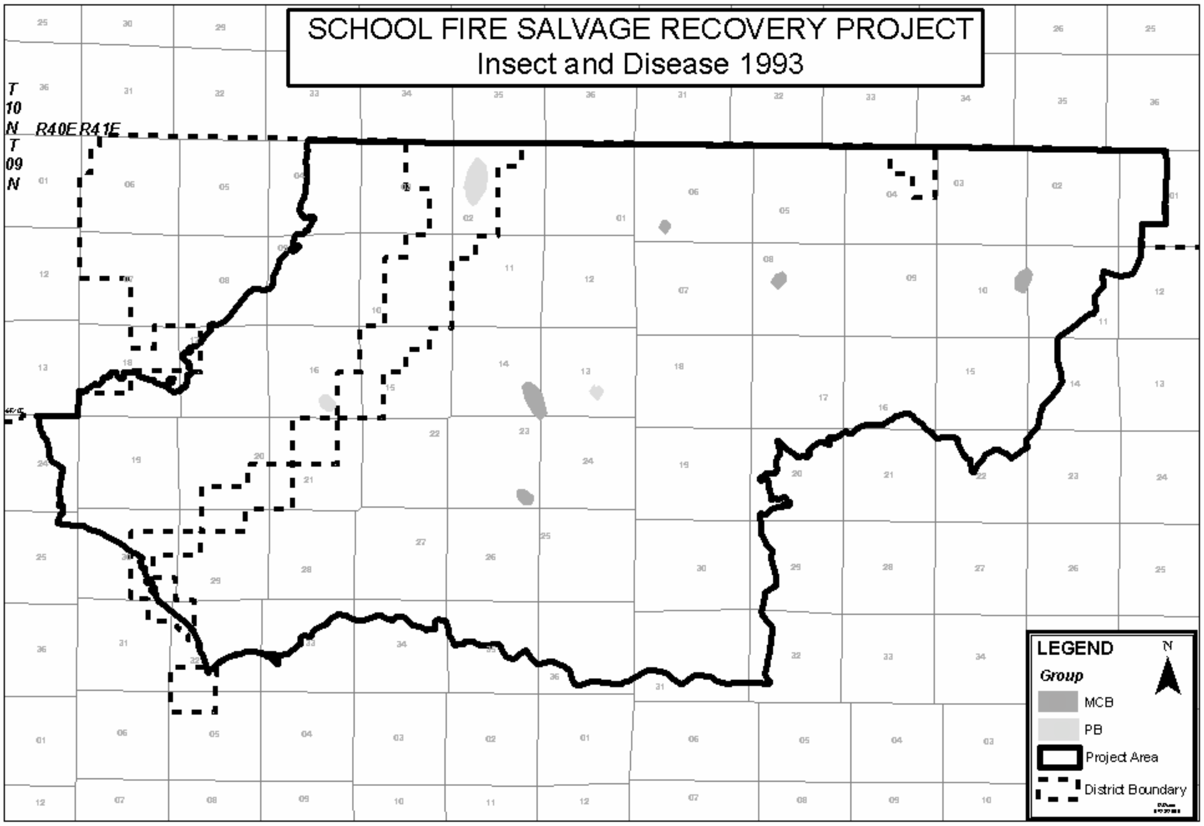


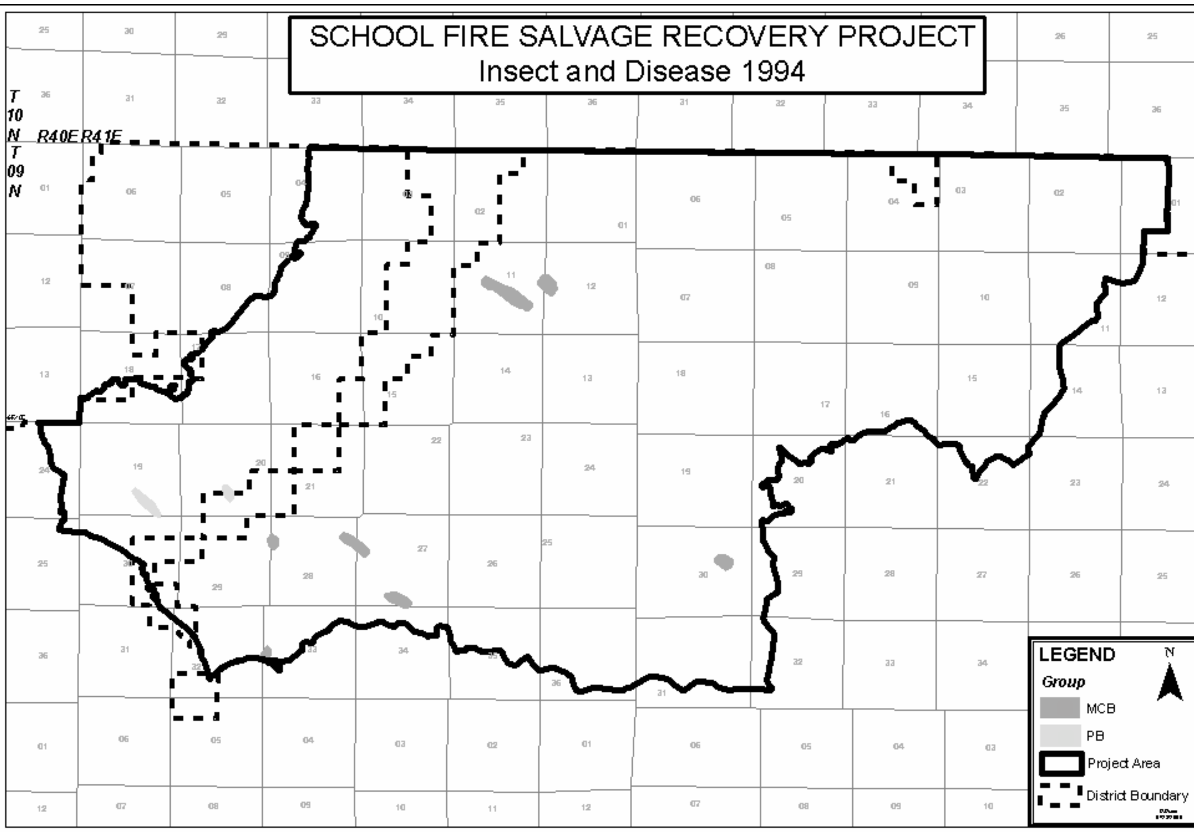
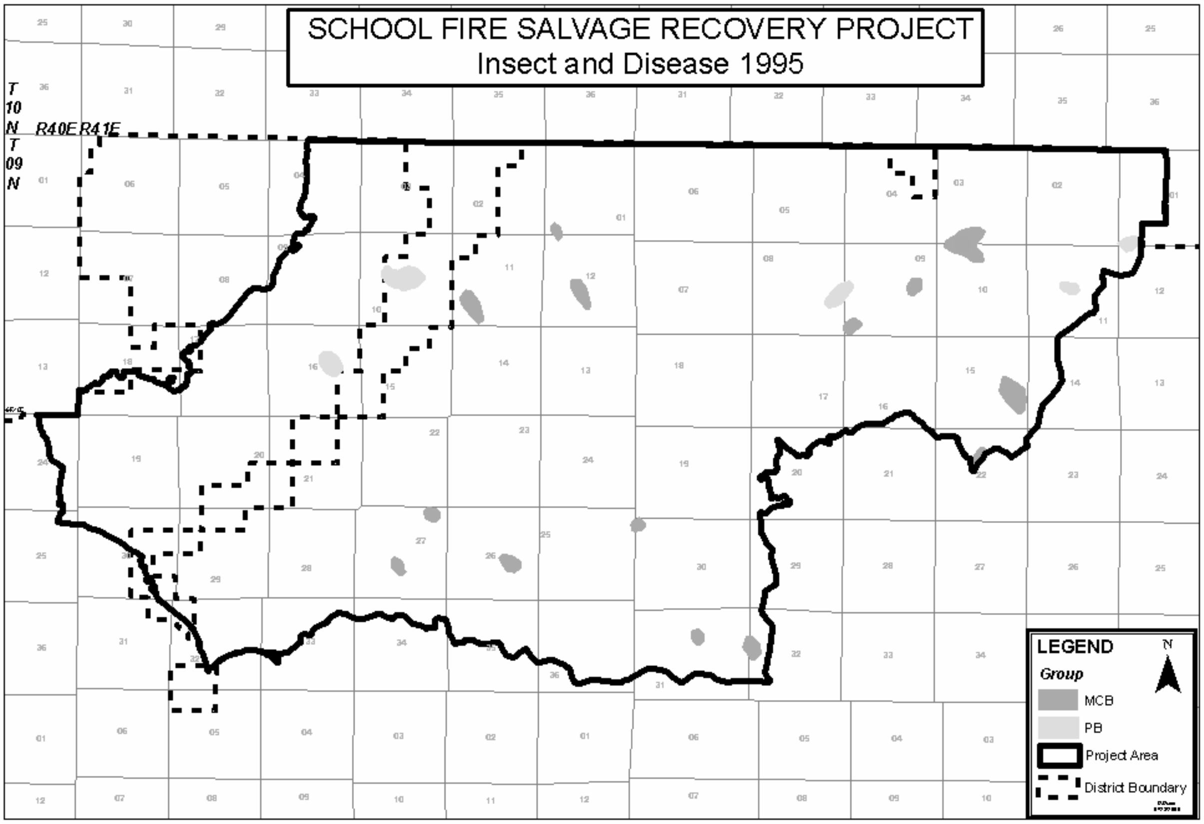
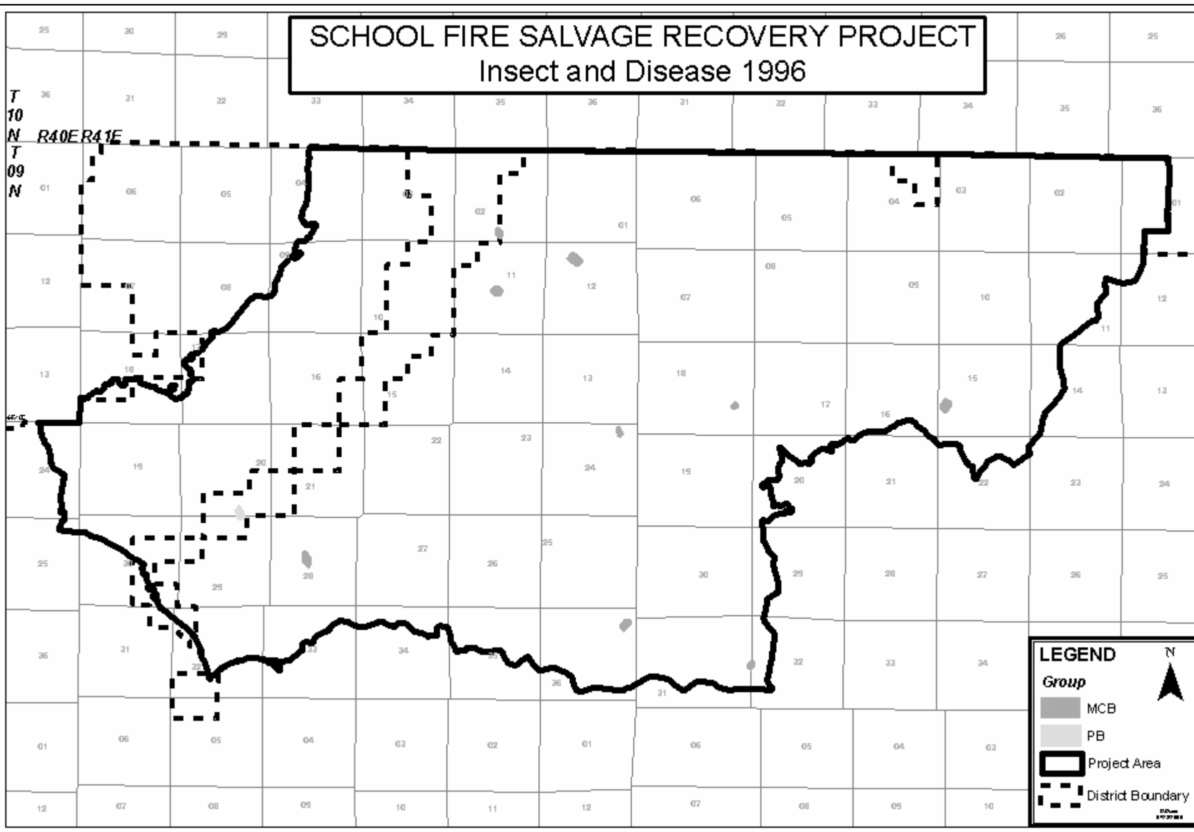


Table E-2. Insect activity from aerial sketch mapping for the School Fire analysis area, 1990-2005.





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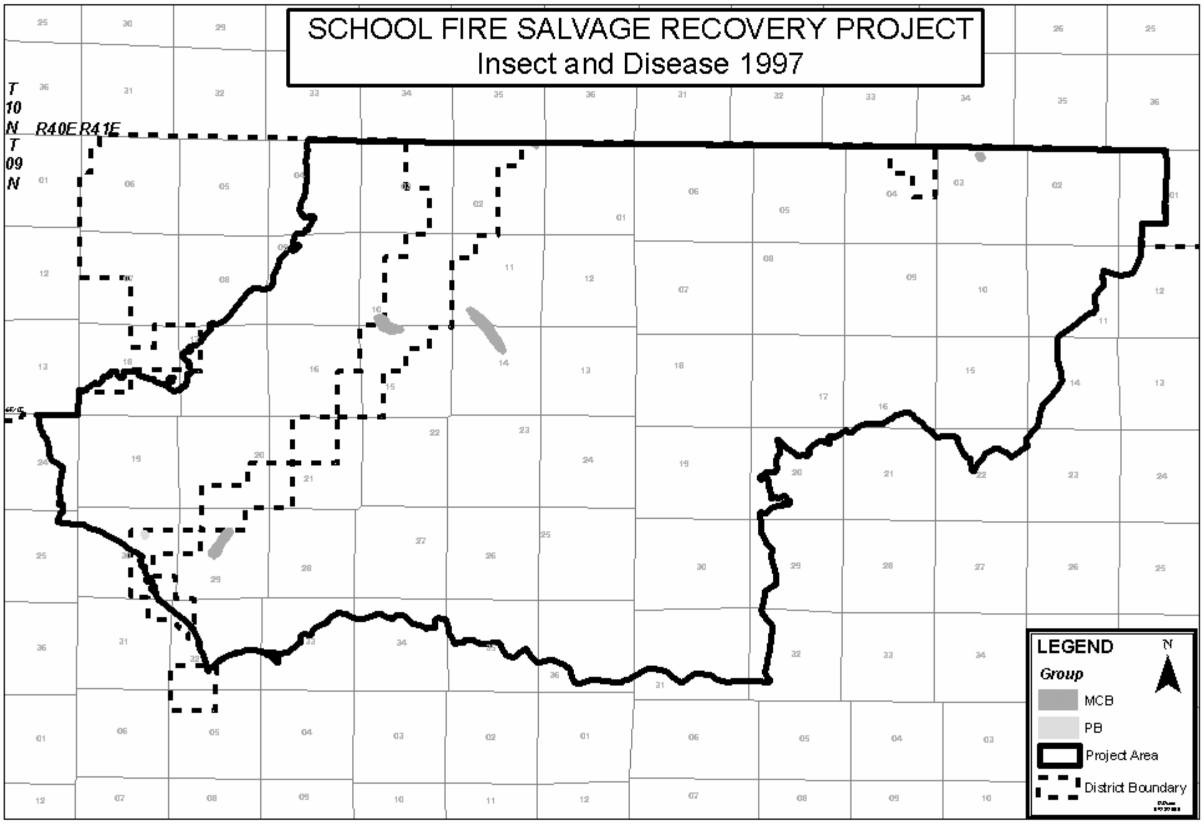


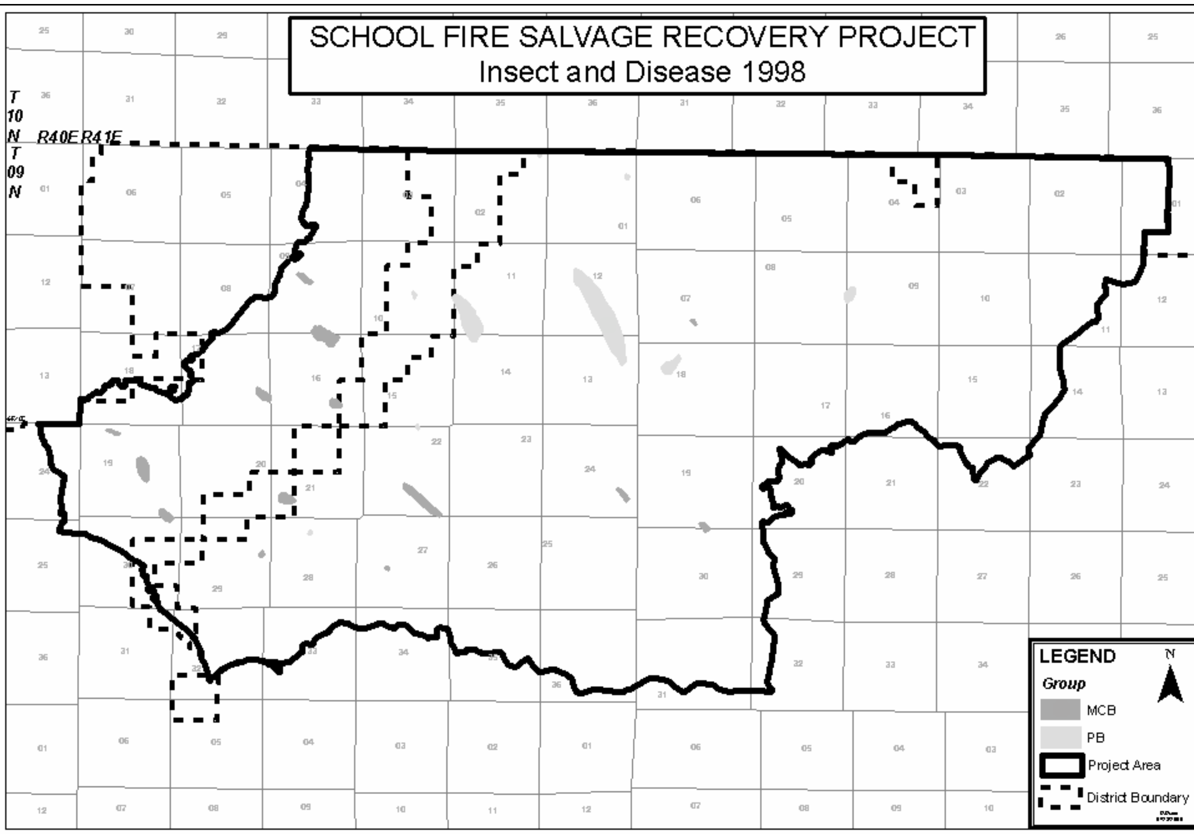
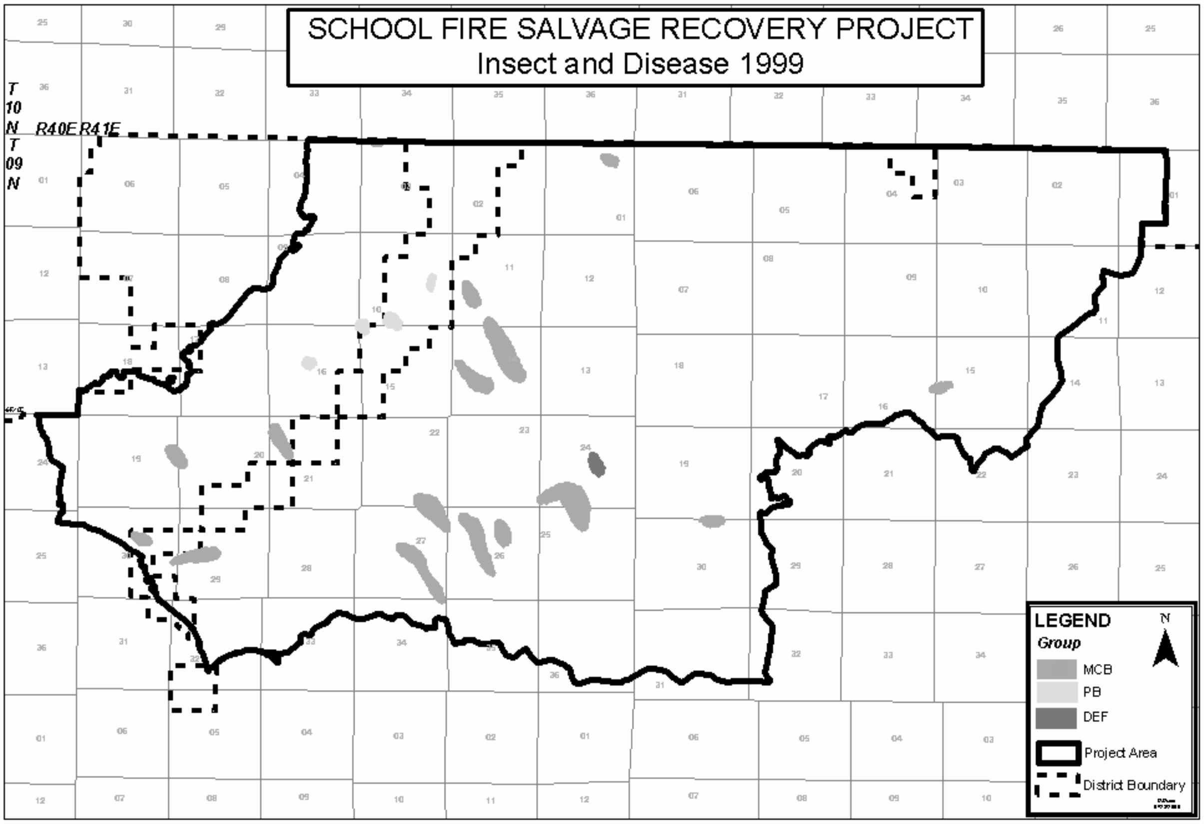


Table E-2. Insect activity from aerial sketch mapping for the School Fire analysis area, 1990-2005.



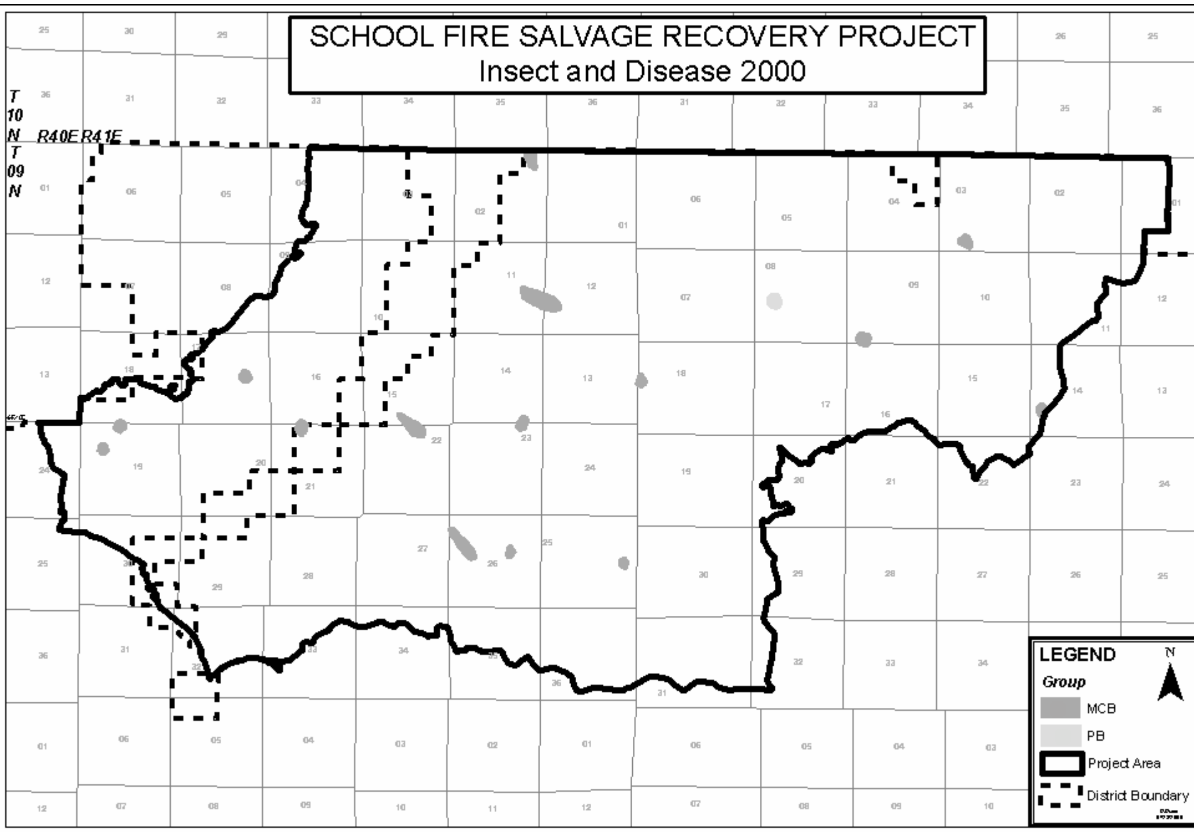
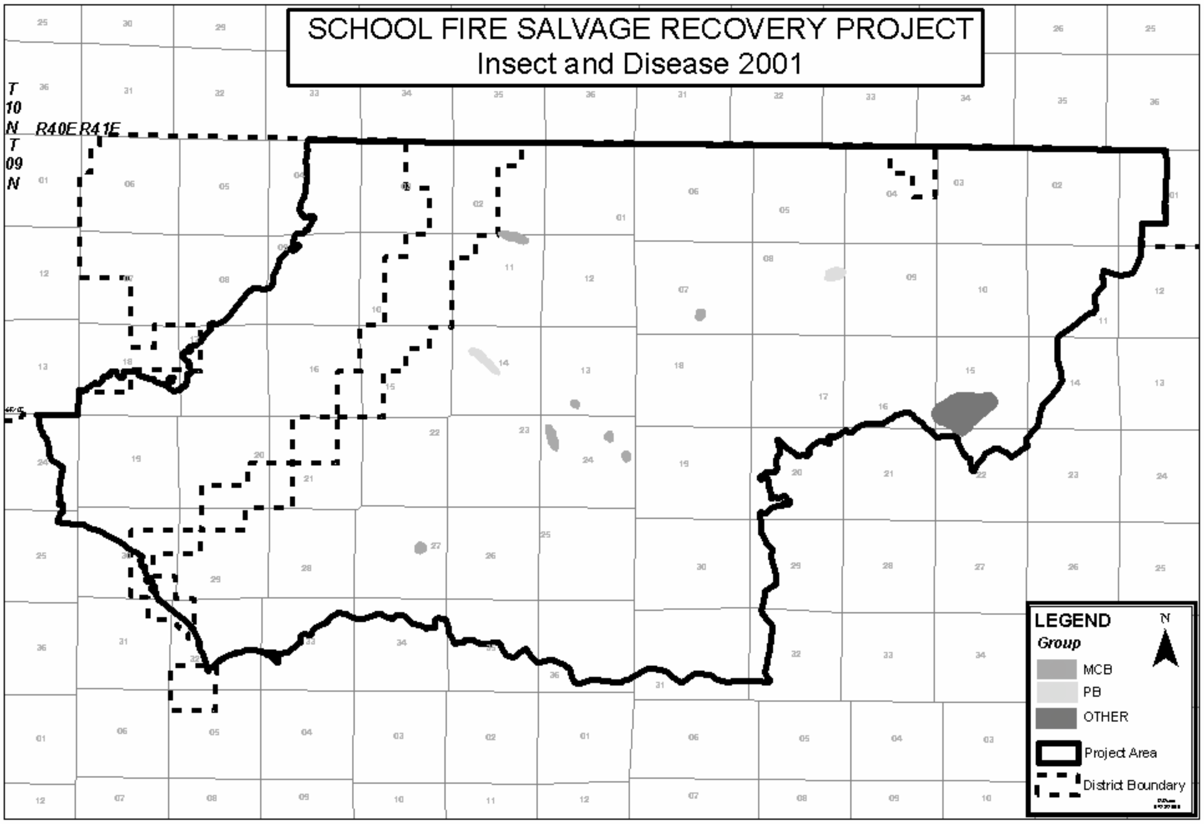


Table E-2. Insect activity from aerial sketch mapping for the School Fire analysis area, 1990-2005.



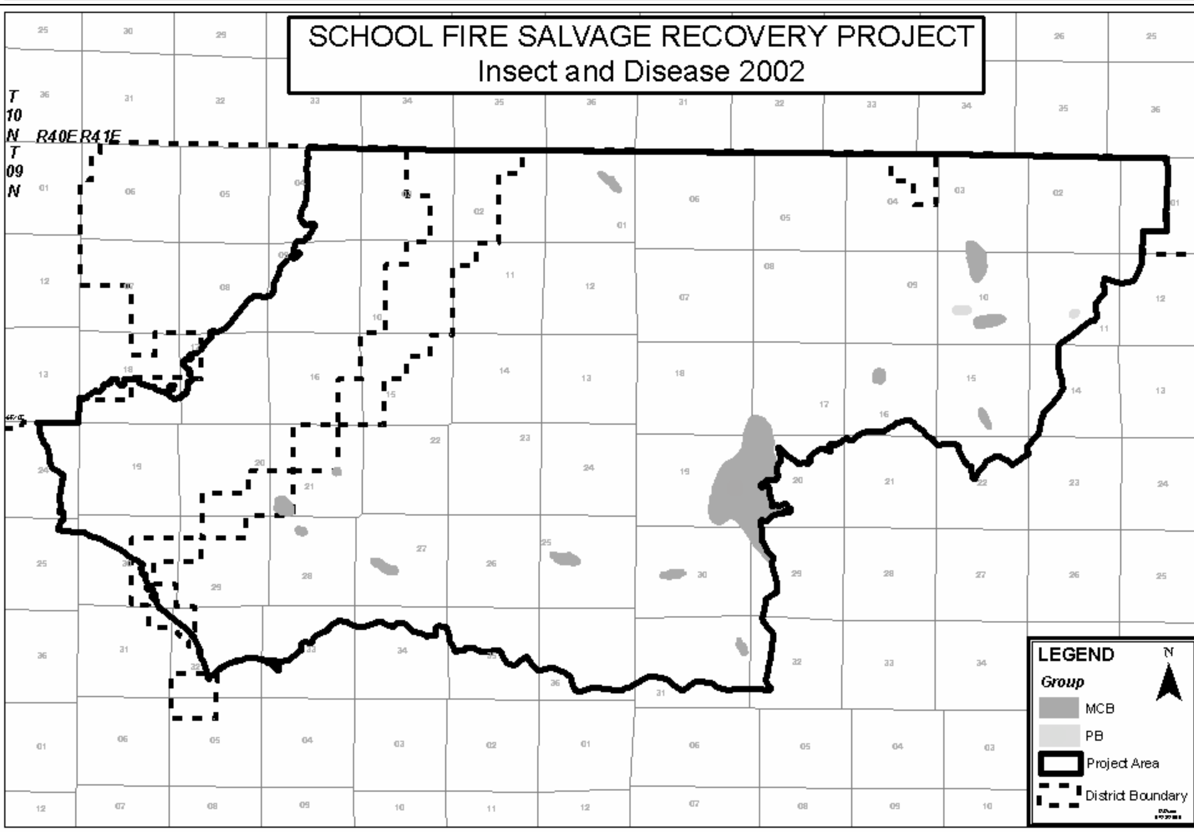
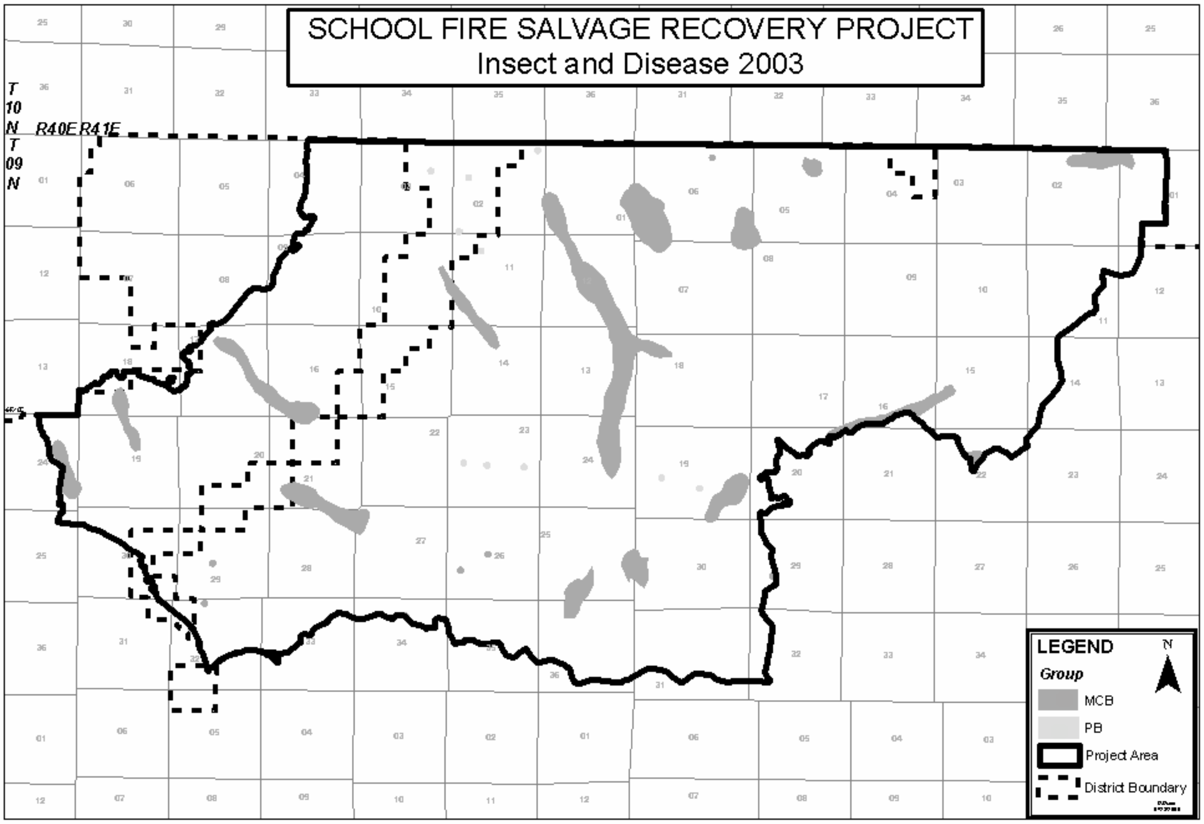


Table E-2. Insect activity from aerial sketch mapping for the School Fire analysis area, 1990-2005.



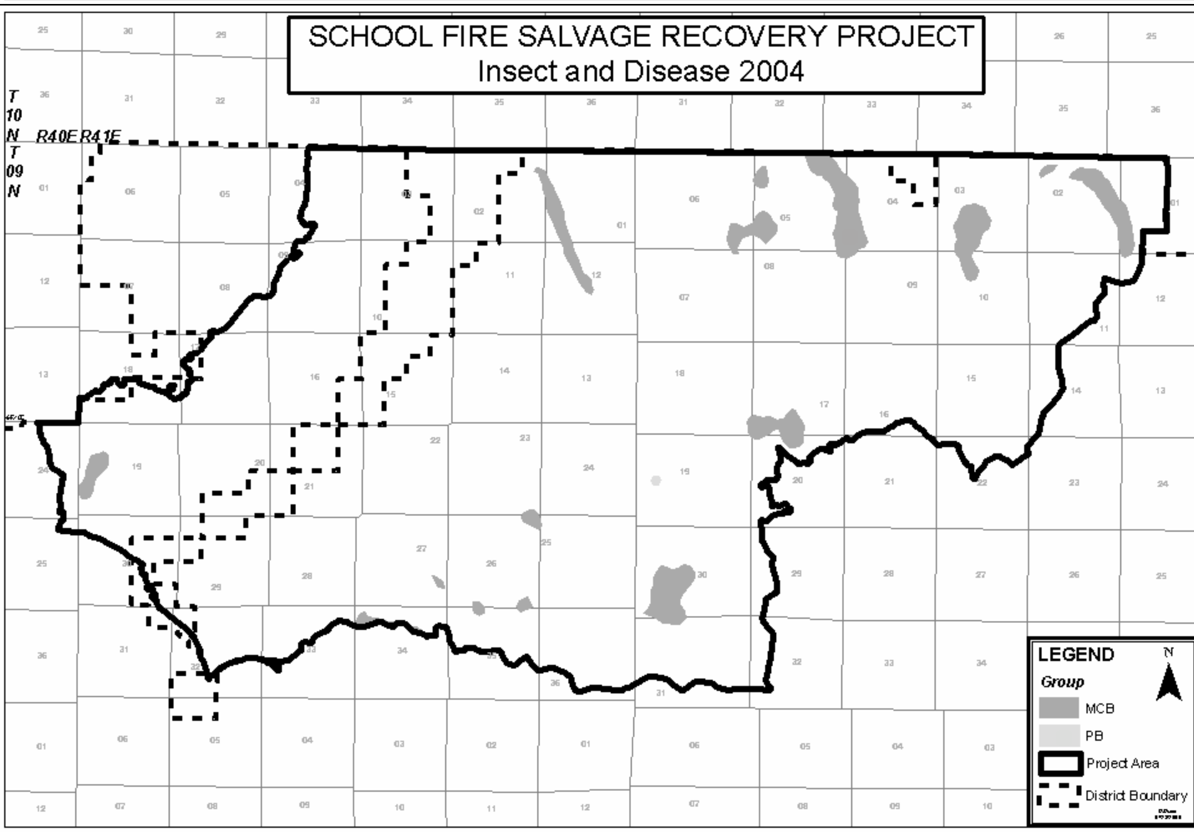
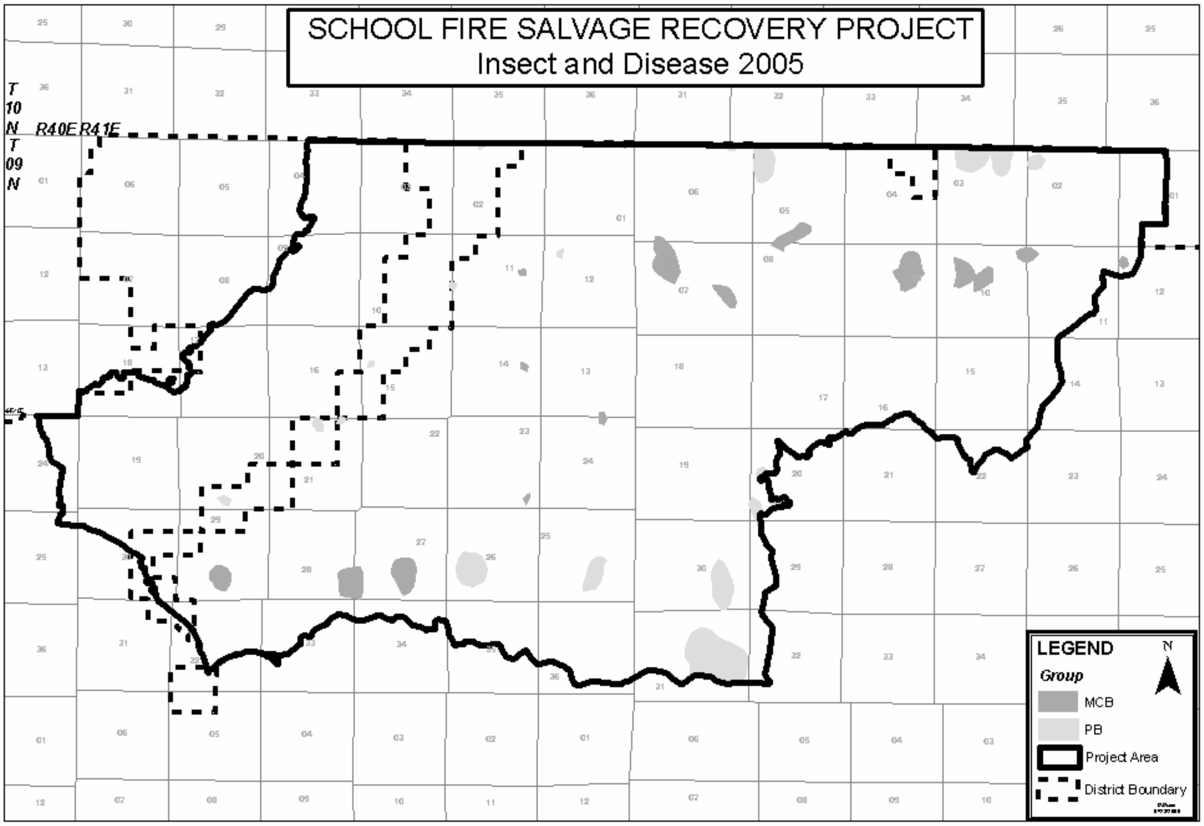


Table E-2. Insect activity from aerial sketch mapping for the School Fire analysis area, 1990-2005.



Sources/Notes: From annual aerial detection surveys completed by the Pacific Northwest Region of the U.S. Forest Service. DEF is defoliators (Douglas-fir tussock moth; western spruce budworm); MCB is mixed-conifer beetles (Douglas-fir beetle; fir engraver); Others include wood borers, miners and other miscellaneous agents; and PB is pine beetles (mountain and western pine beetles, and Ips beetle). An acreage summary for this mapping is as follows (percent, rounded to the nearest whole number, refers to the percent of total forested acreage in the School Fire analysis area: app. 20,500 acres):

Year	Def	MCB	Other	PB	Total	Percent
1990		10,424		95	10,519	**51**
1991		8,425		77	8,502	**42**
1992		569			569	**3**
1993		96		80	176	**1**
1994		145		31	177	**1**
1995		327		155	481	**2**
1996		58		7	65	**< 1**
1997		101		4	104	**1**
1998		135		206	341	**2**
1999	21	644		54	720	**4**
2000		238		15	253	**1**
2001		64	140	38	242	**1**
2002		624		18	641	**3**
2003		1,478		20	1,498	**7**
2004		1,018		5	1,024	**5**
2005		**406**		**554**	**959**	**5**

Pre And Post-Fire Forest Vegetation Conditions

This section summarizes pre- and post-fire vegetation conditions using four indicators relevant to the upland forestland portion of the School Fire analysis area: potential vegetation, species composition, forest structure, and tree density.

The School Fire analysis area contains approximately 27,700 acres of National Forest System lands administered by the Umatilla National Forest, Pomeroy Ranger District.

Potential Vegetation

In the School Fire analysis area, 27 potential vegetation types (PVTs) are present – 23 where forest is the dominant (potential) vegetation and four where nonforest vegetation (herbs or shrubs) is dominant (Table E-3). Of the 27 PVTs occurring in the School Fire analysis area, 25 are plant associations and two are plant community types (Crowe and Clausnitzer 1997, Johnson and Clausnitzer 1992).

Potential vegetation implies that a similar vegetation composition will develop on sites with similar temperature and moisture conditions. PVTs representing equivalent temperature and moisture environments have been aggregated into higher-level hierarchical units called plant association groups (PAG) and potential vegetation groups (PVG) (Powell et al. 2006). The 23 forestland PVTs found in the School Fire analysis area occur in 7 PAGs and 2 PVGs (Table E-3).

The two forest PVGs – dry and moist upland forestland – are used when analyzing five indicators in this appendix: species composition, forest structure, tree density, canopy fuel load, and predicted fire severity.

Map E-1 shows the location and spatial distribution of potential vegetation groups for the School Fire analysis area; Table E-4 describes certain characteristics for the two upland forestland PVGs occurring in the analysis area.

Species Composition

Plant species occur in either pure or mixed communities called cover types. Tree species occurrence in the School Fire analysis area is characterized using cover types, a classification of existing vegetation composition (Eyre 1980), and cover types reflect current tree species amounts on the ground.

Table E-5 summarizes pre- and post-fire vegetation composition for National Forest System lands in the School Fire analysis area. It shows that the predominant pre-fire composition was interior Douglas-fir, grand fir and nonforest vegetation; the primary post-fire composition was the bare ground condition, grand fir and interior Douglas-fir.

Note that Table E-5 indicates that the School Fire apparently caused substantial reductions in the western larch and grass cover types, and a dramatic increase in the bare ground condition.

Map E-2 shows the location and spatial distribution of pre-fire vegetation composition for National Forest System lands in the School Fire analysis area; map E-3 shows post-fire vegetation composition for the same geographical area.

Table E-3. Potential vegetation of the School Fire analysis area.

PVG	PVT and PAG	PVT Acronym	Acres	Percent of Total	Percent of Forest
Dry Upland Forest (9,914 acres; 36%)	ponderosa pine/bluebunch wheatgrass	PIPO/AGSP	81	0.3	0.4
	Hot dry upland forestland PAG		81	0.3	0.4
	Douglas-fir/pinegrass	PSME/CARU	207	0.7	1.0
	Douglas-fir/common snowberry	PSME/SYAL	1,090	3.9	5.3
	Douglas-fir/ninebark	PSME/PHMA	7,918	28.6	38.6
	Douglas-fir/big huckleberry	PSME/VAME	292	1.1	1.4
	ponderosa pine/common snowberry	PIPO/SYAL	251	0.9	1.2
	grand fir/elk sedge	ABGR/CAGE	24	0.1	0.1
	grand fir/birchleaf spiraea	ABGR/SPBE	51	0.2	0.2
	Warm dry upland forestland PAG		9,833	35.5	48.0
Moist Upland Forest (10,588 acres; 38%)	subalpine fir/false bugbane	ABLA2/TRCA3	22	0.1	0.1
	subalpine fir/queencup beadlily	ABLA2/CLUN	1,556	5.6	7.6
	subalpine fir/big huckleberry	ABLA2/VAME	514	1.9	2.5
	lodgepole pine(gf)/big huckleberry/pinegrass	PICO(ABGR)/VAME/CARU*	6	0.0	0.0
	grand fir/twinflower	ABGR/LIBO2	2,220	8.0	10.8
	grand fir/queencup beadlily	ABGR/CLUN	1,200	4.3	5.9
	grand fir/big huckleberry	ABGR/VAME	2,746	9.9	13.4
	Cool moist upland forestland PAG		8,264	29.8	40.3
	grand fir/oakfern	ABGR/GYDR	156	0.6	0.8
	grand fir/sword fern-ginger	ABGR/POMU-ASCA3	238	0.9	1.2
	Cool very moist upland forestland PAG		394	1.4	1.9
	grand fir/Pacific yew/queencup beadlily	ABGR/TABR/CLUN	12	0.0	0.1
	grand fir/Pacific yew/twinflower	ABGR/TABR/LIBO2	60	0.2	0.3
	Cool wet upland forestland PAG		72	0.3	0.4
	Douglas-fir/oceanspray	PSME/HODI	734	2.6	3.6
	Douglas-fir/RM maple-ninebark	PSME/ACGL-PHMA	99	0.4	0.5
	grand fir/RM maple-ninebark	ABGR/ACGL-PHMA*	362	1.3	1.8
	Warm moist upland forestland PAG		1,195	4.3	5.8
	grand fir/Rocky Mountain maple	ABGR/ACGL	663	2.4	3.2
	Warm very moist upland forestland PAG		663	2.4	3.2
Nonforest (26%)	bluebunch wheatgrass	AGSP-POSA3	6,565	23.7	
	Idaho fescue-bluebunch wheatgrass	FEID-AGSP	616	2.2	
	western needlegrass	STOC*	< 1	0.0	
	ninebark-common snowberry	PHMA-SYAL	4	0.0	
	administrative site	ADMIN	< 1	0.0	
	Nonforest PVTs		7,185	26.0	

Sources/Notes: Summarized from the School Fire vegetation database (NFS lands only). USDA Forest Service (2002a) and Powell et al. (2006) describes how potential vegetation types (PVT) were assigned to plant association groups (PAG) and to potential vegetation groups (PVG).
* These PVTs are plant community types; all others are plant associations.

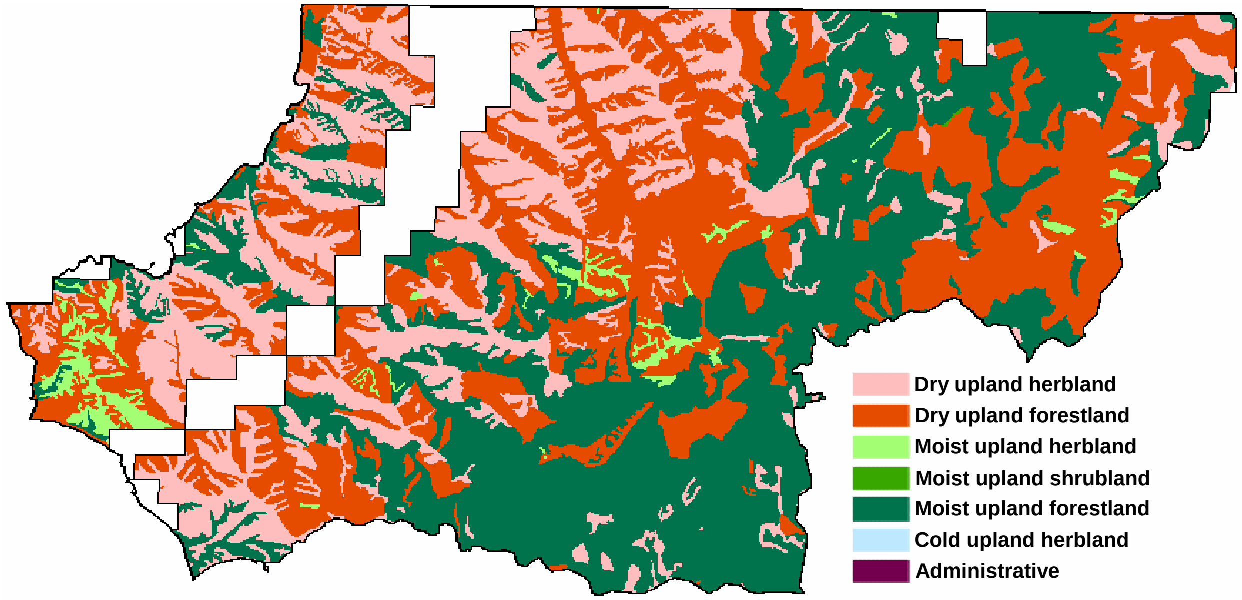


Figure E-1 - Map E-1. Potential vegetation groups for National Forest System lands in the School Fire analysis area.

Table E-4 Biophysical characteristics for upland forest potential vegetation groups (PVG).

PVG	Area (Acres)	Distur-bances	Fire Regime	Patch Size	Elevation (Feet)	Slope (Percent)	Dominant Aspects
Dry Upland Forestland	9,914	Fire Insects Harvest	Frequent Surface	1-2,000	4,150 (2584-5207)	46 (0-69)	East South Southwest
Moist Upland Forestland	10,588	Insects Fire Diseases	Infrequent Mixed	1-10,000	4,701 (2928-6126)	33 (3-73)	Southwest Southeast East

Sources/Notes: Acreage values, elevations, slope percents and aspects were summarized from the School Fire vegetation database. Patch size was taken from Johnson (1993). For elevations and slope percents, values are presented in this format: average (minimum-maximum). Fire regime names correspond to Schmidt et al. (2002).

Table E-5 Pre- and post-fire vegetation cover types for the School Fire analysis area.

Code	Cover Type Description	Pre-Fire Acres	Percent	Post-Fire Acres	Percent
Grass	Grassland communities	7,181	25.9	164	0.6
Shrub	Shrubland communities	4	< 0.1	0	0.0
Bare ground	Areas without species data (burns)	116	0.4	13,686	49.4
Miscellaneous	Administrative site and water	< 1	< 0.1	< 1	< 0.1
Nonforest	Nonforest cover types	7,301	26.4	13,850	50.0
PSME	Douglas-fir forestland	8,793	31.8	5,692	20.6
mix-PSME	Mixed Douglas-fir forestland	112	0.4	112	0.4
Douglas-fir	Douglas-fir cover types	8,905	32.2	5,804	21.0
ABGR	Grand fir forestland	7,974	28.8	6,302	22.8

Code	Cover Type Description	Pre-Fire Acres	Percent	Post-Fire Acres	Percent
mix-ABGR	Mixed grand fir forestland	106	0.4	106	0.4
Grand fir	Grand fir cover types	8,080	29.2	6,408	23.2
PICO	Lodgepole pine forestland	211	0.8	112	0.4
mix-PICO	Mixed lodgepole pine forestland	22	0.1	22	0.1
Lodgepole pine	Lodgepole pine cover types	233	0.9	134	0.5
ABLA2	Subalpine fir forestland	51	0.2	51	0.2
LAOC	Western larch forestland	1,109	4.0	20	0.1
PIPO	Ponderosa pine forestland	1,927	7.0	1,339	4.8
PIEN	Engelmann spruce forestland	81	0.3	81	0.3

Sources/Notes: Summarized from the School Fire vegetation database; acres and percents include NFS lands only. Forest cover types where one tree species comprises a majority (it has 50% or more of total tree stocking) are named for that species (Eyre 1980). For polygons where no single species predominates, the cover type is named for the plurality species preceded by "mix" to denote a mixed-species composition.

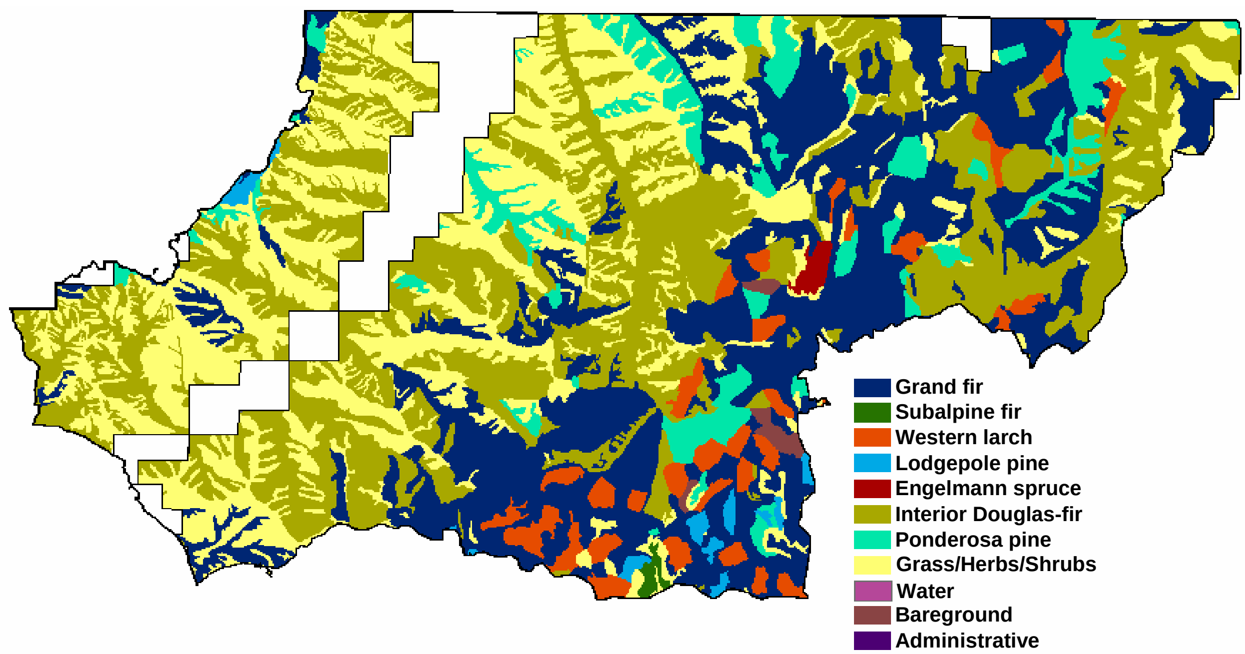


Figure E-2 -Map E-2. Pre-fire vegetation composition for National Forest System lands in the School Fire analysis area.

Historical Range of Variability

A recurring theme in forest ecology literature is the historical range of variability (HRV). The HRV concept is used to characterize fluctuations or variations in ecosystem conditions and processes over a period of time (Figure E-4).

It is now understood that ecosystem conditions change as disturbance processes affect them; when disturbances act with a characteristic frequency and magnitude (severity, intensity), ecosystems respond by exhibiting a particular behavior and complexity (Aplet and Keeton 1999, Landres et al. 1999, Morgan et al. 1994, Swanson et al. 1994).

HRV recognizes that complex ecosystems have a range of conditions in which they are resilient and self-sustaining, and beyond which they move into a state of disequilibrium (Egan and Howell 2001, Holling and Meffe 1996, Kaufmann et al. 1994). HRV generally refers to a range of reference conditions existing prior to Euro-American emigration (a timeframe typically defined as the early to mid 1800s).

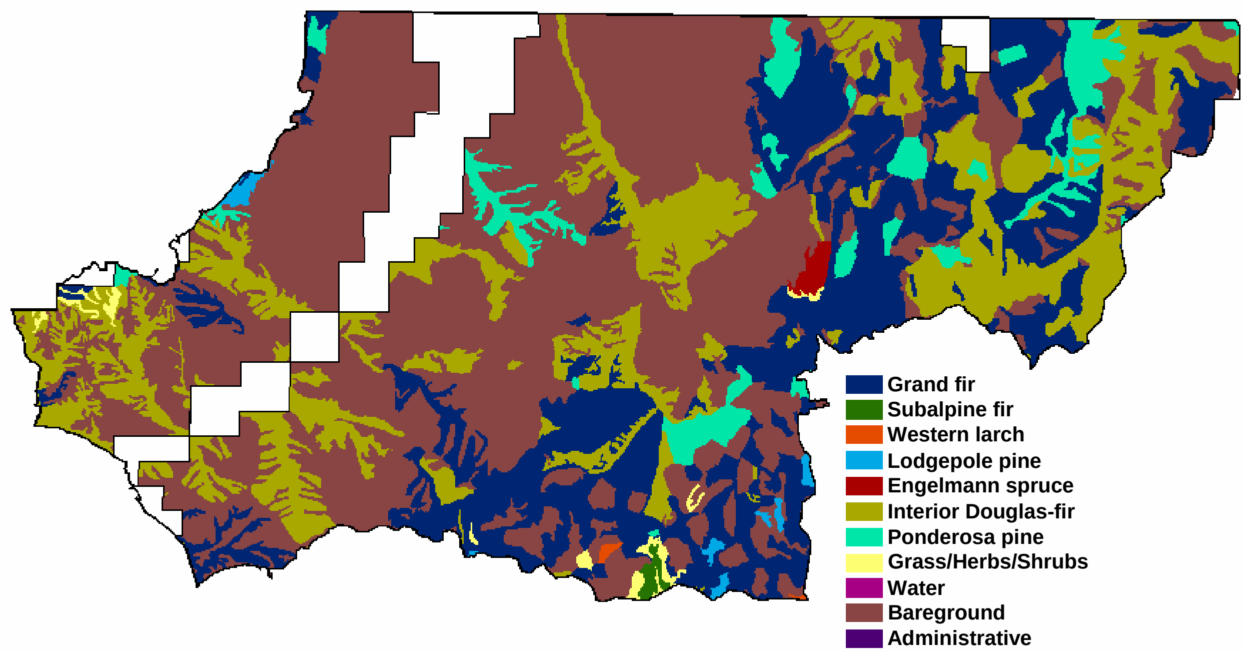


Figure E-3 - Map E-3. Post-fire vegetation composition for National Forest System lands in the School Fire analysis area.

The type and frequency of presettlement disturbances can serve as a management template for maintaining sites within their historical range of plant composition and vegetation structures if landscapes can be maintained within HRV, they stand a good chance of maintaining their biological diversity and ecological integrity through time (Aplet and Keeton 1999, Holling and Meffe 1996, Landres et al. 1999).

At a landscape scale, a forest might be considered healthy or sustainable if the spatial and temporal patterns of composition, structure and density are within HRV for that landscape type (Schmidt et al. 2002). HRV is intended to serve as a benchmark from which change can be measured; it is not a specific condition that active restoration treatments attempt to recreate (USDA Forest Service 1997).

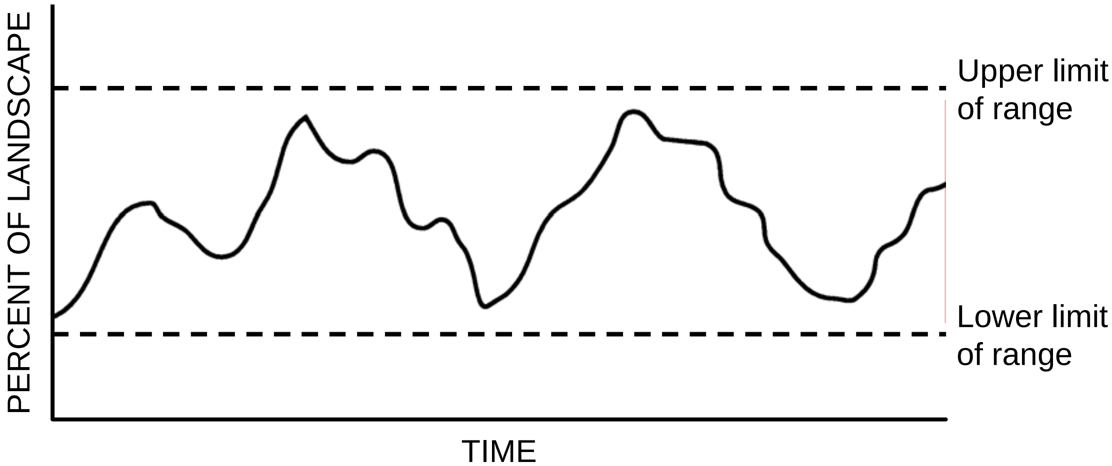


Figure E-4 The historical range of variability (HRV) is used to evaluate whether ecosystem components are functioning properly in a temporal context (Aplet and Keeton 1999, Morgan et al. 1994, Swanson et al. 1994).

Broad-scale assessments completed for the Blue Mountains physiographic province and the interior Columbia River basin suggest that upland forest ecosystems could be characterized as healthy, sustainable and resilient if three of their components (species composition, forest structure, tree density) are within HRV (Caraher et al. 1992; Gast et al. 1991; Lehmkuhl et al. 1994; Quigley et al. 1996; USDA Forest Service 2002b, 2002c).

HRV Analysis for Species Composition

Recent broad-scale assessments concluded that for dry forestland, existing vegetation conditions are out-of-balance when compared with historical conditions (Caraher et al. 1992, Hessburg et al. 1999, Lehmkuhl et al. 1994, Quigley and Arbelbide 1997).

Because active management suppressed surface fires over several return intervals (fire cycles), dry sites historically dominated by ponderosa pine have changed more than any other forest ecosystem over the past 90 years (Hessburg et al. 2005).

Seventy-four percent of National Forest System lands in the School Fire analysis area are forested (Table E-3); 48 percent of this acreage is classified as dry upland forestland and 52 percent is moist upland forestland (Table E-4).

An historical range of variability (HRV) analysis was completed for existing species composition on each of these PVGs separately (dry and moist upland forestland); HRV results are presented in Table E-6 for the pre-fire vegetation composition and in Table E-7 for the post-fire vegetation composition.

Table E-6 Historical range of variability analysis for pre-fire vegetation composition.

Cover Type	DRY UPLAND FORESTLAND PVG				MOIST UPLAND FORESTLAND PVG			
	Historical Range		Pre-Fire Amount		Historical Range		Pre-Fire Amount	
	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres
Grass-forb	0-5	0-496	0	0	0-5	0-529	1	116
Shrub	0-5	0-496	0	0	0-5	0-529	0	0
Western juniper	0-5	0-496	0	0				
Ponderosa pine	50-90	4957-8923	12	1226	5-15	529-1588	7	700
Douglas-fir	5-15	496-1487	70	6974	15-30	1588-3176	18	1931
Western larch	0-10	0-991	0	0	10-30	1059-3176	11	1109

Cover Type	DRY UPLAND FORESTLAND PVG				MOIST UPLAND FORESTLAND PVG			
	Historical Range		Pre-Fire Amount		Historical Range		Pre-Fire Amount	
	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres
Broadleaved trees					0-5	0-529	0	0
Lodgepole pine	0-5	0-496	0	0	5-30	529-3176	2	233
Western white pine					0-5	0-529	0	0
Grand fir	1-5	99-496	17	1714	5-30	529-3176	60	6366
Spruce-fir					0-15	0-1588	1	132

Sources/Notes: Pre-fire amounts, derived from the School Fire vegetation database, include NFS lands only. Gray shading indicates cover types that are either above or below the historical range of variability. Historical ranges are approximate and were adapted from Morgan and Parsons (2000); they were based on multiple 1200-year simulations representing landscapes in a "dynamic equilibrium" with their disturbance regimes.

The information presented in Table E-6 suggests that for the pre-fire vegetation composition, dry upland forestland supported too much of the grand fir and interior Douglas-fir forest cover types and too little of the ponderosa pine forest cover type; moist upland forestland supported too much of the grand fir forest cover type and too little of the lodgepole pine forest cover type.

Table E-7 Historical range of variability analysis for post-fire vegetation composition.

Cover Type	DRY UPLAND FORESTLAND PVG				MOIST UPLAND FORESTLAND PVG			
	Historical Range		Post-Fire Amount		Historical Range		Post-Fire Amount	
	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres
Grass-forb	0-5	0-496	36	3609	0-5	0-529	29	3056
Shrub	0-5	0-496	0	0	0-5	0-529	0	0
Western juniper	0-5	0-496	0	0				
Ponderosa pine	50-90	4957-8923	8	756	5-15	529-1588	6	583
Douglas-fir	5-15	496-1487	45	4417	15-30	1588-3176	13	1388
Western larch	0-10	0-991	0	0	10-30	1059-3176	0	20
Broadleaved trees					0-5	0-529	0	0
Lodgepole pine	0-5	0-496	0	0	5-30	529-3176	1	135
Western white pine					0-5	0-529	0	0
Grand fir	1-5	99-496	11	1133	5-30	529-3176	50	5275
Spruce-fir					0-15	0-1588	1	132

Sources/Notes: Post-fire amounts, derived from the School Fire vegetation database, include NFS lands only. Gray shading indicates cover types that are either above or below the historical range of variability. Historical ranges are approximate and were adapted from Morgan and Parsons (2000); they were based on multiple 1200-year simulations representing landscapes in a "dynamic equilibrium" with their disturbance regimes.

The post-fire vegetation composition information presented in Table E-7 suggests that dry upland forestland currently supports too much of the grass-forb, grand fir and interior Douglas-fir vegetation cover types and too little of the ponderosa pine forest cover type; moist upland forestland supports too much of the grass-forb and grand fir vegetation cover types and too little of the interior Douglas-fir, western larch and lodgepole pine forest cover types.

The post-fire results presented in Table E-7 demonstrate the temporal aspects of an HRV analysis – they illustrate that the entire School Fire analysis area was recently affected by wildfire and the resulting structure classes are not yet in dynamic equilibrium with a landscape-scale disturbance regime (Blackwood 1998).

Forest Structure

Oliver and Larson (1996) developed a classification system for forest structure involving 4 structural stages. Oliver and Larson's (1996) classification system works well for conifer forests west of the Cascade Mountains, but it does not adequately describe forest conditions for the interior Pacific Northwest where structure is more varied. Therefore, the Oliver and Larson (1996) system was expanded to 8 classes to include a wider spectrum of structural variation (O'Hara et al. 1996).

Table E-8 summarizes the area of pre- and post-fire forest structure classes, using the 8-class system described by O'Hara et al. (1996), for National Forest System lands in the School Fire analysis area.

Table E-8 shows that the predominant pre-fire forest structure condition was stem exclusion (closed canopy and open canopy); the primary post-fire forest structure class is stem exclusion (particularly open canopy) and the bareground condition created by wildfire.

Map E-4 shows the location and spatial distribution of pre-fire structure classes for National Forest System lands in the School Fire analysis area; map E-5 shows post-fire structure classes for the same geographical area.

Table E-8 Pre- and post-fire forest structure classes for the School Fire analysis area.

Code	Forest Structure Class	Pre-Fire Acres	Percent	Post-Fire Acres	Percent
BG	Bareground	100	0.4	6,660	24.1
SI	Stand Initiation	1,626	5.9	609	2.2
SEOC	Stem Exclusion Open Canopy	4,868	17.6	8,172	29.5
SECC	Stem Exclusion Closed Canopy	8,020	29.0	2,918	10.5
UR	Understory Reinitiation	1,167	4.2	141	0.5
YFMS	Young Forest Multi Strata	1,583	5.7	488	1.8
OFMS	Old Forest Multi Strata	895	3.2	203	0.7
OFSS	Old Forest Single Stratum	2,242	8.1	1,310	4.7
Nonforest	Grassland/shrubland PVTs	7,185	26.0	7,185	26.0

Sources/Notes: Summarized from the School Fire vegetation database; acres and percents include NFS lands only. Forest structure classes are defined in O'Hara et al. (1996) and Powell (2000). Structure class determinations are based on Hessburg et al. (1999a).

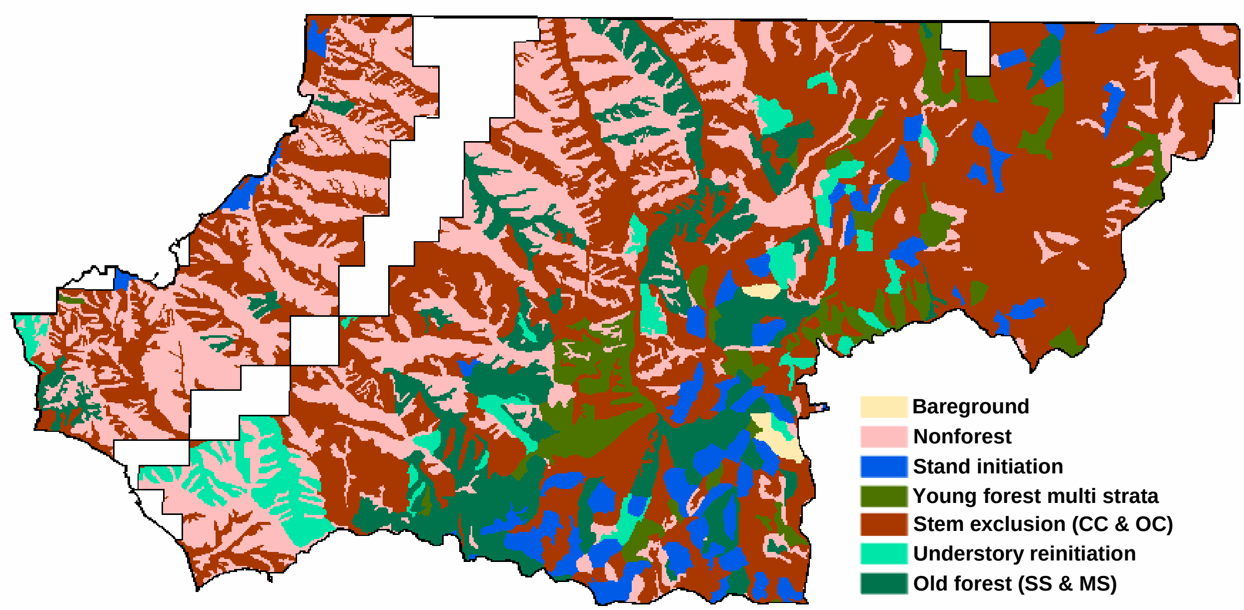


Figure E-5 - Map E-4. Pre-fire forest structure classes for National Forest System lands in the School Fire analysis area.

HRV Analysis for Forest Structure

An historical range of variability (HRV) analysis was used to evaluate forest structure for the School Fire analysis area; results are provided in Table E-9 for pre-fire forest structure classes and in Table E-10 for post-fire forest structure classes.

Tables E-9 and E-10 summarize the current percentage of each forest structure class by potential vegetation group (PVG); the historical range for each structure class is also shown.

The HRV results for pre-fire forest structure classes (Table E-9) show that:

- For dry upland forestland, the stand initiation (SI), young forest multi strata (YFMS) and old forest single stratum (OFSS) structure classes are below the lower limits of their historical ranges, and the stem exclusion closed canopy (SECC) structure class is above the upper limit of its historical range.
- For moist upland forestland, only one structure class is within its historical range of variability (stem exclusion closed canopy, SECC); all other structure classes are either above or below the limits of their historical ranges.

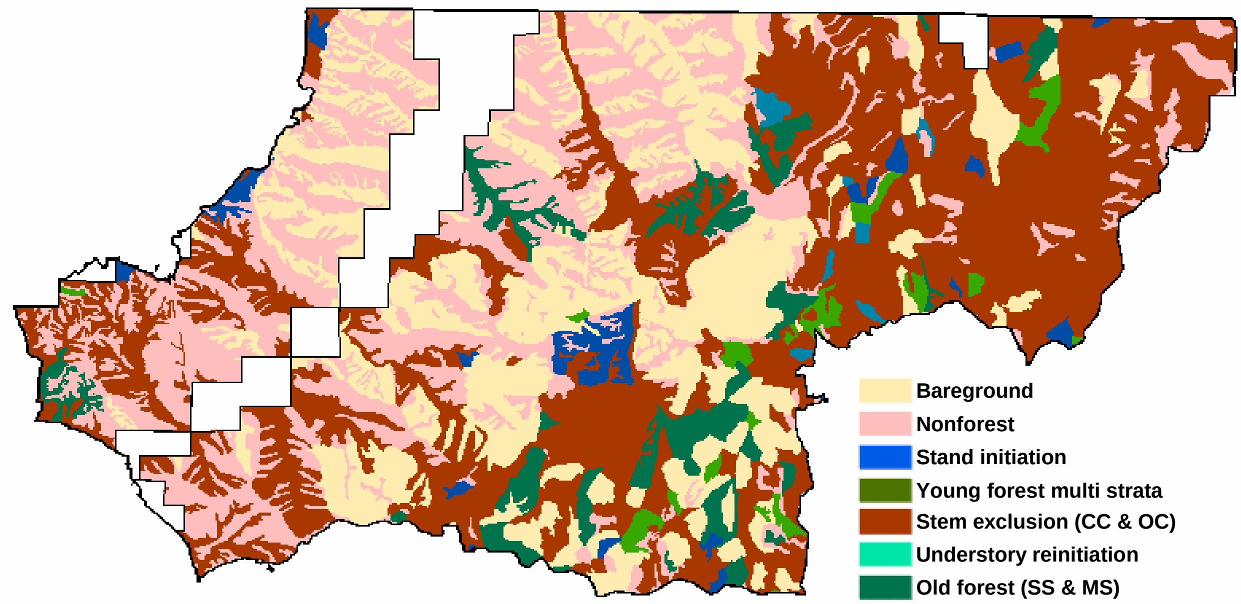


Figure E-6 - Map E-5. Post-fire forest structure classes for National Forest System lands in the School Fire analysis area.

Table E-9. Historical range of variability analysis for pre-fire forest structure classes.

Structure Class	DRY UPLAND FORESTLAND PVG Historical Range Percent	DRY Historical Range Acres	DRY Pre-Fire Amount Percent	DRY Pre-Fire Amount Acres	MOIST UPLAND FORESTLAND PVG Historical Range Percent	MOIST Historical Range Acres	MOIST Pre-Fire Amount Percent	MOIST Pre-Fire Amount Acres
BG/SI	5-15	496-1487	1	75	1-10	106-1059	16	1651
SEOC	5-20	496-1983	9	924	0-5	0-529	37	3945
SECC	1-10	99-991	63	6279	5-25	529-2647	16	1741
UR	1-10	99-991	9	865	5-25	529-2647	3	302
YFMS	5-25	496-2478	3	330	40-60	4235-6353	12	1253
OFMS	5-20	496-1983	7	699	10-30	1059-3176	2	196
OFSS	15-55	1487-5453	7	742	0-5	0-529	14	1501

Sources/Notes: Summarized from the School Fire vegetation database; pre-fire amounts include NFS lands only. Gray shading indicates structure classes that are either above or below the historical range of variability. Upland forestland potential vegetation groups (PVG) are described in Table E-3. Historical percentages (H%) were derived from Hall (1993), Johnson (1993) and USDA Forest Service (1995), as summarized in Blackwood (1998). Forest structure classes are described in Table E-8. Note that the bareground structure class (BG in Table E-8) was combined with stand initiation (SI) for this analysis.

The HRV results for post-fire forest structure classes (Table E-10) show that:

- For dry upland forestland, only one structure class is within its historical range of variability (understory reinitiation, UR); all other structure classes are either above or below the limits of their historical ranges.
- For moist upland forestland, every structure class is either above or below the limits of its historical range.

Table E-10. Historical range of variability analysis for immediate (2005) post-fire forest structure classes.

Structure Class	DRY UPLAND FORESTLAND PVG: Historical Range Percent	Historical Range Acres	Post-Fire Amount Percent	Post-Fire Amount Acres	MOIST UPLAND FORESTLAND PVG: Historical Range Percent	Historical Range Acres	Post-Fire Amount Percent	Post-Fire Amount Acres
BG/SI	5-15	496-1487	40	3947	1-10	106-1059	31	3322
SEOC	5-20	496-1983	26	2529	0-5	0-529	53	5643
SECC	1-10	99-991	26	2591	5-25	529-2647	3	327
UR	1-10	99-991	1	60	5-25	529-2647	1	82
YFMS	5-25	496-2478	1	74	40-60	4235-6353	4	415
OFMS	5-20	496-1983	1	109	10-30	1059-3176	1	94
OFSS	15-55	1487-5453	6	605	0-5	0-529	7	706

Sources/Notes: Summarized from the School Fire vegetation database; post-fire amounts include NFS lands only. Gray shading indicates structure classes that are either above or below the historical range of variability. Upland forestland potential vegetation groups (PVG) are described in Table E-3. Historical percentages (H %) were derived from Hall (1993), Johnson (1993) and USDA Forest Service (1995), as summarized in Blackwood (1998). Forest structure classes are described in Table E-8. Note that the bareground structure class (BG in Table E-8) was combined with stand initiation (SI) for this analysis.

The post-fire results presented in Table E-10 demonstrate the temporal aspects of an HRV analysis – they illustrate that the entire School Fire analysis area was recently affected by wildfire and the resulting structure classes are not yet in dynamic equilibrium with a landscape-scale disturbance regime (Blackwood 1998).

Forest Canopy Layering

After fire suppression allowed interior Douglas-fir and grand fir to accumulate on dry sites because surface fire was prevented from fulfilling its role as a tree-thinning process, vertical forest structure was transformed when leaf area (foliage biomass) shifted downward from one high canopy layer to multiple low layers (Agee 1996a, Arno et al. 1995, Brown et al. 2003, Graham et al. 1999).

This transformation of vertical forest structure created understory layers functioning as ladder fuel, increasing the probability that surface fire will transition to crown fire (Fiedler et al. 2004, Graham et al. 2004, Mason et al. 2003, Peterson et al. 2005, Stephens 1998).

HRV Analysis for Pre-Fire Canopy Layering

How much single-layer and multi-layer structure would have been expected for upland forestland sites? Table E-11 presents an historical range of variability (HRV) analysis for pre-fire canopy layering on upland forestland sites (Powell 2003).

Table E-11 shows that for pre-fire conditions on dry upland forestland, both single and multiple canopy layering are within their historical ranges of variability.

For pre-fire conditions on moist upland forestland, Table E-11 shows that both single and multiple layering are within their historical ranges of variability, but they are right at the upper or lower limits of the historical ranges.

Table E-11. HRV analysis for tree canopy layering for pre-fire conditions.

Canopy Layering	Dry Upland Forestland PVG		Moist Upland Forestland PVG	
	Historical Percentage	Current Percentage	Historical Percentage	Current Percentage
Single	25-100	52	6-45	45
Multiple	10-55	48	55-115	55

Sources/Notes: Current percentages, summarized from the School Fire vegetation database, include NFS lands only. Gray shading indicates canopy layering that is either above or below the historical range of variability. Historical ranges were derived from Table E-8; the single-layer condition is a combination of SI, SEOC, SECC and OFSS; the multiple-layer condition is a combination of UR, YFMS and OFMS.

Tree Density

Overstocked forests have tree density levels in a self-thinning zone where trees compete aggressively for moisture, sunlight and nutrients. Forests in the self-thinning zone experience mortality as crowded trees die from competition or are killed by insects and diseases that preferentially seek out trees under stress (Powell 1999).

Published stocking guidelines were used to analyze pre-fire tree density levels for the School Fire analysis area (Cochran et al. 1994, Powell 1999). By using the stocking guidelines in conjunction with potential vegetation groups, it was possible to estimate how much forestland acreage was overstocked before the fire occurred (Table E-12); the assessment protocol is described in Powell (2005a).

Results of the tree density analysis are summarized in Table E-12; it shows that a very high percentage of dry upland forestland in the School Fire analysis area was overstocked before the fire, and that a smaller proportion of moist upland forestland had moderate or high tree density levels.

The high amount of overstocked dry upland forestland (which is defined as a combination of the moderate and high density classes in Table E-12) was one result of fire suppression since early in the 20th century (Heyerdahl 1997, Heyerdahl et al. 2001) – dry forests became uncharacteristically dense after surface fire was prevented from functioning as a tree-thinning ecosystem process (Powell et al. 2001).

Historical Tree Density Percentages

It is estimated that with a properly functioning disturbance regime influenced primarily by frequent surface fire (Agee 1998), dry upland forestland had 60% of its acreage supporting low-density forest, 30% supporting moderate-density forest and 10% supporting high-density forest.

Table E-12 shows that the dry upland forestland portion of the School Fire analysis area had more acreage supporting high-density forest than would be expected (78% now; 10% historically), and less acreage supporting low-density forest (16% now; 60% historically) or moderate-density forest (6% now; 30% historically).

It is estimated that with a properly functioning disturbance regime influenced primarily by mixed-severity fire (Agee 1998) and defoliating insects, moist forestland had 30% of its acreage supporting low-density forest, 50% supporting moderate-density forest and 20% supporting high-density forest.

Table E-12 shows that the moist forestland portion of the School Fire analysis area had more acreage supporting high-density forest (28% now; 20% historically) or low-density forest (47% now; 30%

historically) than would be expected, and less acreage supporting moderate-density forest (25% now; 50% historically).

Table E-12. Tree density analysis for pre-fire vegetation conditions.

Tree Density Description	Dry Upland Forestland		Historical Percent	Moist Upland Forestland		Historical Percent
	Acres	Percent		Acres	Percent	
Low tree density	1,595	16	60	5,030	47	30
Moderate tree density	625	6	30	2,602	25	50
High tree density	7,693	78	10	2,956	28	20

Sources/Notes: Summarized from the School Fire vegetation database; acres and percents include NFS lands only. "Dry UF" refers to the dry upland forestland potential vegetation group; "Moist UF" refers to the moist upland forestland potential vegetation group. Queries for calculating tree density classes are provided in Powell (2005a).

Table E-13 summarizes tree density for post-fire conditions; it shows that:

- The dry upland forestland portion of the School Fire analysis area had slightly more acreage supporting high-density forest (24% post-fire; 10% historically) or low-density forest (68% post-fire; 60% historically) than would be expected, and less acreage supporting moderate-density forest (8% post-fire; 30% historically).
- The moist upland forestland portion of the School Fire analysis area had much more acreage supporting low-density forest (81% post-fire; 30% historically) than would be expected, and less acreage supporting moderate-density forest (9% post-fire; 50% historically) or high-density forest (10% post-fire; 20% historically).

Table E-13 Tree density analysis for post-fire vegetation conditions.

Tree Density Description	Dry Upland Forestland		Historical Percent	Moist Upland Forestland		Historical Percent
	Acres	Percent		Acres	Percent	
Low tree density	6,769	68	60	8,533	81	30
Moderate tree density	757	8	30	936	9	50
High tree density	2,388	24	10	1,119	10	20

Sources/Notes: Summarized from the School Fire vegetation database; acres and percents include NFS lands only. "Dry UF" refers to the dry upland forestland potential vegetation group; "Moist UF" refers to the moist upland forestland potential vegetation group. Queries for calculating tree density classes are provided in Powell (2005a).

Canopy Fuel Load

One result of severe wildfire seasons in the late 1990s and early 2000s is that silvicultural treatments (primarily thinning) are being considered for millions of acres in the western United States; these areas are considered to be at-risk for uncharacteristic wildfire behavior and its associated fire effects (General Accounting Office 1999, Gorte 1995, Laverty and Williams 2000).

At-risk areas support uncharacteristic levels of tree foliage biomass (canopy bulk density or fuel load), rendering them vulnerable to intense crown fire (Graham et al. 1999, 2004). Research shows that high canopy fuel load causes forest stands to be more vulnerable to crown fire initiation at any age, and it also extends the duration of a stand's exposure to crown fire hazard by 20 to 30 years (Keyes and O'Hara 2002).

In response to concerns about wildfire risk, canopy fuel load (CFL) was analyzed for pre-fire conditions for the School Fire analysis area. Each forest polygon was rated to assess its potential for expressing crown fire behavior during a wildfire event.

Crown fire susceptibility was estimated using stand density thresholds related to the canopy fuel load of tree foliage (Agee 1996b, Keyes and O'Hara 2002); see Powell (2005b) for the crown fire susceptibility protocol.

Results of the canopy fuel load assessment are summarized in Table E-14. It shows that about 43% of the dry upland forestland acreage in the School Fire analysis area had sufficient canopy fuel load to sustain a crown fire, at least marginally (in Table E-14, 43% is a total for the moderate and high CFL categories combined).

Table E-14 indicates that about 61% of the moist upland forestland in the School Fire analysis area had sufficient canopy load to sustain a crown fire, at least marginally (in Table E-14, this is a total for the moderate and high CFL categories combined).

Most (if not all) of the moderate and high CFL acreage qualifies as fire-regime condition class 2 and 3, whereas the low canopy fuel load acreage can probably be assigned to fire-regime condition class 1.

Due to recent concerns about uncharacteristic wildfire impacts, current Forest Service policy emphasizes fuel treatments that convert condition class 2 or 3 back to condition class 1 (USDA Forest Service 2004).

The primary purpose of fuel treatments is to change the behavior of a fire entering a fuel-altered zone, thus lessening its impact to areas of concern. This change in fire behavior is often quantified as a reduction in flame length or fireline intensity, or in spread rate, and it is typically expressed as a change in fire severity or fire growth (Stratton 2004).

Because the entire School Fire analysis area was recently affected by wildfire, the existing canopy fuel load situation is not yet in dynamic equilibrium with a landscape-scale disturbance regime; therefore, post-fire canopy fuel load was not analyzed.

Table E-14 Canopy fuel load assessment for pre-fire vegetation conditions.

Canopy Fuel Load Description	Dry Upland Forestland		Moist Upland Forestland	
	Acres	Percent	Acres	Percent
Low canopy fuel load	**5,624**	**57**	**4,090**	**39**
Moderate canopy fuel load	**4,234**	**43**	**4,958**	**47**
High canopy fuel load	**56**	**< 1**	**1,540**	**14**

Sources/Notes: Summarized from the School Fire vegetation database; acres and percents include NFS lands only. Criteria for determining canopy fuel load, as described in Powell (2005b), are from Agee (1996b) and Keyes and O'Hara (2002).

HRV Analysis for Predicted Fire Severity

An historical range of variability (HRV) analysis was completed for predicted fire severity (Table E-14). It was a simplistic analysis because there was no explicit characterization of surface or ladder fuels; the canopy fuel load categorical ratings presented in table E-14 (high, moderate, low) were assumed to reflect predicted fire severity.

For dry upland forestland (fire regime 1), Table E-15 shows that pre-fire conditions would support less low or high fire severity than would be expected, and a reasonable percentage of moderate fire severity. For moist upland forestland (fire regime 3), pre-fire conditions would support slightly less moderate or high fire severity than would be expected, and a reasonable percentage of low fire severity.

For comparison purposes, Table E-15 also shows the actual (post-fire) amounts of fire severity. Fire regime 1 experienced more of the high severity than was predicted or would have been expected (from the historical range); fire regime 3 had more of the high severity, and less low or moderate, than expected.

Table E-15 Historical range of variability analysis for predicted fire severity.

Fire Regime	Predicted Fire Severity Rating	Historical Range		Pre-fire: Predicted		Post-fire: Actual	
		Percent	Acres	Percent	Acres	Percent	Acres
Frequent Surface (Fire Regime 1)	Low	60-90	5948-8923	57	5624	2	206
	Moderate	20-60	1983-5948	43	4234	12	1220
	High	10-20	991-1983	< 1	56	86	8489
Mixed Severity (Fire Regime 3)	Low	20-60	2118-6353	39	4090	11	1137
	Moderate	50-70	5294-7411	47	4958	20	2108
	High	20-60	2118-6353	14	1540	69	7343

Sources/Notes: Summarized from the School Fire vegetation database; current percents and acres include NFS lands only and are taken from the low, moderate and high canopy fuel load values in Table E-14. Historical ranges were derived from Agee (1998, see his figure 1).

Appendix F

Regeneration Analysis

School Fire

Salvage Recovery Project

APPENDIX F

Regeneration Analysis

National Forest Management Act Regeneration Requirements

The National Forest Management Act of 1976 (P.L. 94-588) (NFMA), including its amendments to the Forest and Rangeland Renewable Resources Planning Act of 1974 (P.L. 93-378) (RPA), states that when trees are cut to achieve timber production objectives, the cuttings shall be made in such a way that "there is assurance that such lands can be adequately restocked within 5 years after harvest" (sec. 6, (g), (3), (E), (ii)).

In the School Fire analysis area, a reforestation need was created by wildfire rather than timber harvest because all of the trees proposed for removal in salvage units were killed or injured by fire, and by insects or diseases that attack and kill fire-injured trees.

Even though fire was the tree-killing agent in the School Fire analysis area (i.e., the trees were not killed by the proposed action of salvage timber harvest), Forest Service policy and interpretation is that NFMA requires salvage units to be reforested within 5 years of harvest (Kline 1995, Goodman 2002).

The only exception to this five-year reforestation requirement is for salvage timber harvest on unsuitable lands (Kline 1995), since these areas do not have a "timber production objective" according to suitability determination criteria established by the Umatilla National Forest's Land and Resource Management Plan (see appendix J to the final environmental impact statement for the Forest Plan (USDA Forest Service 1990b)).

For burned areas where the fire-killed trees are not salvaged, NFMA does not require that reforestation occur, whether within a 5-year timeframe or at all. Even so, the United States Congress and the U.S. Forest Service are interested in reforesting many of the burned areas promptly, particularly when tree planting could attain a Forest Plan desired future condition more quickly than by waiting for natural plant succession to establish appropriate forest cover (Kline 1995, Goodman 2002).

This reforestation policy is based specifically on language from NFMA and RPA: "Sec. 3 (d) (1) It is the policy of the Congress that all forested lands in the National Forest System be maintained in appropriate forest cover with species of trees, degree of stocking, rate of growth, and conditions of stand designed to secure the maximum benefits of multiple use sustained yield management in accordance with land management plans."

For "natural catastrophic conditions such as fire, insect and disease attack, or windstorm" (see Sec. 6, (g), (3), (F), (iv) in NFMA/RPA), an area would not be classed as a created opening when the live-tree density, after salvage timber harvest, meets or exceeds the "minimum acceptable stocking" standards specified by Forest Plan working group (see table 1-2).

Created openings resulting from the School Fire salvage timber harvest activity, particularly when natural regeneration might not be adequate to adequately restock the areas within 5 years of harvest, would be planted with tree seedlings to establish an ecologically appropriate mix of early- and mid-seral tree species and to ensure that minimum stocking objectives from the Forest Plan (see Table 1-2, Chapter 1) are met, and that they are met within 5 years of harvest completion.

Analysis Context for Regeneration

The School Fire affected a very large area supporting a wide diversity of plant species. Plants have varying degrees of fire resistance. A plant's response to fire depends on factors such as the moisture content of soil and duff at the time of burning, the physiological stage of the plant (immature, mature, etc.), and the fire's severity, particularly regarding the amount of heat that permeates the litter, duff and upper soil layers (Crane and Fischer 1986, Stickney 1990).

An important factor affecting a plant's fire resistance is whether it regenerates vegetatively (survivor plants) or from off-site or buried seed (colonizer plants) (Stickney 1990). Table F-6 (located at end of this appendix) provides fire effects information for common plants of mixed-conifer forests in the Blue Mountains (Powell 1994).

The fire created conditions conducive to regeneration of early-seral conifer trees. Unfortunately, it also killed many of the mature trees required for seed production. The probability of obtaining natural regeneration in the School Fire analysis area will depend on many interacting factors:

- The availability and abundance of seed in the canopy of fire-killed or fire-injured trees in 2005,
- Whether seed dispersed from killed or injured trees germinates in 2006-2007 and survives,
- The availability of surviving trees to serve as a seed source for long-term regeneration,
- The spatial distribution of seed trees, especially their proximity to severely burned areas,
- Whether the survivors are physiologically capable of producing seed in any abundance,
- Whether cone (seed) crops are actually produced, and if seedbeds are still receptive then.

We can expect forest recovery to be slow in many portions of the fire, particularly for areas that burned at moderate or high severity and whose pre-fire composition was dominated by species with low fire resistance (table E-1 in Appendix E summarizes fire resistance characteristics by tree species).

For the high-mortality portion of the School Fire analysis area (see map 1-1), the fire functioned as a stand-replacing disturbance event, resulting in considerable mortality of plant species, some degree of site disturbance, and initiation of successional processes that ultimately lead to a new plant community with a different structure and often a different composition than its predecessor (Johnson and Miyanishi 2001).

In this high-mortality portion of the fire area, herbaceous plants (forbs, grasses, sedges) and shrubs will initially dominate for the first several decades, with trees eventually predominating by 30 or 40 years after the fire (Cholewa and Johnson 1983, Greene and Johnson 2000, Keane et al. 1990, Steele and Geier-Hayes 1995) (Figure F-1).

Table F-1 summarizes the area and proportion of burned National Forest System lands, stratified using categories of potential vegetation group and fire severity (tree mortality). It shows that:

- Both the dry and moist upland forestland potential vegetation groups had a higher percentage of high fire severity than would have been expected from the historical fire regime;
- Both the dry and moist upland forestland potential vegetation groups had a lower percentage of moderate fire severity than would have been expected historically;
- Both the dry and moist upland forestland potential vegetation groups had a lower percentage of low fire severity than would have been expected historically.

Map 1-1 (chapter 1 page 1-4) shows the geographical distribution of fire severity (stand mortality) categories for National Forest System lands in the School Fire analysis area; map E-1 in Appendix E shows the geographical distribution of potential vegetation groups for National Forest System lands in the School Fire analysis area.

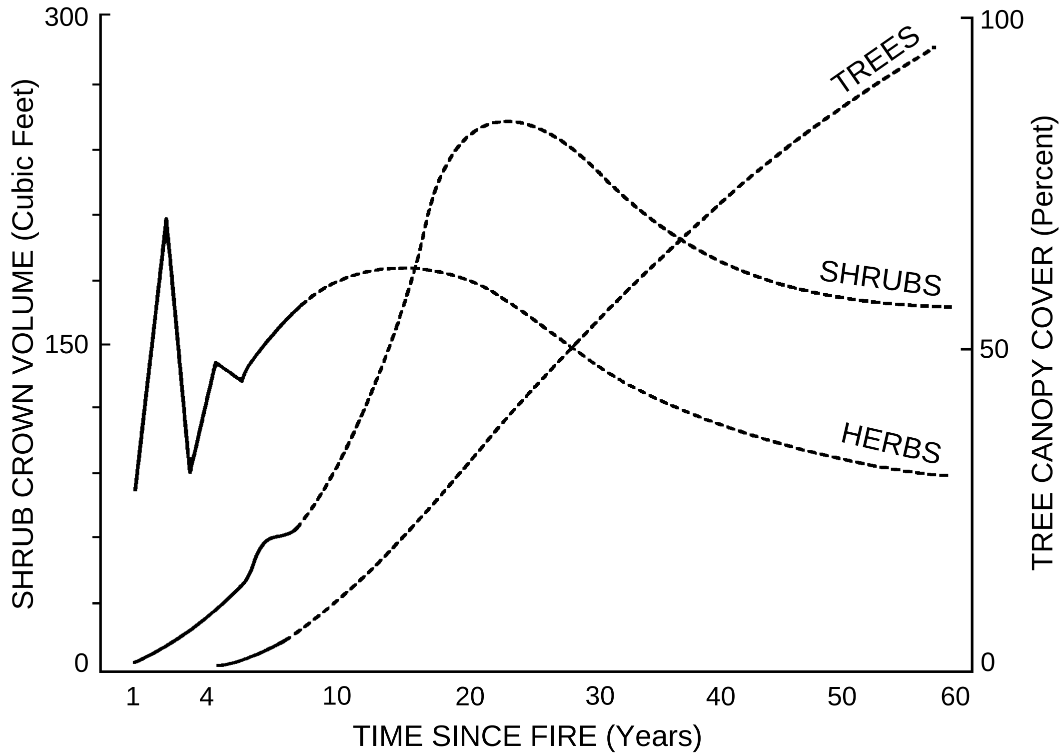


Figure F-1. Plant succession following a stand-replacing crown fire in south-central Idaho (modified from Lyon 1971). Herbaceous plants (forbs, grasses and sedges) will initially dominate a stand-replacing wildfire area. As succession progresses, woody plants ultimately prevail, with shrubs peaking by the second decade and trees becoming dominant between 30 and 40 years after the fire. Note that even though trees may not predominate until the third decade, they were already established in the post-fire community by the fourth year after the fire – a good example of the initial floristics development pattern (Oliver and Larson 1996).

Table F-1 Acreage and percentage summaries by potential vegetation group and fire severity

Potential Vegetation Group	**ACRES (PERCENT) BY FIRE SEVERITY CATEGORY**					
	Low	**Expected**	**Moderate**	**Expected**	**High**	**Expected**
Dry upland forestland	206 (2%)	60-90%	1,220 (12%)	20-60%	8,489 (86%)	10-20%
Moist upland forestland	1,137 (11%)	20-60%	2,108 (20%)	50-70%	7,343 (69%)	20-60%
Cold upland forestland	0 (0%)	10-20%	0 (0%)	10-60%	0 (0%)	60-90%

Sources/Notes: Based on the potential vegetation and fire severity maps (maps A-1 and 1-1). Forestland potential vegetation groups are described in table A-2. The expected values are the percentages that would have been expected based on the historical fire regimes (Agee 1996a).

In the case of lodgepole pine, some natural regeneration may be produced by cones present in the canopy of dead stands, assuming that any canopy remained after the fire. In many areas experiencing moderate fire severity, the fire killed all of the lodgepole pines although some of their crowns still persist and will serve as a seed source if cones were present before the burn.

Although lodgepole pine has a low percentage of closed cones (serotiny) in the Blue Mountains (fig. F-2), it is a prolific seed producer and good seed crops occur frequently (Trappe and Harris 1958). If 2005 was a good seed year for lodgepole pines in the School Fire area, adequate to abundant amounts of lodgepole pine regeneration can be expected in the future.

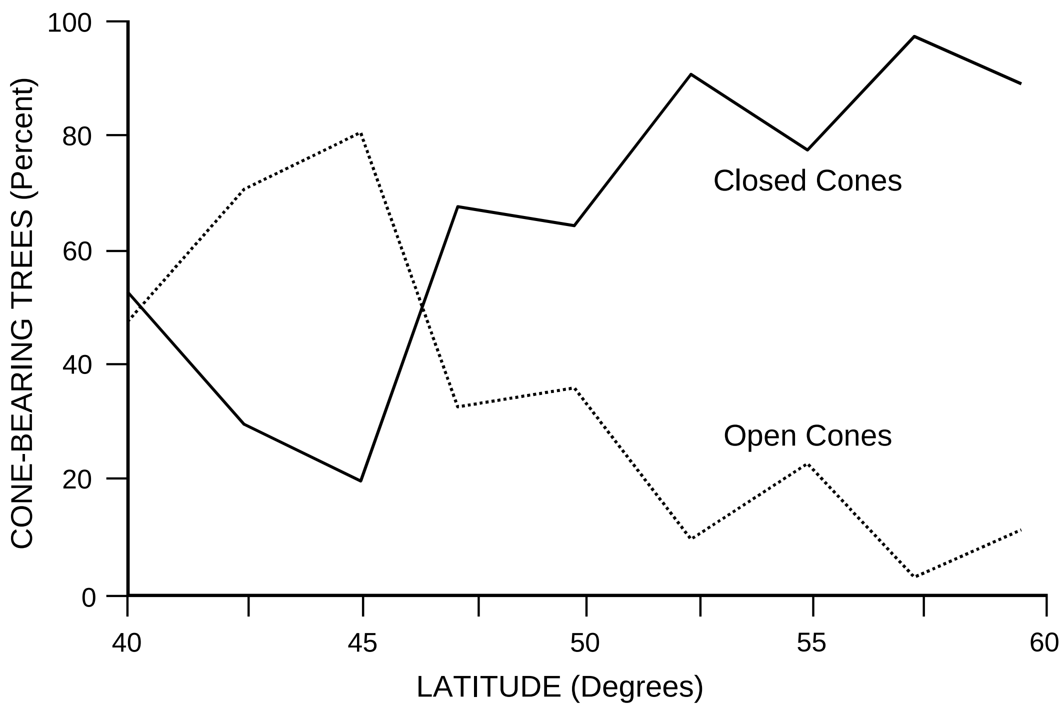


Figure F-2. Lodgepole pine serotiny varies with latitude. Note that the School Fire analysis area (with a latitude centered on 46°) coincides with the lowest serotiny percentage for lodgepole pine in the western United States (figure modified from Koch 1996).

Table F-2 provides tolerance, resistance and other life history traits (autecological information) influencing the reproduction characteristics for common conifer species affected by the School Fire.

Table F-2 Reproduction characteristics for common conifer trees of the Blue Mountains

Life History Trait	**PIPO**	**PSME**	**LAOC**	**ABGR**	**PIMO**	**PICO**	**PIEN**	**ABLA2**
Sprouts from root system or root collar	No	No	No	No	No	No	No	No
Long-term seed storage in duff or soil	No	No	No	No	No	No	No	No
Tolerance to frost	L	L	L	M	H	H	H	M
Tolerance to drought	H	M	M	M	M	M	L	L
Resistance to snow damage	L	L	M	M	M	M	H	H
Susceptibility to Armillaria root	L	H	L	H	M	M	M	M

Life History Trait	PIPO	PSME	LAOC	ABGR	PIMO	PICO	PIEN	ABLA2
disease								
Seed germination on ash/char seedbed	IN	IN	NE	IN	IN	NE	RE	NR
Reproduction capacity[1]	H	H	H	M	H	H	M	M
Seed dissemination distance (feet)	100-120	300-330	120-150	200	400	200	100-120	50-100
Potential for regeneration in the open	H	H	H	L	H	H	H	L
Potential initial growth rate (≤ 5 years)	H	H	M	M	M	H	L	L

Sources/Notes: Ratings derived from Barrett (1966), Cole (1993), Dahms (1963), Fisher (1935), Klinka et al. (2000), Minore (1979), Nyland (1996) and Williams et al. (1995). Table F-4 describes the tree species acronyms used as column headings. Codes are: H, high; M, moderate; L, low; IN, increased; NE, no effect; RE, reduced; NR, not reported. Species rankings are based on the predominant situation for each trait. A species trait can vary during the lifespan of an individual tree, and from one individual to another in a population; figure F-3 illustrates this concept using Engelmann spruce seed dissemination.

[1] Reproduction capacity considers minimum cone-bearing age, seed crop frequency, crop size, seed soundness and other related factors.

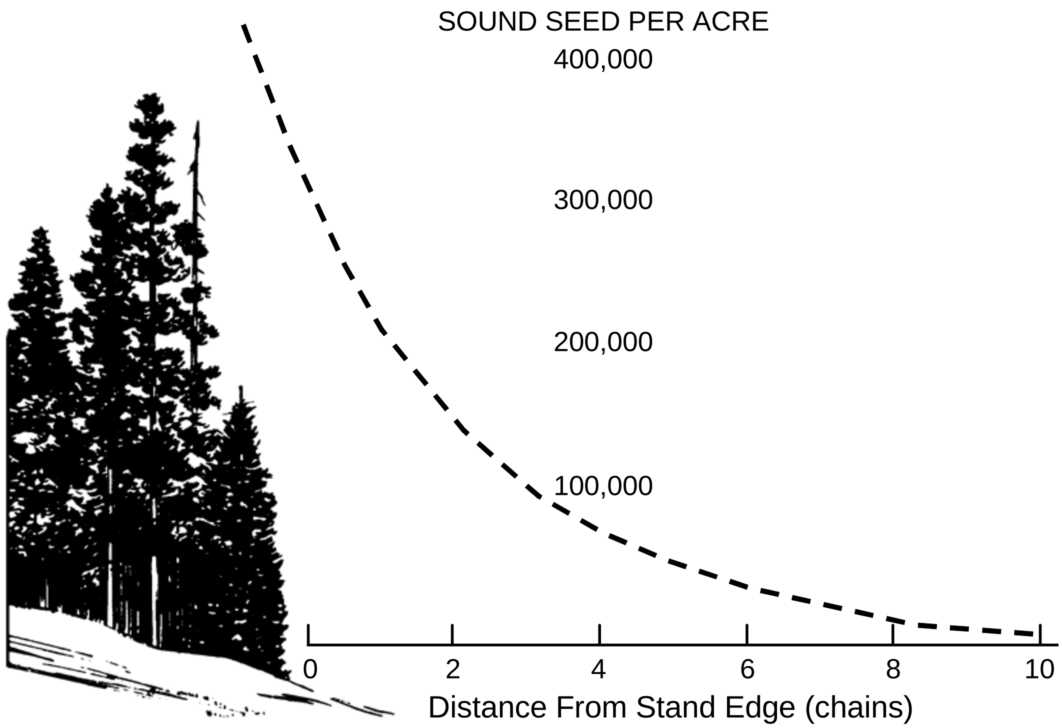


Figure F-3. Seed quantities decline with increasing distance from a seed source. This diagram shows that Engelmann spruce is a prolific seed producer, but that seed amounts decline rapidly as the distance from a seed source increases. At least 50% of Engelmann spruce seed will fall within 120 feet of the windward edge of an opening, although up to 10% of the seed will disperse as far as 300 feet (diagram modified from Roe et al. 1970).

Estimating Natural and Artificial Regeneration

After considering the information contained in Table F-2, along with empirical experience gained by following recovery after other local forest fires, it was possible to estimate lag times to obtain natural regeneration in the School Fire area. It is difficult to make these estimates precisely due to variation in fire severity and stand mortality, both of which affect seed availability and natural regeneration potential.

Map F-1 shows areas where natural regeneration is expected to occur. It was prepared using the assumption that a live seed source would be present in the low and moderate severity areas (see map 1-1), and that this seed source would be sufficient to result in natural regeneration for at least 60 meters (197 feet) into the high severity areas. The 60-meter width was based on the seed dispersal information summarized in table F-2. The acres of natural regeneration portrayed in Map F-1 are summarized in table F-3.

According to a GIS analysis and interpretation of satellite imagery, it appears that approximately 15,830 forestland acres were burned severely enough to warrant artificial regeneration using tree planting. After removing the fringe portion of high-severity areas that are likely to regenerate naturally because a seed source is available from adjoining low or moderate severity areas (approximately 2,270 acres of upland forestland, which is the “buffered area” in Map F-1), the remaining high-severity area (approximately 13,560 forestland acres) should be evaluated for tree planting as soon as possible.

Map F-1 shows the location of areas where tree planting should be considered. For areas where it is estimated that an insufficient seed source exists to promote natural regeneration, it will be important to complete tree planting before plants competing with conifer seedlings gets well established (table F-4).

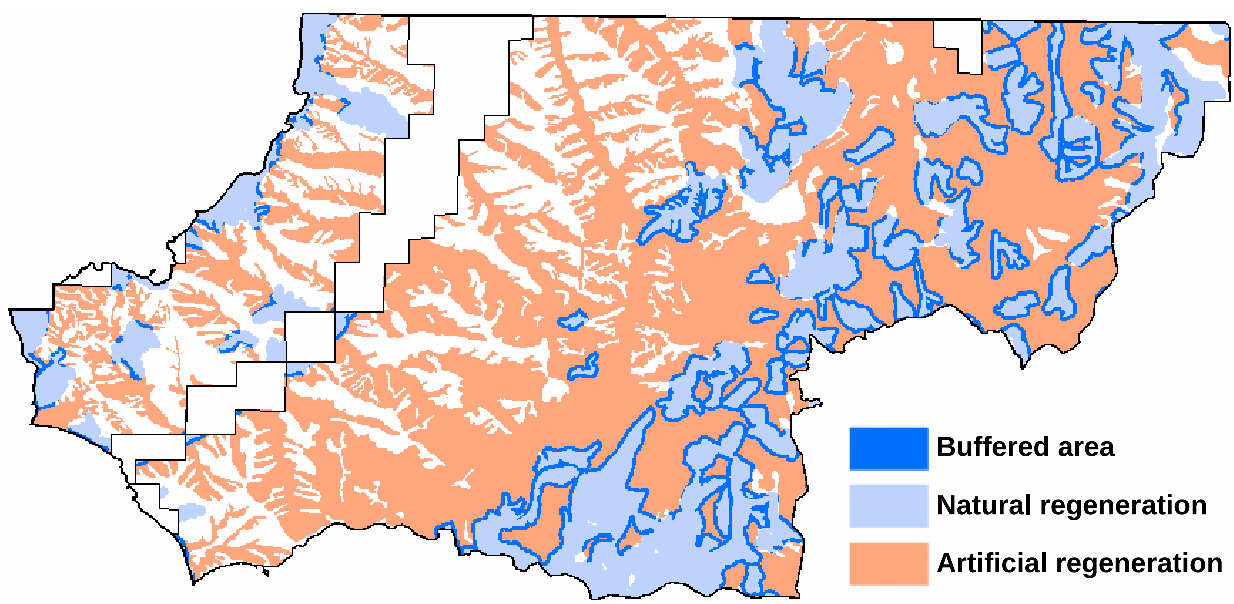


Figure F-4 - Map F-1. Regeneration estimates for National Forest System lands in the School Fire analysis area. It was assumed that a live seed source will be present in the low and moderate fire severity areas (see map 1-1) and that it will be sufficient to promote natural regeneration for these portions of the fire area. It was also assumed that the seed source present near the edges of the low and moderate fire severity areas would be sufficient to facilitate natural regeneration for at least 60 meters (197 feet) into the high severity portion of the fire area (this is the “buffered area”). The 60-meter width was based on the seed dissemination information summarized in table F-2.

Table F-3 Estimated tree regeneration status, by upland forestland PVG and Forest Plan management area allocation, for the School Fire analysis area

Mgmt Area	DRY UPLAND FORESTLAND PVG				MOIST UPLAND FORESTLAND PVG			
	Upland Sites		Riparian (RHCA)		Upland Sites		Riparian (RHCA)	
	NR	PL	NR	PL	NR	PL	NR	PL
A4	76	38	2	2	213	366	7	24
A6	23	41	13	< 1	12	40	0	3
C1	89	812	46	243	45	115	35	83
C3	282	2,206	58	290	124	1,308	18	167
C4	117	70	21	10	148	30	1	0
C5	15	38	64	190	19	57	101	202
C8	15	573	< 1	209	65	44	22	20
D2	0	22	0	0	0	0	0	0
E2	1,421	2,560	113	255	3,376	3,259	396	285
Total	**2,038**	**6,360**	**317**	**1,199**	**4,002**	**5,219**	**580**	**784**

Sources/Notes: Derived from the potential vegetation group (map A-1) and regeneration (Map F-1) maps, in combination with the management area allocations. The NR column shows the acreage where Natural Regeneration is expected to produce an adequately stocked stand (approximately 6,940 acres of upland forestland); PL summarizes the acreage where planting is believed to be necessary to obtain satisfactory tree regeneration (approximately 13,560 acres of upland forestland). The NR columns also include the acreage associated with the "buffered area" item in map C-1 (approximately 2,270 acres of upland forestland) because it is assumed that natural regeneration will occur for these areas. Note that this table does not include all acres in the School Fire analysis area because nonforest potential vegetation types (meadows and scablands) were excluded.

Table F-4 Post-fire response and seedling inhibition comments for common shrubs and herbs of common forested potential vegetation types in the School Fire analysis area.[1]

Plant Species[2]	Post-fire Response and Tree Seedling Inhibition Comments[3]
Big huckleberry	Slow post-fire response; low seedling inhibition risk
Birchleaf spiraea	Moderate response; moderate inhibition risk from this sprouting shrub
Bracken fern	High response; allelopathy and frond crush result in very high seedling risk
Common snowberry	Moderate response; moderate inhibition after low or moderate severity fire
Elk sedge	High response; competes aggressively with tree seedlings on dry sites
Grouse huckleberry	Low response; low seedling inhibition risk from this cold-site subshrub
Heartleaf arnica	Low survival; often increases from off-site seed and competes moderately
Mallow ninebark	High response; this sprouting mid-height shrub is an aggressive competitor
Pinegrass	High response; prolific spread and seeding after fire; aggressive competitor
Redstem ceanothus	High response; moderate inhibition risk; not as common as snowbrush
Scouler willow	Moderate/high response; prolific sprouting after fire; aggressive competitor
Snowbrush ceanothus	High response; very aggressive competitor on both moist and dry sites
Trailplant	Low response; generally slow post-fire recovery and low inhibition risk
Twinflower	Low response; generally slow post-fire recovery and low inhibition risk

[1] "Common forested potential vegetation types" was defined to be those comprising 5 percent or more of forestland in the School Fire analysis area (see table B-3): ABGR/CLUN, ABGR/LIBO2, ABGR/VAME, ABLA2/CLUN, PSME/PHMA and PSME/SYAL.
[2] "Plant species" are known to be abundant (10% or more canopy cover) in the pre-fire plant community (Johnson and Clausnitzer 1992) or predicted to be abundant in the post-fire community after moderate- or high-severity fire in the Blue Mountains (Clausnitzer 1993, Johnson 1998, Powell 1998, Steele and Geier-Hayes 1995, Swanson 2006, Uebler 2000).
[3] "Seedling inhibition" comments are based on local experience and Clausnitzer (1993), Johnson (1998), Steele and Geier-Hayes (1995) and Swanson (2006). Species with high inhibition potential are capable of killing conifer seedlings directly; species with moderate potential cause limited seedling mortality but more commonly result in growth losses; plants with low potential cause limited growth losses and no seedling mortality. Plant nomenclature follows table F-7.

The total reforestation need created by the School Fire, regardless of whether it is considered to be a natural regeneration or artificial regeneration need (the NR and PL columns in Table F-3) has been tabulated and included in the Reforestation and TSI Needs Report (2400-K), which is submitted annually to the US Congress as required by the Forest and Rangeland Renewable Resources Planning Act of 1974 and the National Forest Management Act of 1976 (sec. 4(d)1).

Tree Regeneration Modeling Assumptions

Tree regeneration, whether derived from natural or artificial sources, was simulated using the FVS model and the Most Similar Neighbor data (see appendix E).

Natural regeneration simulations were based on professional judgment and empirical information from other fires on the Umatilla National Forest (Tower, Bull, Summit, Wheeler Point, Willow Springs, etc.).

Assumptions about the species composition of natural regeneration were based on potential vegetation, and on fire severity and its associated tree mortality predictions. Table E-3 shows the potential vegetation composition of the School Fire analysis area.

Note that the natural regeneration assumptions also apply to the planted areas; it was assumed (and modeled) that the planted areas would also receive natural regeneration in the amounts and compositions described below. This means that for the high and moderate mortality categories, total seedling density is assumed to be a combination of the natural and artificial regeneration amounts.

Table F-5 shows assumptions about natural regeneration lag times for the six most common forested potential vegetation types (PVTs) in the School Fire analysis area. Table F-5 shows that it could require 30-50 years to establish appropriate forest cover for two PVTs comprising almost 50% of forestland in the analysis area – the Douglas-fir/mallow ninebark and Douglas-fir/common snowberry PVTs (table B-3).

Table F-5 Estimates of natural regeneration lag times (years) for the School Fire analysis area

	LAG TIME BY TREE MORTALITY CLASS	
Potential Vegetation Type[1]	**Low/Moderate Mortality**[2]	**High Mortality**[2]
ABGR/CLUN (grand fir/queencup beadlily)	< 10	< 10/20[3]
ABGR/LIBO2 (grand fir/twinflower)	< 10	< 10/20[3]
ABGR/VAME (grand fir/big huckleberry)	< 10	< 10/25[3]
ABLA2/CLUN (subalpine fir/queencup beadlily)	< 10	20-30
PSME/PHMA (Douglas-fir/mallow ninebark)	< 15	30-50
PSME/SYAL (Douglas-fir/common snowberry)	< 15	20-40

[1] Potential vegetation type (PVT) is described in table B-3; the most abundant forested PVTs (those comprising 5% or more of the forestland area) are included in this table.

[2] Low, moderate and high mortality refers to the characterization of predicted mortality depicted on map 1-1.

[3] The first value is an estimate of lag time when lodgepole pine was present in the pre-fire stand composition; the second value is a lag-time estimate for stands where lodgepole pine was not a pre-fire component.

Moist Upland Forestland PVG. For the moist upland forestland potential vegetation group, it was assumed that natural regeneration totaling 350 trees per acre (all species combined) would become established over a 5- to 20-year period, with regeneration lag time varying by mortality category. Tree planting, using an assumption of 200 trees per acre (all species combined), was simulated for the high and moderate mortality categories only.

a. Moist Upland Forestland potential vegetation group, high mortality category

Regeneration Type	Year	Tree Species	Trees Per Acre	Post-Fire Growing Seasons
Plant	2009	DF	50	Start of 4th
	2009	WL	50	
	2009	WP	50	
	2009	PP	50	
Natural	2014	ES	20	End of 9th
	2014	GF	20	
	2014	LP	30	
	2014	WL	30	
Natural	2019	ES	20	End of 14th
	2019	GF	20	
	2019	LP	40	
	2019	WL	45	
Natural	2024	ES	20	End of 19th
	2024	GF	20	
	2024	LP	40	
	2024	WL	45	

b. Moist Upland Forestland potential vegetation group, moderate mortality category

Regeneration Type	Year	Tree Species	Trees Per Acre	Post-Fire Growing Seasons
Plant	2009	DF	50	Start of 4th
	2009	WL	50	
	2009	WP	50	
	2009	PP	50	
Natural	2009	ES	20	End of 4th
	2009	GF	20	
	2009	LP	30	
	2009	WL	30	
Natural	2014	ES	20	End of 9th
	2014	GF	20	
	2014	LP	40	
	2014	WL	45	
Natural	2019	ES	20	End of 14th
	2019	GF	20	
	2019	LP	40	
	2019	WL	45	

c. Moist Upland Forestland potential vegetation group, low mortality category

Regeneration Type	Year	Tree Species	Trees Per Acre	Post-Fire Growing Seasons
Natural	2009	ES	25	End of 4th
	2009	GF	35	
	2009	LP	50	
	2009	WL	50	
	2009	DF	40	
	2009	PP	30	
Natural	2014	ES	25	End of 9th
	2014	GF	40	
	2014	LP	25	
	2014	WL	25	
	2014	DF	35	
	2014	PP	20	

Dry Upland Forestland PVG. For the dry upland forestland potential vegetation group, it was assumed that natural regeneration totaling 200 trees per acre (all species combined) would become established over a 5- to 40-year period, with regeneration lag times varying by mortality category. Tree planting, using an assumption of 150 trees per acre (all species combined), was simulated for the high and moderate mortality categories only.

a. Dry Upland Forestland potential vegetation group, high mortality category

Regeneration Type	Year	Tree Species	Trees Per Acre	Post-Fire Growing Seasons
Plant	2009	DF	50	Start of 4th
	2009	PP	100	
Natural	2014	DF	15	End of 9th
	2014	GF	10	
	2014	PP	25	
Natural	2024	DF	15	End of 19th
	2024	GF	10	
	2024	PP	25	
Natural	2034	DF	15	End of 29th
	2034	GF	10	
	2034	PP	25	
Natural	2044	DF	15	End of 39th
	2044	GF	10	
	2044	PP	25	

b. Dry Upland Forestland potential vegetation group, moderate mortality category

Regeneration Type	Year	Tree Species	Trees Per Acre	Post-Fire Growing Seasons
Plant	2009	DF	50	Start of 4th
	2009	PP	100	
Natural	2014	DF	30	End of 9th
	2014	GF	20	
	2014	PP	50	
Natural	2024	DF	30	End of 19th
	2024	GF	20	
	2024	PP	50	

c. Dry Upland Forestland potential vegetation group, low mortality category

Regeneration Type	Year	Tree Species	Trees Per Acre	Post-Fire Growing Seasons
Natural	2009	DF	40	End of 4th
	2009	GF	20	
	2009	PP	60	
Natural	2014	DF	40	End of 9th
	2014	GF	20	
	2014	PP	60	

Implementing Regeneration Activities

After a decision is made to plant an area, it generally takes 2 or 3 years of lead time to prepare the sites, grow seedlings adapted to specific site conditions (as represented by elevational ranges within designated seed zones), prepare silvicultural prescriptions detailing activity specifications, and make arrangements for getting the trees planted using either contract or force-account crews.

Tree planting is a powerful tool for influencing the future species composition of a forest. In order to meet objectives related to forest health, and to select a composition that is ecologically appropriate for the open environmental conditions produced by a high-severity fire, the tree planting activity would attempt to establish a future composition with at least 60 percent of the trees being early- or mid-seral species.

The successional (seral) status of nine Blue Mountain conifer species, and showing how their seral status varies depending upon which of the School Fire analysis area potential vegetation types they occur on, is presented in Table F-6.

Since lodgepole pine is expected to regenerate naturally on all areas where a pre-fire seed source for that species existed, it is recommended that upland forestland plantings emphasize other early-seral species (western larch and ponderosa pine) to a greater extent than lodgepole pine.

Silvicultural prescriptions would be prepared for all regeneration activities, as required by the Forest Plan (see Silvicultural Prescriptions section in Timber section of Forest-wide standards and guidelines, page 4-69 in Forest Plan). The prescriptions would be prepared or reviewed by a certified silviculturist.

Regeneration prescriptions would specify an optimum and minimum stocking level. Minimum stocking levels, which are summarized in table 1-2, are expressed for “working groups” by the Forest Plan. Since working groups are no longer used for contemporary planning and management, the FP minimum stocking levels are correlated with potential vegetation types in table F-7.

The Forest Plan minimum stocking objectives will be used when certifying plantation establishment, which normally occurs after the third growing season following tree planting (see Reforestation section of Forest-wide standards and guidelines, page 4-70 in FP).

Recommended tree planting specifications – suggested composition by tree species, and seedling density expressed as trees per acre and intertree spacing – are provided in table 1-3. The species composition recommendations in table 1-3 are consistent with the Species Preference and Species Diversity standards from the Forest Plan (see pages 4-72 and 4-74).

It must be emphasized that the planting compositions in table 1-3 involve a mixture of species. A common misconception is that plantations are monocultures – “corn-row” forests devoid of species or spacing diversity (DeLong 2002). Although a monoculture is possible for dense stands of lodgepole pine or ponderosa pine because they are susceptible to a physiological condition called stagnation (Hall 1984), the monoculture or stagnation conditions are not predicted for the School Fire analysis area.

Table F-6 Seral status of tree species for potential vegetation types of the School Fire analysis area

PVG	Potential Vegetation Type Acronym	--- TREE SPECIES ORDERED FROM WARM DRY TO COLD MOIST --- JUOC	PIPO	PSME	LAOC	PICO	PIMO	PIEN	ABGR	ABLA2
MOIST UPLAND FOREST	ABGR/TABR/CLUN		ES	MS	ES			LS	LS	
	ABGR/TABR/LIBO2			MS	ES		MS	LS	LS	
	ABGR/GYDR								LS	
	ABGR/POMU-ASCA3				ES			LS	LS	
	ABLA2/TRCA3					ES		LS		LS
	ABLA2/CLUN				ES			LS		LS
	ABLA2/VAME				ES	ES		LS		LS
	ABGR/CLUN		ES	MS	ES	ES	MS	LS	LS	
	ABGR/LIBO2		ES	MS	ES	ES	MS	LS	LS	
	ABGR/VAME		ES	MS	ES	ES		LS	LS	
	ABGR/ACGL		ES	MS	ES		MS	LS	LS	
	PSME/ACGL-PHMA		ES	LS						
	PSME/HODI		ES	LS						
DRY UPLAND FOREST	ABGR/SPBE		ES	MS	ES	ES			LS	
	ABGR/CAGE		ES	MS	ES				LS	
	PSME/PHMA		ES	LS	ES					
	PSME/SYAL	A	ES	LS	ES					
	PSME/VAME		ES	LS						
	PSME/CARU		ES	LS					A	
	PIPO/SYAL	A	LS							
	PIPO/AGSP	A	LS							

Sources/Notes: Derived from Clausnitzer (1993), Hall (1973), Johnson and Clausnitzer (1992) and Steele et al. (1981). Potential vegetation group (PVG) is described in appendix A. The tree species acronyms used as column headings are: JUOC, western juniper; PIPO, ponderosa pine; PSME, interior Douglas-fir; LAOC, western larch, PICO, lodgepole pine; PIMO, western white pine; PIEN, Engelmann spruce; ABGR, grand fir; ABLA2, subalpine fir. Seral status codes (Hall et al. 1995) are: LS = late seral; MS = mid seral; ES = early seral; A = accidental occurrence. Table A-3 provides common names for the potential vegetation type acronyms included in this table.

Table F-7 Forest Plan minimum stocking levels for potential vegetation types of the School Fire analysis area

PVG	Potential Vegetation Type	Forest Plan Working Group	Minimum Stocking Level
MOIST UPLAND FOREST	ABGR/TABR/CLUN	North Associated	200
	ABGR/TABR/LIBO2	North Associated	200
	ABGR/GYDR	North Associated	200
	ABGR/POMU-ASCA3	North Associated	200
	ABLA2/TRCA3	North Associated	200
	ABLA2/CLUN	North Associated	200
	ABLA2/VAME	North Associated	200
	PICO(ABGR)/VAME/CARU	Lodgepole Pine	100
	ABGR/CLUN	North Associated	200
	ABGR/LIBO2	North Associated	200
	ABGR/VAME	North Associated	200
	ABGR/ACGL	North Associated	200
	PSME/ACGL-PHMA	North Associated	200
	ABGR/ACGL-PHMA	North Associated	200
	PSME/HODI	North Associated	200
DRY UPLAND FOREST	ABGR/SPBE	North Associated	200
	ABGR/CAGE	North Associated	200
	PSME/PHMA	North Associated	200
	PSME/SYAL	North Associated	200
	PSME/VAME	North Associated	200
	PSME/CARU	North Associated	200
	PIPO/SYAL	Ponderosa Pine	100
	PIPO/AGSP	Ponderosa Pine	100

Sources/Notes: Assignment of potential vegetation types to Forest Plan Working Group is described in appendix K of the final environmental impact statement for the Umatilla National Forest Land and Resource Management Plan (see page K-5 specifically) (USDA Forest Service 1990b). The Forest Plan used potential vegetation types from a guide called "Plant communities of the Blue Mountains in eastern Oregon and southeastern Washington" (Hall 1973). That guide was superseded by Johnson and Clausnitzer (1992). The Hall (1973) potential vegetation types were cross-walked to their corresponding Johnson and Clausnitzer (1992) types when assigning potential vegetation types to Forest Plan Working Groups. The minimum stocking level values are expressed as trees per acre; they were taken from page 4-70 in the Forest Plan (USDA Forest Service 1990a). Table A-3 provides common names for the potential vegetation types included in this table.

Table F-8 Fire effects information for common plants of mixed-conifer forests of the Blue Mountains

Code	Plant Name	Fire Resistance	Fire Response	Site Type	Comments About Regeneration Methods
			TREES		
ABGR	Grand fir (*Abies grandis*)	Medium	Low	Cool Mesic	A dense, low branching habit, flammable foliage and resinous bark add to fire susceptibility; thick bark of mature trees is fire resistant.
ABLA2	Subalpine fir (*Abies lasiocarpa)*	Low	Low	Cold Mesic	Entire stands of this high-elevation species are easily killed by fire; colonizes burned areas very slowly.
JUOC	Western juniper (*Juniperus occidentalis)*	Medium	Low	Warm, Dry	Post-fire establishment occurs from seed, much of which is dispersed by animals (rabbits, squirrels, etc.).
LAOC	Western larch (*Larix occidentalis)*	High	High	Cool, Mesic	Our most fire-resistant conifer because of its thick bark, short crown length and high tolerance to foliage loss.
PICO	Lodgepole pine (*Pinus contorta)*	Medium	High	Cool Mesic	Often regenerates after stand-replacing wildfires, when it forms dense, even-aged thickets.
PIEN	Engelmann spruce (*Picea engelmannii)*	Low	Low	Cold, Moist	Easily killed by fire because of its long, full crown, thin bark and a shallow root system.
PIMO	Western white pine (*Pinus monticola*)	Medium	Medium	Cool Mesic	High branching habit limits fire susceptibility; abundant bark resin and medium bark thickness reduce fire resistance.
PIPO	Ponderosa pine (*Pinus ponderosa)*	High	High	Warm, Mesic	Very high fire resistance; experiences reduced diameter growth after high levels of crown scorch.
PSME	Douglas-fir (*Pseudotsuga menziesii)*	High	Medium	Warm, Mesic	Mature trees are fire resistant due to thick bark, but thin-barked poles and saplings are easily damaged by fire.
			SHRUBS		
AMAL	Serviceberry (*Amelanchier alnifolia)*	Medium	High	Cool, Mesic	Sprouts immediately after fire and also reproduces from bird- and mammal-dispersed seed; germinates on bare soil in partial shade.
ARNE	Manzanita (*Arctostaphylos nevadensis)*	Low	Medium	Cool, Dry	Regenerates from the root crown, runners (stolons) or from seed; survives cool fires if the litter/duff is not completely consumed.
BERE	Creeping hollygrape (*Berberis repens)*	Medium	Medium	Cool, Dry	Sprouts from surviving rhizomes after fire; survives all but severe burns that cause high soil heating.
CEVE	Snowbrush ceanothus (*Ceanothus velutinus)*	High	High	Warm, Mesic	Often regenerates prolifically from seeds buried in the soil; seeds can remain viable for a hundred or more years.
CELE	Mountain mahogany (*Cercocarpus ledifolius)*	Low	Low	Warm, Dry	Sprouts weakly after low-intensity fire; reproduces from wind- and mammal-dispersed seed (some soil storage); germinates in full sun.
HODI	Oceanspray	Medium	High	Warm, Dry	Regenerates from the surviving root crown and from seed stored in

Table F-8 Fire effects information for common plants of mixed-conifer forests of the Blue Mountains

Code	Plant Name	Fire Resistance	Fire Response	Site Type	Comments About Regeneration Methods
	(*Holodiscus discolor)*				the soil; its seedlings establish easily on fresh mineral soil.
PAMY	Myrtle pachistima (*Pachistima myrsinites)*	Medium	Medium	Cool, Mesic	Regenerates from the crown of a deep taproot, stem bud sprouts or stored seed; may increase after cool or moderate burns.
PRVI	Common chokecherry (*Prunus virginiana)*	Medium	High	Warm, Mesic	Sprouts prolifically from its root crown; reproduces from bird- and mammal-dispersed seed; germinates in full sun after disturbances.
RICE	Wax currant (*Ribes cereum)*	Medium	High	Warm, Dry	Regenerates from seed stored in the litter/duff and from basal stem sprouts; susceptible to fire-induced mortality after severe burns.
RILA	Prickly currant (*Ribes lacustre)*	High	High	Cool, Moist	Usually increases after burning, even severe fires. Cool or moderate-intensity fires favor prickly currant seedling establishment.
ROGY	Baldhip rose (*Rosa gymnocarpa)*	Medium	Medium	Cool, Mesic	Regenerates from the root crown, stem bases and seed; it responds vigorously to cool or moderate fires.
SASC	Scouler willow (*Salix scouleriana)*	High	High	Cool, Mesic	Regenerates from the root crown or by using small, windborne seed; may increase dramatically after fire, especially on moist sites.
SPBE	White spiraea (*Spiraea betulifolia)*	High	High	Cool, Mesic	Regenerates from the root crown and by use of rhizomes located 2-5 inches beneath the soil surface; usually increases after burning.
SYAL	Common snowberry (*Symphoricarpos albus)*	Medium	High	Cool, Mesic	Regenerates from deep rhizomes, basal stem buds and seed; favored by cool or moderate fires, but often survives severe ones too.
SYOR	Mountain snowberry (*Symphoricarpos oreophilus)*	Low	Medium	Cool, Dry	Sprouts weakly from the root crown and from rhizomes; usually maintains prefire cover and abundance after cool or moderate fires.
VAME	Big huckleberry (*Vaccinium membranaceum)*	High	Medium	Cool, Mesic	Regenerates from rhizomes and seed, but post-fire recovery may be slow; fire used by native Americans to maintain huckleberry fields.
VASC	Grouse huckleberry (*Vaccinium scoparium)*	Medium	Medium	Cold, Mesic	Regenerates from shallow rhizomes and seed; usually survives cool or moderate fires that don't consume all of the litter and duff layers.
			GRASSES AND GRASS-LIKE PLANTS		
BRCA	California brome (*Bromus carinatus)*	Medium	Medium	Warm, Dry	Regenerates from the root crown and from wind-disseminated seed; nonrhizomatous; germinates on bare soil in full sun.
BRVU	Columbia brome (*Bromus vulgaris)*	Medium	Medium	Cool, Moist	Regenerates from seed, some of which may be stored in the soil; generally declines following severe fires.
CARU	Pinegrass (*Calamagrostis rubescens)*	Medium	Medium	Warm, Mesic	Regenerates from rhizomes and wind-disseminated seed; survives all but severe fires; germinates on bare soil.
CACO	Northwestern sedge (*Carex concinnoides)*	Medium	Medium	Cool, Moist	Sprouts from rhizomes located in the duff; fires that consume most of the litter and duff have an adverse impact on this plant.
CAGE	Elk sedge	High	High	Warm, Mesic	Sprouts from surviving rhizomes and reproduces from seed stored

Table F-8 Fire effects information for common plants of mixed-conifer forests of the Blue Mountains

Code	Plant Name	Fire Resistance	Fire Response	Site Type	Comments About Regeneration Methods
	(*Carex geyeri)*				in the soil; germinates on bare soil after burning or scarification.
CARO	Ross sedge (*Carex rossii)*	High	Medium	Cool, Dry	Regenerates from short rhizomes and from seed stored in the duff and upper soil; germinates on bare soil mainly after scarification.
ELGL	Blue wildrye (*Elymus glaucus)*	Medium	Medium	Warm, Mesic	Regenerates from the root crown, rootstock sprouts and seed; seed can survive temperatures associated with a moderate-intensity burn.
FEID	Idaho fescue (*Festuca idahoensis)*	Low	Medium	Warm, Dry	Regenerates from the root crown and wind-disseminated seed; non-rhizomatous; germinates on bare soil.
FEOC	Western fescue (*Festuca occidentalis)*	Low	Low	Cool, Mesic	Regenerates from the root crown and from off-site seed; generally declines after fire, although it germinates well on bare, shaded soil.
KOCR	Prairie junegrass (*Koeleria cristata)*	Medium	Medium	Warm, Dry	Regenerates from seed – susceptible to mortality from late-spring burns, although this is one of our more fire-resistant bunchgrasses.
PHPR	Common timothy (*Phleum pratense)*	Medium	Medium	Disturbances	Regenerates from the surviving root crown or, more commonly, from seed blown in from adjacent roadsides and forest openings.
PONE	Wheeler bluegrass (*Poa nervosa)*	Medium	High	Warm, Mesic	Regenerates from surviving rhizomes and seed; seldom damaged by fire unless the litter and duff layers are consumed.
POPR	Kentucky bluegrass (*Poa pratensis)*	High	High	Warm, Mesic	Regenerates from basal stem buds, slender rhizomes and seed; seldom damaged by fire except for hot, spring burns.
SIHY	Bottlebrush squirreltail (*Sitanion hystrix)*	Medium	High	Warm, Dry	Regenerates from the root crown and seed; since it cures early, this grass survives summer fires better than spring ones.
STOC	Western needlegrass (*Stipa occidentalis)*	Low	Low	Warm, Dry	Regenerates from surviving root crowns and wind-disseminated seed; non-rhizomatous; germinates on bare soil in full sun.
			FORBS		
ACMI	Western yarrow (*Achillea millefolium)*	Medium	High	Disturbances	Regenerates from short, shallow rhizomes and seed; declines after severe fires, but invasion from off-site seed usually occurs rapidly.
ADBI	Trailplant (*Adenocaulon bicolor)*	Low	Low	Cool, Moist	Regenerates from short surface rhizomes and seed; generally survives cool fires although post-fire recovery is usually slow.
ANRO	Rose pussytoes (*Antennaria rosea)*	Low	Medium	Cool, Dry	Regenerates from trailing stolons and wind-blown seed; is likely to increase slightly or remain unchanged after cool or moderate burns.
AQFO	Red columbine (*Aquilegia formosa)*	Medium	Medium	Cool, Moist	Regenerates mostly from seed; likely that moderate or hot fires will have a detrimental effect on this species.
ARMA3	Bigleaf sandwort (*Arenaria macrophylla)*	Low	Medium	Cool, Mesic	Regenerates from shallow rhizomes and seed; decreases slightly or remains unchanged after fire depending on duff consumption.
ARCO	Heartleaf arnica (*Arnica cordifolia)*	Low	High	Cool, Mesic	Sprouts from surviving rhizomes; readily invades burned areas using windborne seed; germinates on bare soil in partial shade.

Table F-8 Fire effects information for common plants of mixed-conifer forests of the Blue Mountains

Code	Plant Name	Fire Resistance	Fire Response	Site Type	Comments About Regeneration Methods
ASCO	Showy aster (*Aster conspicuus)*	Medium	High	Cool, Mesic	Regenerates from surviving rhizomes and wind-disseminated seed; germinates on bare soil in partial shade.
BASA	Balsamroot (*Balsamorhiza sagittata)*	High	High	Warm, Dry	Regenerates from a root crown and animal-disseminated seed; plant densities are often greater than pre-burn levels by the second year.
CAMI2	Scarlet paintbrush (*Castilleja miniata)*	Medium	Medium	Warm, Mesic	Regenerates from the crown of a deep taproot and from off-site seed; reestablishment in the post-fire community is somewhat slow.
CHUM	Pipsissewa (*Chimaphila umbellata)*	Low	Medium	Cool, Mesic	Sprouts from shallow rhizomes; usually survives cool or moderate burns that don't consume all of the litter and duff layers.
CIVU	Bull thistle (*Cirsium vulgare)*	Medium	Medium	Disturbances	Regenerates from root sprouts and seed; often increases dramatically after burning and may compete moderately with tree seedlings.
CLUN	Queencup beadlily (*Clintonia uniflora)*	Low	Low	Cool, Moist	Regenerates from widely spreading rhizomes and from seed; generally declines after fire.
ERCO3	Longleaf fleabane (*Erigeron corymbosus)*	Low	Medium	Cool, Dry	Regenerates from off-site seed or a moderately well-developed rootcrown; apt to decrease slightly or remain unchanged after fire.
FRVE	Woods strawberry (*Fragaria vesca)*	Medium	Medium	Cool, Mesic	Regenerates from root crown sprouts, runners (stolons) and seed stored in upper soil; survives cool fires.
FRVI	Blueleaf strawberry (*Fragaria virginiana)*	Medium	High	Cool, Mesic	Regenerates from root crown sprouts and runners (stolons); survives cool fires that don't consume all of the litter and duff layers.
GABO	Northern bedstraw (*Galium boreale)*	Medium	Medium	Cool, Mesic	Regenerates from creeping, underground rhizomes and from sticky seed; is fairly resistant to light burns but declines after severe fires.
GATR	Sweetscented bedstraw (*Galium triflorum)*	Low	Medium	Cool, Moist	Regenerates using rhizomes and seed; decreases dramatically after severe fires, but can increase following cool burns.
GOOB	Rattlesnake plantain (*Goodyera oblongifolia)*	Low	Low	Cool, Mesic	Regenerates using rhizomes and seed; easily killed by fire because its shallow rhizomes are very sensitive to heat.
HIAL2	Western hawkweed (*Hieracium albertinum)*	Low	Medium	Cool, Dry	Lacks rhizomes or another means of vegetative reproduction, but readily invades burned areas using windborne seed.
HIAL	White hawkweed (*Hieracium albiflorum)*	Low	Medium	Cool, Mesic	Lacks rhizomes or another means of vegetative reproduction, but readily invades burned areas using windborne seed.
LALA2	Thickleaf peavine (*Lathyrus lanzwertii)*	Medium	High	Warm, Dry	Regenerates from rhizome sprouts and seed; similar to other legumes in that this plant is a nitrogen fixer.
LANE	Cusick's peavine (*Lathyrus nevadensis)*	Medium	High	Warm, Mesic	Reproduces from surviving rhizomes and from seed stored in the soil; also a nitrogen fixer.
LIBO2	American twinflower (*Linnaea borealis)*	Low	Medium	Cool, Moist	Regenerates from root crowns, stolons and seed; survives cool fires if the duff and litter layers were damp and not totally consumed.
LUCA	Tailcup lupine	High	Medium	Cool, Mesic	Regenerates from a deep taproot and heavy seed; its seed can

Table F-8 Fire effects information for common plants of mixed-conifer forests of the Blue Mountains

Code	Plant Name	Fire Resistance	Fire Response	Site Type	Comments About Regeneration Methods
	(*Lupinus caudatus)*				survive for long periods in the lower duff and upper soil layers.
MITR	False agoseris (*Microseris troximoides)*	Medium	High	Warm, Dry	Regenerates from a deep taproot; increases or remains unchanged after fires that don't consume all of the litter and duff layers.
MIST2	Sideflowered mitella (*Mitella stauropetala)*	Medium	High	Cool, Mesic	Regenerates from the root crown and seed; fires that consume most of the litter and duff are apt to have a detrimental impact.
OSCH	Mountain sweetroot (*Osmorhiza chilensis)*	Medium	Medium	Cool, Moist	Regenerates from a taproot or root crown and from seeds; flowering usually increases after the tree canopy has been opened by fire.
POPU	Polemonium (*Polemonium pulcherrimum)*	Low	Medium	Cold, Moist	Regenerates from the semi-woody crown of a large taproot and from seed; usually declines following fire.
PTAQ	Bracken fern (*Pteridium aquilinum)*	High	High	Cool, Moist	Sprouts from surviving rhizomes and spreads vigorously after fire; inhibits conifer regeneration by producing chemicals (allelopathy).
PYSE	Sidebells pyrola (*Pyrola secunda)*	Low	Low	Cool, Mesic	Sprouts from rhizomes in the lower duff or at the soil surface; commonly decreases after fire unless duff moisture is high.
SEIN	Woolly groundsel (*Senecio integerrimus)*	Low	Medium	Cool, Dry	Regeneration occurs mainly from off-site seed; apt to decrease slightly or remain unchanged after low- or moderate-intensity fire.
SMRA	Feather solomonplume (*Smilacina racemosa)*	Medium	Medium	Cool, Mesic	Regenerates from creeping rhizomes and is fairly resistant to fire damage; usually maintains its prefire frequency after burning.
SMST	Starry solomonplume (*Smilacina stellata)*	Medium	Medium	Cool, Mesic	Sprouts from creeping rhizomes; often decreases after fire, especially severe burns that consume most of the litter and duff.
TAOF	Common dandelion (*Taraxacum officinale)*	Medium	Medium	Disturbances	Regenerates from a deep taproot and light, windborne seed; can quickly colonize burns located near an abundant seed source.
VIAM	American vetch (*Vicia americana)*	Medium	High	Cool, Mesic	Regenerates from rhizomes in the upper soil; seldom damaged unless the litter/duff has been consumed; a nitrogen fixer.
VIOR2	Darkwoods violet (*Viola orbiculata)*	Medium	Medium	Cool, Mesic	Regenerates from short, slender rhizomes and seed stored in the upper soil or duff layers; usually declines following fire.

Sources/Notes: Adapted from table 5 in Powell (1994). Common and scientific plant names generally follow Hitchcock and Cronquist (1973). Powell (1994) provides literature sources for the ratings and comments presented in this table.

Fire resistance ratings have the following interpretation:

- High – Greater than 65 percent chance that 50 percent of the species population will survive or immediately reestablish after passage of a fire with an average flame length of 12 inches.
- Medium – 35 to 64 percent chance that 50 percent of the species population will survive or immediately reestablish after passage of a fire with an average flame length of 12 inches.

- Low – Less than 35 percent chance that 50 percent of the species population will survive or immediately reestablish after passage of a fire with an average flame length of 12 inches.

Fire response ratings estimate of how quickly a plant species will regain its prefire population level. They have the following interpretation:

- High – The species population will regain its preburn frequency or cover in 5 years or less.
- Medium – The species will regain its preburn frequency or cover in 5 to 10 years.
- Low – The species will regain its preburn frequency or cover in more than 10 years.

Appendix G

Best Management Practices (BMPs)

School Fire

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APPENDIX G

Best Management Practices (BMPs)

Best Management Practices (BMPs) are the primary mechanism for achievement of water quality standards. This appendix describes key BMPs that have been selected in addition to those listed in Chapter 2, Table 2-3 - Design Features and Management Requirements, for implementation with any of the action alternatives.

Best Management Practices include but are not limited to structural and non-structural controls, operations, and maintenance procedures. BMPs can be applied before, during, or after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving watersheds. BMPs are selected on the basis of site-specific conditions that reflect natural background conditions and political, social, economic, and technical feasibility.

The Memorandum of Agreement between the USDA Forest Service and the Washington State Department of Ecology for meeting Clean Water Act specifically identifies Best Management Practices (BMPs) as the primary mechanism to control non-point source pollution on National Forest Service lands and as an important component of the state surface water quality laws and regulations.

Below are a list of BMPs that will be used in the School Fire Salvage Recovery project area, along with information as to who will be responsible for implementing them, when they will be done, and a determination of ability to implement, and effectiveness:

T-1 - Timber Sale Planning Process
Estimates will be made on the potential changes to water quality and instream beneficial uses.
Responsibility: Hydrologist and Fisheries Biologist
Timing: Prior to activity
Ability to Implement: High
Effectiveness: High

T-4 – Use of Sale Area Maps for Designating Water Quality Protection Needs
The Sale Area Map will include locations of streams to be protected and the required harvest method (ephemeral draws would be protected by a 25 foot buffer in helicopter and skyline units and during forwarder route design, but not under the protected stream course provision).
Responsibility: Presale Technician
Timing: Prior to activity
Ability to Implement: High
Effectiveness: High

T-10 – Log Land Location
Harvest plans will include proposed landing locations. Landing locations and size will be approved in advance by Forest Service personnel.
Responsibility: Presale Technician and Sale Administrator
Timing: Prior to and during activity
Ability to Implement: High
Effectiveness: High

T-11 – Yarding and Skidding Trail Location and Design
Harvest plans will include proposed yarding patterns. Skid trails will be approved in advance by Forest Service personnel.

Responsibility: Presale Technician and Sale Administrator
Timing: Prior to and during activity
Ability to Implement: High
Effectiveness: High

T-12 – Suspended Log Yarding In Timber Harvesting
Full suspension will occur where forwarder and helicopter logging is required and partial suspension will occur where skyline logging is required so as to create minimal soil disturbance, except in RHCAs and in ephemeral draw bottoms, where full suspension would be required.

Responsibility: Presale Technician and Sale Administrator
Timing: Prior to and during activity
Ability to Implement: High
Effectiveness: High

T-13 – Erosion Prevention Measures during Timber Sale Operations
Equipment shall not operate when ground conditions are susceptible to detrimental soil disturbances (not more than 15% of the logged area is permitted to have detrimental soil disturbance). Erosion control work will be kept current.

Responsibility: Sale Administrator
Timing: During activity
Ability to Implement: High
Effectiveness: High

T-18 – Erosion Control Structure Maintenance
The Purchaser will provide maintenance of soil erosion control structures as required in the timber sale contract.

Responsibility: Sale Administrator
Timing: During activity
Ability to Implement: Moderate
Effectiveness: High

T-19 – Acceptance of Timber Sale Erosion Control Measures before Sale Closure
The effectiveness of erosion control measures will be evaluated periodically during the life of the timber sale contract.

Responsibility: Sale Administrator and Hydrologist
Timing: During activity
Ability to Implement: High
Effectiveness: High

R – 1 – General Guidelines for the Location and Design of Roads
Road reconstruction will assure design creates minimal resource damage

Responsibility: Engineering Technician
Timing: Prior to activity
Ability to Implement: High
Effectiveness: High

R-2 – Erosion Control Plan
Limit erosion and sedimentation through effective planning and contract administration.
Responsibility: Engineering Technician and Sale Administrator
Timing: Prior to and during activity
Ability to Implement: High
Effectiveness: Moderate

R-3 – Timing of Construction Activities
Road reconstruction will occur during minimal runoff periods to minimize erosion
Responsibility: Engineering Technician
Timing: During activity
Ability to Implement: High
Effectiveness: Moderate

R-6 & R-7 – Dispersion of Subsurface and Surface Drainage Associated with Roads
Ditch relief and cross drainage design will assure intercepted ground water and surface water is moved from road prism before it develops enough energy to undermine cut slopes or erode fill slopes.
Responsibility: Engineering Technician
Timing: During activity
Ability to Implement: High
Effectiveness: Moderate

R-18 – Maintenance of Roads
Ditches and culverts will be kept open and ruts repaired
Responsibility: Sale Administrator, Engineering Technician
Timing: During activity
Ability to Implement: High
Effectiveness: High

R-19 – Road Surface Treatment to Prevent Loss of Material
Watering and grading will be kept on schedule to assure surface material is not lost.
Responsibility: Sale Administrator, Engineering Technician
Timing: During activity
Ability to Implement: High
Effectiveness: High

R-21 – Snow Removal Controls to Avoid Resource Damage
Snow removal will assure water can drain from road prism before it develops enough energy to erode road surface or fill slopes.
Responsibility: Sale Administrator, Engineering Technician, Silvicultural Technician
Timing: During activity
Ability to Implement: High
Effectiveness: High

R-22 – Restoration of Borrow Pits and Quarries
Borrow pits will be stabilized such that banks are stable and access road provides necessary drainage.
Responsibility: Engineering Technician
Timing: During activity
Ability to Implement: High
Effectiveness: High

F-3 – Protection of Water Quality During Prescribed Fire Operations
The prescribed fire will follow the burn plan. Adjustments will be made during firing operations if objectives are not being met.

Responsibility: Fire Management Officer, District Ranger
Timing: Prior to and during activity
Ability to Implement: High
Effectiveness: High

W-5 – Cumulative Watershed Effects
To ensure that the additional effects of the proposed management activities, when added to the existing conditions do not exceed thresholds of concern or result in adverse (degraded) water quality or channel/fish habitat conditions.

Responsibility: Hydrologist, Fish Biologist, Silviculturist
Timing: Prior to activity
Ability to Implement: High
Effectiveness: High

Appendix H

Soils

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APPENDIX H

Soils Information

Ecological Hierarchy

School Fire Salvage Recovery project lies within the Tollgate Plateau Subsection in the far northern-most portion of the Blue Mountains section of the Blue Mountains Ecoregion (Province). The Tollgate Plateau is influenced by marine air flowing through the Columbia River Gorge and is particularly strong in this area with comparatively high rain and snowfall amounts and temperature moderated compared to southern portions of the Umatilla National Forest.

Table H-1 Subsection Description of Tollgate Plateau

SUBSECTION Blue Mountains Ecoregion/Province, FS				
Ecological Framework: Subsection	**Geomorphology Process, typical landform, top features, drainages**	**Geology Lithology, structure, hard fracture**	**Inferred climate, Potential Natural Vegetation, unique features**	**Natural disturbance; Fire, flooding, slope stability, and flow regime**
M323Gaa **Tollgate Plateau other names: CRB Plateau-maritime or Tollgate CRB Plateau-maritime**	Major process: Volcanism, fluvial erosion (stream incision) Major landforms: Upland plateaus, V-canyons, narrow valley bottoms Dendritic and parallel drainage patterns, often follow structural features (faults) Moderate relief, ~3000 (fluvial incision)	Columbia River Basalts Thick sequence of basalt flows, with deep loess and ash soils on stable plateaus, north slopes and valley bottoms Local groundwater influence on base flows Basalts among more impermeable in the Blues (min. fracturing)	Maritime influence zone directly intercepts maritime weather systems moving east through Columbia river gorge. Relatively high precip. for the elevation range and cool to cold temperatures Grand fir communities dominant	Slope stability affected by ROS with localized shallow rapid landslides in 1st order drainages and steep concave headwalls Winter rain-on-snow, spring snow-melt mixed flow regimes with some localized flashy runoff (peak flows, low flows) moderated by deep surficial ash deposits Fire regime: III Mixed severity; II Stand-replacing non-forest on grass-tree mosaic canyons and shallow soil plateaus

Land Type Associations (LTA)

A Land Type Association (LTA) is a grouping of ecologically similar geomorphic processes, landform and potential vegetation at a (larger) scale more detailed than subsections. An LTA map and descriptions has been completed for the three Blue Mountains National Forests, the Umatilla, Wallowa-Whitman, and Malheur (unpublished USFS data). Table H-2 displays the LTA codes, descriptive name, and primary and secondary soils found in these LTAs.

Table H-2 - School Fire Salvage Recovery Project Area Land Type Associations

LTA Code	Descriptor	Slope Gradient	Major Soil	Secondary Soil
116	Moist forest-basic igneous-gentle slopes	0 -30%	Limberjim	Syrupcreek
117	Moist forest-basic igneous-steep slopes	30 -60%	Limberjim	Mountemily
118	Moist forest-basic igneous-canyons	60 -90%	Harl	Limberjim
216	Dry forest-basic igneous-gentle slopes	0 -30%	Larabee	Bennettcreek
217	Dry forest-basic igneous-steep slopes	30 -60%	Klickson	Larabee
218	Dry forest-basic igneous-canyons	60 -90%	Klicker	Fivebit
233	Dry forest-surficial-alluvial	0 -15%	Stevenscreek	Borger

Following are descriptions of dominant representative soil series typical of the Land Type Associations (LTAs) in School Fire Salvage Recovery project planning area.

- **Klicker Series -** Klicker series consists of moderately deep, well drained soils formed in loess mixed with volcanic ash, and slope alluvium and colluvium from basalt. Klicker soils are on mountains, plateaus, and benches. Slopes are 0 to 90 percent. The average annual precipitation is about 30 inches and average annual temperature is about 42 degrees F.

  Geographic Setting: Klicker soils are on mountains, plateaus and benches at an elevation of 2,500 to 6,200 feet. Slopes range from 0 to 90 percent. The soils formed in loess mixed with volcanic ash, and slope alluvium and colluvium from basalt. Summers are cool and dry and winters are cold and wet. Average annual precipitation is 15 to 40 inches. Average January temperature is 24 to 27 degrees F.; average July temperature is 63 to 67 degrees F.; and average annual temperature is 40 to 45 degrees F. Frost-free season is 60 to 120 days.

  Native vegetation is an open stand of ponderosa pine and Douglas-fir with an understory of bluebunch wheatgrass, slender wheatgrass, brome grass, Oregon-grape, common snowberry, saskatoon serviceberry, creambush oceanspray, mallow ninebark and wild rose.

- **Larabee Series -** Larabee series consists of well drained, moderately deep soils on hills and canyons. They formed in colluvium weathered from basalt or welded tuff with an influence of loess and volcanic ash. Permeability is moderately slow. Slope ranges from 0 to 90 percent. The average annual temperature is about 43 degrees F and the average annual precipitation is about 27 inch

  Geographic Setting: - Larabee soils are on hill backslopes and shoulders, and canyons of dissected basalt plateaus. Slopes are 0 to 90 percent. These soils formed largely in material weathered from basalt or welded tuff, with minor additions of loess and volcanic ash. Elevations are typically 3,400 to 5,600 feet but range to 2,800 feet on north and east-facing slopes in Oregon. Average annual precipitation is typically 24 to 30 inches, but ranges to 17 inches in northeastern Oregon. The average annual temperature is 39 to 45 degrees F. The frost-free period is 60 to 100 days.

Native vegetation is mainly Douglas-fir, grand fir, larch, elk sedge, pinegrass and heartleaf arnica.

- **Harl Series -** Harl series consists of very deep well drained soils on side slopes of plateaus and mountains. Harl soils formed in ash over colluvium derived from basalt. Slopes are 30 to 90 percent. The mean annual precipitation is about 30 inches and the mean annual temperature is about 43 degrees F.

  Geographic Setting: - Harl soils occur on side slopes of plateaus and mountains. Slopes are 0 to 90 percent. These soils formed largely in volcanic ash mixed with colluvium. Elevations are typically 2,800 to 6,000 feet. Climate is characterized by cold, wet winters and cool (warm at lower elevations) and dry summers. Average annual precipitation is typically 20 to 40 inches, but ranges to 16 inches in northeastern Oregon. The average annual temperature is 41 to 44 degrees F. The frost-free period is 70 to 100 days.

- **Limberjim Series -** The Limberjim series consists of deep, well drained soils on stable ridgetops and side slopes of mountains and plateaus. Limberjim soils formed in ash over colluvium and residuum derived from basalt and andesitic brecias. Slopes are 0 to 90 percent. The mean annual precipitation is about 30 inches and the mean annual temperature is about 43 degrees F.

  Geographic Setting: - Limberjim soils are on stable slopes of mountains and plateaus. Elevations are 2,800 to 5,800 feet. Slopes are 0 to 90 percent. The soil formed in ash over colluvium and residuum derived from basalt and andesitic brecias. The climate is characterized by cool, wet winters and warm, moist summers. The mean annual precipitation is 20 to 40 inches and can range to 16 inches on north-facing slopes. The mean annual temperature is 41 to 44 degrees F. The frost-free period is 70 to 100 days

Geology & Mass Wasting Processes

School Fire Salvage Recovery project area is in the northern-most part of the large anticline that is the Blue Mountains of northeastern Oregon and southeastern Washington. The rock type is dominated by Columbia River Basalt (CBR) group and comprised of the Grande Ronde and Wanapum lava flows (McKee 1972, as cited in Clark and Bryce 1997). Interbedded layers of lava flows of different ages contain fractured rock and old soil surfaces developed during periods of relative geologic inactivity. These can be sources of springs or sidehill seeps where moisture-living plant species may be found in an otherwise drier environment. This appears in the form of bands of trees and associated understory plant species or as small areas of forbs, grasses or herbs that normally are found in different microenvironments (deeper soils and more moisture) such as the footslopes below. Periodic release of soil and rock material is more likely from these less-consolidated interbed areas as well, although rarely in large amounts.

The fire area includes very steep canyon topography in mountainous terrain and as such is a dynamic environment. The basalt/andesite rock type is mostly level-bedded with the most fracture areas where outcrops are exposed on the sideslopes. Rock fragments periodically calve off of these rock outcrops and fall down onto and into footslope and drainage bottom areas. These rock fragments are primarily cobble to stone size (3 inches to about 3 feet), and collect both in talus and less organized random manner. The source area of rock fragments typically do not support continous stands of trees, but in places have scattered trees on areas of adjacent soil capable of supporting them.

Despite the steep terrain, rock type is quite stable with relatively little mass movement activity. Events generally are limited to shallow debris slides from buildup of rock fragments. Road fill failures can occur in these landscapes after significant storm events. The periodic flush of accumulated rock fragments from side channels during extreme weather events has provided the most dramatic mass movement in recent times, most recently the rain on snow events of 1997/1997. These shallow (as opposed to deep-seated) rock-laden debris flow areas were mapped following the 1997 events. This activity was primarily limited to Tucannon Canyon. The steep sideslopes of the other primary drainages (Cummings, Tumalum, and Pataha) have similar geophysical makeup but are not as steep, have shorter slopes and less volume of rock fragment accumulation. Following is a summary of the 1996/97 debris flows and slides for Upper Tucannon River (Umatilla National Forest 2002):

- Stream system – Tucannon
- Number of features – 21
- Number of Flows – 16
- Number of Slides – 5
- Average Crown Elevation – 3,085
- Average Toe Elevation – 2,736
- Average Slope – 0.27

Fifteen debris flow locations were mapped in the Tucannon corridor portion of the project area, all of them in low order ephemeral or intermittent drainages on the west side of the Tucannon River. Four of the fifteen features were mapped on State land down slope of NFS lands. Another three were mapped below the Forest Boundary on the Wooten Wildlife Refuge. Nearly all of these debris flows occurred in unroaded and unharvested areas and were classified as having an unknown or natural (climatic) cause. Two debris flows may have been caused by saturated conditions leading to fill slope failures along FR 4620 (Patrick Grade).

There is only one mapped area of land slump (deep-seated soil and rock movement) indicated in the Umatilla Soil Resource Inventory of no more than 26 acres. It is located at the head of Hixon Canyon in the Roadless Area on the east side of the Tucannon Canyon, outside of the salvage project area.

<u>Soil Inventory</u>

Soil types are inventoried (mapped) and documented in the Umatilla National Forest Soil Resource Inventory (SRI) (USDA Forest Service 1977). The Soil Resource Inventory (SRI) provides soil mapping and descriptions of soils for the School area. Soils are not named as the SRI is not a National Cooperative Soil Survey (NCSS) correlated survey. The map unit codes represent soils to the family level in the Soil Taxonomic system (USDA 1975). Table H-3 provides a compilation of the primary SRI map units for the activity units described in the Proposed Action. Ash soil depth is shown as a primary characteristic due to its importance for site properties and response to management activity. Interpretations for compaction, displacement, puddling, and erosion hazard are listed for dominant soils.

Table H-3- Summary SRI Soil Types of Activity Units

Planning Unit Number	Primary SRI Map Units Bold Is Dominant	Ash Soil Depth, Range, Inches	Compaction Hazard	Displacement Hazard	Puddling Hazard	Erosion Hazard
2,6,40,29,71,86	**12**,13,313,14	17-26	L	H	L	**M**
155,201,367	**915**	0	L	H	L	**S**
15	05,08,**12**,314	0-17	L	H	L	**M**
17	06,**07**	0-20	H	M	M	**S**
20	01, **314**	0-26	H	H	H	**S**
21	12,14,08,**076**,313	0-26	H, L	M, H	M	**S**
24	07,**064**	0-20	L	H	M	**S**
25	06,**07**,064	0-20	H	M	M	**S**
26	**06**,12	0-17	L	H	M	**S**

Planning Unit Number	Primary SRI Map Units Bold Is Dominant	Ash Soil Depth, Range, Inches	Compaction Hazard	Displacement Hazard	Puddling Hazard	Erosion Hazard
27,35	08, **13**	0-26	H	M	H	**M**
29,218,423,404,167	13,**313**	0-26	H	H	H	**M**
31,81,84,98,114,130,138,140,341,120,147,170,182,238,248,250,254,63,280,287,291,297,300,319,320,324,327,335,358,417,421, 424,443,701	**812**	0-17	L	H	L	**M**
55	**06**	0-17	L	H	M	**S**
33	313,**812**,912	0-26	L	H	L	**M**
41,54,334,343,442,253,286,253,286	**912**,915	0-17	L	H	L	**S**
44,77	12,**13**,046	0-26	H	M	H	**M**
46	08,**12**,313,812	0-26	L	H	L	**M**
47	**313**,812	0-26	H	H	H	**M**
53,110,122	**076**	0-20	H, L	M, H	M	**S**
57	05, **12**,314	0-17	L	H	L	**M**
66	**91**,812	0-17	L	H	L	**S**
70	312,**912**	0-17	L	H	L	**S**
4,5,85,151,32,284, 298,322,406,416,425,439	**912**	0-17	L	H	L	**S**
88,115,308,438,474,615	**13**	26	H	M	H	**M**
94	**13**,041	0-26	H	M	H	**M**
121	129,**912**	0-17	L	H	L	**S**
123	046,313,**812**,915	0-26	L	H	L	**M**
131,165	**07**	20	H	M	M	**S**
132	08,14,**313**	0-26	H	H	H	**M**
135,203	**124**,313	0-25	M	H	L	**M**
142	**064**	0	L	H	M	**S**
145	**08**,076,812	0-20	L	H	L	**S**
153,175	**08**,14	0-26	L	H	L	**S**
154	**085**	0	L	H	L	**S**
160	07,**313**	0-26	H	H	H	**M**
161,505,527,486	**918**	0	L	H	L	**S**
172,249	**129**	0-17	L	H	L	**S**
179	**129**,915	0-17	L	H	L	**S**
185	046,124,**812**,915	0-25	L	H	L	**M**
193	**041**	0	L	H	L	**S**
195,205	08,**076**	0-20	H, L	M, H	M	**S**
199	12,**912**,128	0-17	L	H	L	**S**
200,276,323	13,313,**812**	0-26	L	H	L	**M**
210	064,**912**,915	0-17	L	H	L	**S**

Planning Unit Number	Primary SRI Map Units Bold Is Dominant	Ash Soil Depth, Range, Inches	Compaction Hazard	Displacement Hazard	Puddling Hazard	Erosion Hazard
220	**012**,046	0	M, L	H, M	L	**S**
221	**05**,812	0-17	L	H	L	**S**
225	**124**,046	0-25	M	H	L	**M**
232,240	**046**	0	L	M, H	L, M	**S**
241	**912**,312,918	0-17	L	H	L	**S**
262	**812**,13	0-26	L	H	L	**M**
267,355,365	812,**915**	0-17	L	H	L	**S**
304,305,326,711	**812**,313	0-26	L	H	L	**M**
330	**13**,315	22-26	H	M	H	**M**
666	313,**912**	0-26	L	H	L	**S**
342	**13**,912	0-26	H	M	H	**M**
346	**07**,04	0-20	H	M	M	**S**
352	**07**,812	0-20	H	M	M	**S**
353	**312**,129,912,39	0-17	M	H	M	**M**
362	315,**13**,173	0-26	H	M	H	**M**
370	915,129,918,**312**	0-17	M	H	M	**M**
379	**149**,315,209	0-25	L	H	L	**M**
380	18,**173**	0-27	H	H	L	**M**
387,446,489,453	918,**312**	0-17	M	H	M	**M**
409,478,464	**128**	0-17	L	H	L	**S**
413	**04**	0	L	M	L	**S**
418	**13**,09,173	0-26	H	M	H	**M**
420	**04**,315	0-26	L	M	L	**S**
434	915,**129**	0-26	L	H	L	**M**
436,485,449,462,407	**149**	0-25	L	H	L	**M**
445	**128**,315	0-26	L	H	L	**S**
448	**13**,124	0-26	H	M	H	**M**
454,545,555	**209**	0-26	L	H	L	**S**
456	**09**	0	M	H	H	**M**
470	**199**,13,138,291	0-26	L	H	L	**S**
471	12,**14**,128,124,315	0-25	H	H	L	**M**
484	**918**,128,315	0-26	L	H	L	**S**
491	315,209,**314**,14,138	0-27	H	H	H	**S**
499	**315**,128	0-26	H	H	H	**M**
507,514	209,**314**	0-27	H	H	H	**S**
517	128,**13**	0-26	H	M	H	**M**
519	**124**,314	0-27	M	H	L	**M**
521,536	314,**124**,14	0-26	M	H	L	**M**
523	**209**,315	0-27	L	H	L	**S**
524,594,588	**315**	22-26	H	H	H	**M**
528	**19**	26	H	H	M	**S**
533,590,712,567,498,233,129	**124**	17-25	M	H	L	**M**
539,597,554	315,**12**	17-26	L	H	L	**M**
549	**128**,13	0-26	L	H	L	**S**
552	14,**315**,12	17-26	H	H	H	**M**

Planning Unit Number	Primary SRI Map Units Bold Is Dominant	Ash Soil Depth, Range, Inches	Compaction Hazard	Displacement Hazard	Puddling Hazard	Erosion Hazard
553,636,683	**138**	26-27	M	M	M	**M**
562	**18**,14	25-27	H	H	M	**M**
564	314**,14**,13,315	17-26	H	H	L	**M**
568,570,575,582,704	**14**	25	H	H	L	**M**
576	14,314,**18**	17-27	H	H	M	**M**
584	**315**,14,138,13	17-27	H	H	H	**M**
599	**124**,18	17-27	M	H	L	**M**
601,609	**12**	17	L	H	L	**M**
611,652	**18**,138	17-27	H	H	M	**M**
622	**13**,139	0-26	H	M	H	**M**
627,640	**413**	0-26	H	H	L	**S**
628	**138**,315	22-27	M	M	M	**M**
643	**05**	0	L	H	L	**S**
696	**139**	0-26	L	H	L	**S**
L = Low; M = Moderate H = High S= Severe						

Existing Detrimental Soil Conditions (DSC)

Table H-4 is a detailed listing of soil conditions by activity unit. Units for School Fire Salvage Recovery project were assessed for the extent and degree of previously impacted soil using field observation starting in the fall of 2005, the soil inventory (SRI) with field verification by the Forest Soil Scientist, prior history of activity (including harvest entries), and prior knowledge of the sites from previous assessment by both district and Forest staff.. Observations and ratings were done by field layout crews that had previous experience and training.

Units were grouped into three ranges (0-10; 10-20; >20) of existing detrimental soil condition as a percentage of area based on those field assessments. Additionally, units with prior harvest history and the likelihood for greater existing impacts were evaluated by the Forest Soil Scientist for quantitative assessment relative to Forest Plan standards and guidelines for detrimental soil condition. Units with an asterisk adjacent to the descriptor (low, moderate (mod), high) were field evaluated by the Forest Soil Scientist. Soils have (also) been examined in the field by the Forest Soil Scientist during other project assessments including the Tucannon Watershed Analysis and Lower Tucannon project analysis, monitoring of previous management activities within the area, and for the Burned Area Emergency Response assessment.

Table H-4 Existing Condition of Activity Units

HARVEST UNIT	**PREVIOUS HARVEST ENTRIES entries≥1:ac** balance of acres is 0 entries	**EXISTING SOIL DISTURBANCE CONDITION DESCRIPTION/LEVEL OF CONCERN** * soil scientist field assessment	**EXISTING DETRIMENTAL SOIL CONDITION (DSC) %**
2	1: 19 2: 48 3: 5	mod	10-20
4	1: 7	low	0-10
5	1: 3	low	0-10
6	none	low	0-5
15	1:35	low	0-10
17	2: 3 3: 27	mod	10-20
20	1: 5 2: 18	low	0-10
21	1: 86	low	0-10
22	1: 5	low*	0-10
24	1: 4 2: 2	mod*	10-20
25	1: 15 2: 31 3: 65	mod*	10-20
26	1: 52 2: 2	mod*	10-20
27	2: 31 3: 6	mod*	10-20
29	1: 15 2: 26	mod*	10-20
31	1: 44 2: 6 3: 5	low	0-10
32	1: 3 2: 6	low	0-10
33	1: 31 2: 20	low	0-10
35	1: 1 2: 9 3: 29 4: 12 5: 7	mod*	10-20
40	none	low	0-5

HARVEST UNIT	**PREVIOUS HARVEST ENTRIES entries≥1:ac** balance of acres is 0 entries	**EXISTING SOIL DISTURBANCE CONDITION DESCRIPTION/LEVEL OF CONCERN** * soil scientist field assessment	**EXISTING DETRIMENTAL SOIL CONDITION (DSC) %**
41	1: 40 2: 3 3: 1	low	0-10
44	2: 42 3: 15	mod	10-20
46	1: 113 2: 38 3:2	low	0-10
47	1: 277 2: 60 3: 8	low*	0-10
53	1: 33	low	0-10
54	none	low	0-5
55	1: 2 2: 5 3: 18	mod	10-20
57	1: 29 2: 4	low	0-10
66	1: 28 2: 3 3: 3	low	0-10
70	none	low	0-5
71	1: 3 2: 17 3: 35 4: 6 5: 2	mod	10-20
77	3: 2 4: 16	mod	10-20
81	2:2	mod	10-20
84	1: 26 2: 1	low*	0-10
85	1: 15	low	0-5
86	1: 74 2: 22 3: 1	low*	0-10
88	2:34 3: 4	mod	10-20
94	2: 20 3: 22	mod*	10-20
98	1: 8	low	0-5

HARVEST UNIT	**PREVIOUS HARVEST ENTRIES entries≥1:ac** balance of acres is 0 entries	**EXISTING SOIL DISTURBANCE CONDITION DESCRIPTION/LEVEL OF CONCERN** * soil scientist field assessment	**EXISTING DETRIMENTAL SOIL CONDITION (DSC) %**
	2: 1		
100	1: 16	low	0-5
103	1: 5 2: 28 3: 6	mod	10-20
108	2: 70 3: 3	low	0-10
110	1: 18	low	0-10
111	1: 19 2: 23 3: 3	low	0-5
114	1: 3 2: 10 3: 4	mod*	10-20
115	2:5 3:28	mod*	10-20
118	none	low	0-5
120	1: 11	low	0-5
121	1: 12	low	0-10
122	none	low	0
123	1: 24 2: 68 3:31 4: 16	mod*	5-15
129	2:8	low	0-5
130	1: 7	low	0-5
131	1: 16 2: 4	low	0-10
132	1: 31 2: 1	low	0-5
135	1: 28 2: 101 3: 10	low	0-10
138	1: 5	low	0-5
140	1: 14 2: 46 3: 10 4: 2	low	0-10
142	1: 4	low	0-10

HARVEST UNIT	**PREVIOUS HARVEST ENTRIES entries≥1:ac** balance of acres is 0 entries	**EXISTING SOIL DISTURBANCE CONDITION DESCRIPTION/LEVEL OF CONCERN** * soil scientist field assessment	**EXISTING DETRIMENTAL SOIL CONDITION (DSC) %**
145	1: 29 2: 10 3: 29 4: 19	high	20+
147	1:8	low*	0-10
151	1: 23 2: 1	low	0-10
153	1: 19 2:8	mod	10-20
154	1: 16	low	0-5
155	none	low	0
160	1: 25 2: 2	low	0-10
161	1: 33	low	0-5
165	1: 1	low	0-5
167	2: 44 3:50 4: 18	mod*	10-20
170	1: 8	low	0-5
172	1: 4	low	0-5
175	1: 12	low	0-5
179	1: 24	low	0
182	1: 3	low	0-5
185	1: 83 2: 148 3: 4	low*	5-10
193	3: 6	high	20+
195	1:2 2: 74 3:19	mod*	
199	1: 50 2: 1	low	0-5
200	1:26 2: 2	low	0-5
201	1: 13 2: 3	low	0-5
203	1: 35 2:2	low	0-5
205	1:8	low	0-10
210	1: 12 2:4	low	5-10

HARVEST UNIT	PREVIOUS HARVEST ENTRIES **entries≥1:ac** balance of acres is 0 entries	EXISTING SOIL DISTURBANCE CONDITION DESCRIPTION/LEVEL OF CONCERN * soil scientist field assessment	EXISTING DETRIMENTAL SOIL CONDITION (DSC) %
218	1: 6 2: 4	low	0-5
220	1: 5 2: 3 3: 3	mod	10-20
221	1: 5 2: 7	mod	0 -10
225	1: 3 2:8 3: 2	mod	10-20
232	1: 2 2:2	mod	10-20
233	2: 9	low	0-10
238	1:2 2:9	low	0-10
240	1: 2 2: 5 3: 19	mod	10-20
241	1: 16 2: 8 3: 2	low	0-5
248	1: 65 2: 41 3: 14 4: 2	low	0-10
249	1: 1	low	0-5
250	2: 13 3: 13 4: 5	low	0-10
253	none	low	0
254	2: 13 3: 2	low	0-10
262	1: 6 2: 34	low	0-10
263	2: 6 3: 4	low	0-10
267	1: 19 2: 6	low	0-10
276	1: 7 2: 58 3:8	mod*	10-20

HARVEST UNIT	**PREVIOUS HARVEST ENTRIES entries≥1:ac** balance of acres is 0 entries	**EXISTING SOIL DISTURBANCE CONDITION DESCRIPTION/LEVEL OF CONCERN** * soil scientist field assessment	**EXISTING DETRIMENTAL SOIL CONDITION (DSC) %**
280	1: 5 2: 11 3: 4	mod*	5-10
284	none	low	0
286	1: 17	low	0-10
287	1: 3 2: 29	low*	5-10
291	2: 8 3:3	low	0-10
297	2: 3	low	0-10
300	1: 2 2: 11 3: 3	low	0-10
304	1: 50 2: 22 3: 6	low	0-10
305	1: 5 2: 14	low	0-10
308	1: 6 2:3	low	0-10
319	3: 5	high	20+
320	1: 1 2: 24 3:11	mod	10-20
322	1: 11	low	0-10
323	1: 35 2: 2	low	0-10
324	1: 2 2: 9 3: 21 4: 5	low	0-10
326	1: 12 2: 8	low	0-10
327	2: 7 3: 29	mod	10-20
330	1: 3 2: 10	low	0-10
334	1: 26	low	0-5
335	1: 5	low	0-5
341	1: 2 2: 14	low	0-10

HARVEST UNIT	PREVIOUS HARVEST ENTRIES **entries≥1:ac** balance of acres is 0 entries	EXISTING SOIL DISTURBANCE CONDITION DESCRIPTION/LEVEL OF CONCERN * soil scientist field assessment	EXISTING DETRIMENTAL SOIL CONDITION (DSC) %
	3: 16		
342	none	low	0-5
343	1: 2	low	0-5
346	1: 7 2: 6 3: 1	low	0-10
352	1: 11 2: 35 3: 3	mod	0-10
353	none	low	0-10
355	none	low	0-5
358	2: 12 3: 3	mod	10-20
362	1: 26 2: 8	mod	0-10
365	1: 7 2: 9 3: 10	low	0-5
367	none	low	0-5
370	none	low	0-5
379	1: 10	low*	5-10
380	1: 23	low	0-10
387	1: 12	low	0-10
404	1: 3	low	0-10
406	1: 2	mod	10-20
407	1: 4	low	0-10
409	none	low	0-5
413	1: 3	low	0-10
416	1: 17	low	0-5
417	none	low	0-5
418	1: 15 2: 4	low	0-10
420	1: 11 2: 4	low	0-10
421	2: 1 3: 2	mod	10-20
423	none	low	0-5
424	1: 2 2: 2 3: 5	high	20+
425	none	low	0-5

HARVEST UNIT	**PREVIOUS HARVEST ENTRIES entries≥1:ac** balance of acres is 0 entries	**EXISTING SOIL DISTURBANCE CONDITION DESCRIPTION/LEVEL OF CONCERN** * soil scientist field assessment	**EXISTING DETRIMENTAL SOIL CONDITION (DSC) %**
434	none	low	0-5
436	none	low	0-5
438	1: 5	low	0-10
439	1: 6	low	0-5
442	1: 9	low	0-5
443	1: 2	low	0-10
445	1: 29 2: 3 3: 3	low	0-10
446	1: 8	low	0-10
448	1: 8 2: 6	mod*	10-20
453	1: 4	low	0-10
454	1: 47	low	0-10
456	1: 1	low	0-10
459	1: 3	low	0-10
462	none	low	0-5
464	1: 9 2: 4	low	0-10
470	1: 3 2: 5	low*	5-10
471	1: 8	low	0-10
474	1: 4 2: 8	mod	10-20
478	none	low	0-5
484	none	low	0-5
485	1: 4	low	0-10
486	1: 12	low	0-10
489	1: 46	low	0-10
491	1: 57 2: 12	low*	3-5
498	none	low*	2-5
499	1: 1	low	0-5
505	none	low	0-5
507	1: 21	low	0-10
514	1: 3	low	0-10
517	1: 1 2: 8 3: 7	high*	8-12
519	none	low	0-5

HARVEST UNIT	**PREVIOUS HARVEST ENTRIES entries≥1:ac** balance of acres is 0 entries	**EXISTING SOIL DISTURBANCE CONDITION DESCRIPTION/LEVEL OF CONCERN** * soil scientist field assessment	**EXISTING DETRIMENTAL SOIL CONDITION (DSC) %**
521	1: 17	low*	0-5
523	none	low	0-5
524	1: 7	low	0-10
527	1: 11	low	0-10
528	1: 13	low*	2-10
533	none	low	0-5
536	1: 43 2: 7	low	0-10
539	1: 2 2: 1	low	0-10
545	1: 11 2: 16	mod	10-20
549	1: 9 2: 8 3: 3	mod*	3-5
552	1: 18 2: 25	mod*	3-5
553	1: 46 2: 22	low*	5-10
554	none	low	0-5
555	none	low	0-5
562	1: 8	low	0-10
564	1: 11 2: 12	low	0-10
567	1: 8	low	0-10
568	1: 5 2: 5	low	0-10
570	2: 4	mod	10-20
575	1: 12	low	0-10
576	1: 2	low	0-10
582	1: 8	low	0-10
584	1: 12	low*	2-10
588	1: 1 2: 1	low	0-10
590	1: 12	low*	2-5
594	1: 1 2: 21	low	0-10
597	1: 31 2: 4	low	0-5
599	1: 12	low	0-10
601	1: 6	low	0-10

HARVEST UNIT	PREVIOUS HARVEST ENTRIES **entries≥1:ac** balance of acres is 0 entries	EXISTING SOIL DISTURBANCE CONDITION DESCRIPTION/LEVEL OF CONCERN * soil scientist field assessment	EXISTING DETRIMENTAL SOIL CONDITION (DSC) %
609	1: 7	low	0-10
611	1: 35	low*	2-10
615	1: 6 2: 2	low*	3-5
622	1: 15 2: 60 3: 1	low	0-10
627	1: 11	low	0-10
628	1: 13	low	0-10
636	1: 18	low	0-10
640	1: 2	low	0-10
643	none	low	0-5
652	1: 11	low	0-10
666	1: 11	low	0-10
683	none	low	0-5
696	none	low*	0-5
701	none	low	0-5
704	1: 3	low	0-10
711	none	low	0-5
712	none	low	2-5

Assessment Methodology – Environmental Consequences

Effects due to salvage and associated operations were assessed on a unit basis. Direct effects estimates included observations from previous monitoring of both green and fire salvage (primarily Tower and Bull Springs, Wheeler Point, and Willow Springs which is adjacent to the School Fire) operations on the Forest. Estimate of DSC increases from activity were increased 1 to 2 percent to account for lack of surface cover and anticipated higher rates of compaction effects without the down wood component typical of green operations. Operational rehabilitation mitigation/design criteria *were* factored into overall DSC estimates expected at the end of operations. Units with previous higher (10 percent or more) existing (detrimental) soil conditions would be expected to have less increases from proposed actions due to reuse of trails and landings. This was not factored into overall estimates but would tend to reduce cumulative effects of additional soil disturbance.

New temporary roads were factored by the unit(s) that they are accessing. They will be obliterated as part of the project design and placed back into productive capacity in the long term, but were factored in the detrimental soil condition tabulation for immediate post-project conditions. Calculated in acres, most are quite small (less than 1 acre) with little to no effect on overall unit percentages in most units. Use of existing unclassified/unauthorized roads will facilitate rehabilitation on those sites, improving the productive capacity from present condition. In total (about 25 acres), they represent restoration efforts to improve heavily disturbed sites and increase productivity in the area. Additional rehabilitation efforts under consideration for the area (see Reasonably Foreseeable Actions – Chapter 3) will further improve on current conditions as they occur.

It was evident during field assessments that some of the existing condition estimates will overstate the existing DSC in some cases. In some cases this is due to an existing access (non-system) road or skid trail in a small unit, thus increasing the percentage of the area impacted. In other cases, small areas of large units had high disturbance levels that were (then) assigned to the unit as a whole due to placing in the percentage groupings, which will tend to indicate larger acreages of DSC than actually occur in those units. A primary intent of Forest Plan standard and guidelines for the DSC is to inform managers of areas with potential and need for rehabilitation, so while overestimating in these cases, the relatively higher numbers (percentage or acres) indicate areas where rehabilitation opportunity exists.

The tabulation for Alternative C is essentially the same as shown in Table H-5, except acreages (and subsequent percentage values) were adjusted for units where they changed from the Proposed Action, Alternative B. This has the effect of changes the percentage of DSC for those units where portions are not included in Alternative C. For example, unit 145 has an upper (gently sloping) portion which includes an existing unclassified/unauthorized road. This road and multiple (ground-based) entries combine to indicate higher residual detrimental soil condition. The portion included in Alternative C is the steeper portion with little to no detrimental condition. In either action alternative, the existing road (and new temporary road) would be rehabilitated resulting in a net improvement of productive area.

Table H-5 shows the acres of DSC from cumulative effects of existing and proposed actions, including mitigation/rehabilitation. Temporary roads and rehabilitation of existing non-system roads are factored in as well.

Table H-5- Cumulative Detrimental Soil Condition - Alternative B

Alternative B Unit	Acres Total	Acres DSC <25%	New Temporary Road/Oblit.	Road Rehab (reduction)	Acres DSC >Road Adj	% DSC Cumulative
2	72.7	11.3			11	15
4	7.8	0.8			1	10
5	28.8	1.5			2	5
6	10.9	0.3			0	3
15	48.8	3.3			3	7
17	31	4.0			4	13
20	28.9	2.0			2	7
21	279.5	16.8	0.4		17	6
22	10	0.9			1	9
24	7.3	1.1			1	15
25	113	17.9			18	16
26	55.9	8.4			8	15
27	38.4	6.4			6	17
29	41.5	6.5			7	16
31	56.2	2.9		0.34	3	5
32	9.5	0.6			1	6
33	77.9	5.9			6	8
35	57.9	8.7			9	15
40	76.6	4.1	0.03		4	5

Alternative B Unit	Acres Total	Acres DSC <25%	New Temporary Road/Oblit.	Road Rehab (reduction)	Acres DSC >Road Adj	% DSC Cumulative
41	77.8	3.5			4	5
44	58	9.2	0.01		9	16
46	161.6	12.2	1.1		13	8
47	436.1	19.7	0.2	0.27	19	4
53	39.1	2.1			2	5
54	7.2	0.2			0	3
55	24.9	3.9			4	16
57	34.8	2.3			2	7
66	34	2.0			2	6
70	64.6	2.0			2	3
71	62.4	8.0			8	13
77	17.7	2.8			3	16
81	2.5	0.4			0	15
84	28.2	1.9			2	7
85	83.9	5.7			6	7
86	120.6	9.1			9	8
88	39	6.2			6	16
94	42.1	7.0			7	17
98	9.4	0.6		0.2	0	4
100	26.9	1.2			1	4
103	39.4	5.9			6	15
108	73.1	5.5	1.2		6	8
110	20.3	1.1			1	5
111	44.7	3.0	0.4		3	7
114	17.3	2.7			3	16
115	33.2	5.5	0.03		5	16
118	3.3	0.1			0	2
120	12	0.8	0.04		1	6
121	71.5	3.8			4	5
122	31.5	1.2			1	4
123	139.4	15.0		1.93	13	9
129	7.6	0.5			0	6
130	8.8	0.5		0.39	0	1
131	29.8	2.5			2	8
132	90	5.4			5	6
135	148.6	11.2		0.14	11	7
138	4.6	0.2			0	5
140	71.4	4.3		0.82	3	5
142	6.3	0.5		0.6	0	0
145	88.6	18.6	0.9	1	18	20
147	8.3	0.8			1	9
151	37.4	2.0			2	5
153	28.6	3.9		0.91	3	10
154	20.4	1.1			1	5

Alternative B Unit	Acres Total	Acres DSC <25%	New Temporary Road/Oblit.	Road Rehab (reduction)	Acres DSC >Road Adj	% DSC Cumulative
155	4.2	0.2			0	4
160	61.5	4.1		0.32	4	6
161	46.1	2.4	0.2		2	5
165	8.5	0.7			1	8
167	111.6	17.6			18	16
170	8.2	0.5			1	6
172	16.5	0.8			1	5
175	25.9	2.3			2	9
179	96	5.0			5	5
182	4.1	0.2			0	5
185	235.7	23.0			23	10
193	9.1	2.0		0.4	2	17
195	95.2	8.6			9	9
199	190.8	8.6			9	5
200	42.5	2.6			3	6
201	14.9	0.6			1	4
203	81.6	4.3	0.2		4	5
205	12.4	1.1			1	8
210	16	1.2			1	8
218	43.9	2.6			3	6
220	15.3	2.4			2	16
221	15.5	2.1			2	14
225	13.5	2.0			2	14
232	4.3	0.7			1	16
233	9	1.4			1	15
238	11.9	1.6	0.2		2	13
240	26	3.9			4	15
241	197.1	8.9			9	4
248	120.7	6.4	.05		6	5
249	11.8	0.5			0	4
250	33	4.4	0.14	0.99	3	10
253	20.7	0.8			1	4
254	14.8	1.1		1.6	0	0
262	43.1	2.6	1.09	0.01	4	9
263	10.2	1.4	0.6		1.6	16
267	25.6	1.4			1	5
276	74.2	11.1			11	15
280	19.9	2.0	1.4		3	15
284	3.3	0.2			0	5
286	46.5	2.1			2	5
287	32.4	2.4		0.95	1	4
291	11.8	0.6			1	5
297	3.2	0.2		0.05	0	5
298	1.1	0.0			0	3

Alternative B Unit	Acres Total	Acres DSC <25%	New Temporary Road/Oblit.	Road Rehab (reduction)	Acres DSC >Road Adj	% DSC Cumulative
300	16.1	0.8		0.08	1	5
304	76.4	4.1			4	5
305	18.7	1.0		0.52	0	2
308	8.8	1.4			1	16
319	6.5	1.4	.2	0.16	1	18
320	35.7	4.8	.01	0.37	4	12
322	20.6	1.7	0.3		2	8
323	58.4	3.5	0.2		4	6
324	36.2	4.9			5	13
326	19.7	1.1			1	5
327	35.6	5.3			5	15
330	12.6	0.7		0.79	0	0
334	86.6	3.2			3	4
335	5.9	0.2			0	4
341	31.9	4.8	0.6		6	19
342	14	0.5			1	4
343	89.2	3.4			3	4
346	14.8	1.8			2	12
352	49.7	7.4	0.2		7	15
353	45.7	2.8			3	6
355	11.3	0.4			0	3
358	16.5	2.3			2	14
362	75.4	11.3	.01	1.1	10	14
365	27.5	3.8			4	14
367	10.6	0.3			0	3
370	63	2.4			2	4
379	149.7	11.3			11	8
380	25.8	2.1	0.2		2	8
387	55.3	2.9			3	5
404	3.8	0.2			0	6
406	2.6	0.5			0	17
407	8.4	0.8			1	9
409	4.7	0.2			0	5
413	3.9	0.3	.09		0	8
416	58.3	2.2			2	4
417	15.5	0.7			1	4
418	24.6	1.9			2	8
420	15.2	1.1		0.2	1	6
421	3.9	0.5		0.09	0	9
423	8.6	0.3			0	3
424	9.1	2.2		0.461	2	19
425	15.3	0.5			0	3
434	48.7	1.8			2	4
436	10	0.3			0	3

Alternative B Unit	Acres Total	Acres DSC <25%	New Temporary Road/Oblit.	Road Rehab (reduction)	Acres DSC >Road Adj	% DSC Cumulative
438	5.8	0.5			0	8
439	16.9	0.5			1	3
442	136.9	5.2			5	4
443	3.8	0.2			0	6
445	43.4	2.6		0.01	3	6
446	19.3	1.1			1	5
448	15.2	2.4			2	16
453	26.7	1.4			1	5
454	91.5	8.3		0.06	8	9
456	1.8	0.2			0	8
459	22.5	1.1		0.01	1	5
462	4	0.2			0	4
464	13	0.8			1	6
470	105.1	9.5			9	9
471	203.4	12.2		0.49	12	6
474	13.9	2.2			2	16
478	16.7	0.6			1	4
484	30.9	1.2			1	4
485	4.9	0.3		0.21	0	2
486	54.9	2.9			3	5
489	58.1	4.4			4	7
491	236.6	16.0		0.88	15	6
498	13.2	1.0			1	7
499	17.2	0.7			1	4
505	7.9	0.3			0	4
507	24	1.7			2	7
514	53.5	2.9			3	5
517	16.1	2.0			2	12
519	67	2.6			3	4
521	119.7	6.3			6	5
523	19	0.6			1	3
524	10	0.6			1	6
527	15.3	0.8			1	5
528	13.1	1.1			1	8
533	13.4	0.5			1	4
536	79.4	5.4		0.28	5	6
539	24.8	1.3			1	5
545	40.7	6.1		0.1	6	1
549	21.1	1.4			1	7
552	58.3	3.5			4	6
553	101.9	9.2			9	9
554	24.6	0.9			1	4
555	4.9	0.2			0	3
562	17.4	1.4			1	8

Alternative B Unit	Acres Total	Acres DSC <25%	New Temporary Road/Oblit.	Road Rehab (reduction)	Acres DSC >Road Adj	% DSC Cumulative
564	83	6.8		0.16	7	8
567	14.6	1.2			1	8
568	9.8	1.4			1	14
570	4.9	0.8			1	15
575	14.3	1.2			1	8
576	62.1	4.7		0.04	5	7
582	15.6	1.3			1	8
584	65.2	5.4			5	8
588	19.2	1.0			1	5
590	19.8	1.1			1	5
594	23.1	1.2		0.01	1	5
597	70.5	6.4		0.6	6	8
599	12.4	1.1			1	8
601	6.1	0.4			0	6
609	8.2	0.7	0.4		1	8
611	115.4	10.4			10	9
615	10	0.8			1	8
622	78	6.5		0.08	6	8
627	11.3	0.9			1	8
628	106.5	8.0			8	8
636	19.1	1.6		0.21	1	7
640	2.9	0.2			0	8
643	2.4	0.2			0	6
652	51.4	4.3	0.03		4	8
666	11.7	0.9	0.05	0.42	0	4
683	2	0.1			0	4
696	0.9	0.1			0	8
701	0.1	0.0			0	0
704	3.7	0.3			0	8
711	1.9	0.1			0	4
712	3.5	0.2			0	6
Totals	**9437.3**				**726**	

Burn Severity by Harvest Unit

Table H-6 lists the harvest units from the Proposed Action (Alternative B) with a composite rating for burn severity. Many units had a range of burn severity ratings (from the BAER process), requiring a compilation process to determine a single rating by unit. These ratings were then used in the effects analysis.

Table H-6 Harvest Unit Burn Severity – Alternative B

HARVEST UNIT	BURN SEVERITY COMPOSITE
2	low
4	mod
5	mod
6	mod
15	high
17	mod
20	high
21	high
22	mod
24	low
25	low
26	mod
27	mod
29	low
31	low
32	mod
33	mod
35	low
40	low
41	mod
44	low
46	mod
47	low
53	high
54	mod
55	low
57	high
66	mod
70	mod
71	low
77	low
81	mod
84	mod
85	mod
86	low
88	low
94	mod
98	mod
100	mod
103	low
108	low
110	low

HARVEST UNIT	BURN SEVERITY COMPOSITE
111	mod
114	mod
115	mod
118	mod
120	mod
121	high
122	mod
123	low
129	mod
130	low
131	low
132	low
135	low
138	low
140	mod
142	mod
145	low
147	mod
151	low
153	mod
154	low
155	mod
160	mod
161	low
165	low
167	low
170	mod
172	high
175	mod
179	mod
182	mod
185	low
193	low
195	low
199	mod
200	mod
201	mod
203	low
205	low
210	mod
218	low
220	low
221	mod
225	mod
232	low

HARVEST UNIT	BURN SEVERITY COMPOSITE
233	low
238	mod
240	low
241	mod
248	low
249	low
250	mod
253	mod
254	low
262	mod
263	mod
267	low
276	low
280	low
284	mod
286	mod
287	mod
291	low
297	mod
300	low
304	low
305	low
308	low
319	mod
320	mod
322	low
323	low
324	mod
326	low
327	mod
330	low
334	mod
335	low
341	mod
342	mod
343	mod
346	high
352	low
353	mod
355	mod
358	mod
362	low
365	mod
367	mod
370	mod

HARVEST UNIT	BURN SEVERITY COMPOSITE
379	mod
380	low
387	mod
404	low
406	low
407	mod
409	mod
413	low
416	low
417	mod
418	low
420	low
421	low
423	low
424	mod
425	mod
434	low
436	high
438	low
439	low
442	mod
443	low
445	mod
446	low
448	low
453	mod
454	mod
456	low
459	mod
462	mod
464	mod
470	low
471	mod
474	low
478	high
484	low
485	mod
486	low
489	low
491	low
498	mod
499	mod
505	low
507	mod
514	low

HARVEST UNIT	BURN SEVERITY COMPOSITE
517	mod
519	low
521	low
523	mod
524	low
527	low
528	low
533	mod
536	low
539	low
545	mod
549	mod
552	low
553	low
554	low
555	low
562	low
564	low
567	mod
568	low
570	low
575	low
576	low
582	low
584	low
588	low
590	low
594	low
597	low
599	low
601	low
609	low
611	low
615	low
622	low
627	low
628	low
636	low
640	low
643	low
652	low
666	high
683	low
696	low
701	low

HARVEST UNIT	BURN SEVERITY COMPOSITE
704	low
711	low
712	low

Effective Ground Cover

The Umatilla Forest Plan includes standards and guidelines for effective ground cover remaining after ground disturbing activity based on erosion hazard.

Maintain minimum percent effective ground cover after cessation of any soil-disturbing activity as follows:

Erosion Hazard Class	Minimum % Effective Ground Cover	
	1st Year	2nd Year
Low (Very Slight, Slight)	20-30	30-40
Medium (Moderate)	30-45	40-60
High (Severe)	45-60	60-75
Very High (Very Severe)	60-75	75-90

These standards and guidelines are included in following table in the column with the heading "REQ MIN EFF CVR 1st YR". This is short for Required Minimum Effective Ground Cover in the 1st Year (after activity) as listed in the Plan. Table H-7 displays an example of the calculations included to determine effective ground cover after the first year of activity using the first six harvest units proposed.

Table H-7- Effective Ground Cover - Select Units

Unit	**Burn Severity Composite** (indicator of effective ground cover)	**Harvest And Yarding %**	**Fuels Treatment Site Prep+**	**Temp Road+**	**Total Bare Ground %**	**Total Effective Ground Cover 1st Yr > Activity**	**Erosion Hazard Rating**	**Req Min Eff Cvr 1st Yr**
2	low	rdx 0-2	2-5	-	2-7	93-98	M	30-45
4	mod	rdx 1-4	0-2	-	1-6	94-99	S	60-75
5	mod	inc 0	-	-	0	100	S	60-75
6	mod	inc 0	-	-	0	100	M	30-45
15	high	rdx 1-4	0-2	-	1-6	94-99	M	30-45
17	mod	inc 0	0-2	-	0-2	98-100	S	60-75

rdx = reduction
inc = increase
Forwarder / Low= 0-2
Forwarder / Mod/High= 2-5
Skyline, all severity = 1-4
Helicopter, all severity = <1, use 0

S (Severe) uses minimum Plan Standards &Guides for Very Severe Erosion Hazard

Appendix I

Wepp Modeling

School Fire

Salvage Recovery Project

APPENDIX I

School Fire Salvage Erosion and Sediment Modeling

Background

The Water Erosion Prediction Project (WEPP) model was used to estimate erosion and sediment yield for purposes of evaluating fire effects, comparing management activities, and estimating cumulative effects. WEPP is a continuous simulation, process-based model that incorporates climate, soil, ground cover, and topographic conditions. WEPP interfaces were specifically designed for forest applications by the Rocky Mountain Research Station, and are commonly used for project analysis (Neary et al. 2005).

As with any model, assumptions for model runs and applicability of results need to be documented and explicit. Modeling assumptions are summarized in this report and documented in project files (Umatilla National Forest, Supervisor's Office, Pendleton, Oregon). Model results should be considered estimates only, and used as relative values for purposes of comparing fire effects and management scenarios. Because of natural variability in climate, soil types, cover, and other factors, and assumptions made to simplify modeling, results are at best plus or minus 50 percent (Elliot and Hall 1999, Elliot et al. 2000).

Accurately predicting erosion is highly complex and subject to large error terms from various sources because of highly complex processes and uncertainty in climate prediction. Every effort was made to arrive at reasonable estimates, including use of local data on climate, fire severity, slope, and cover conditions. Predicted erosion may over or underestimate actual erosion; however, model results include probabilities of exceedances. These values are helpful in determining how likely actual erosion would be greater or less than the predicted value.

The analysis was conducted at multiple spatial and temporal scales, using varying conditions representative of conditions pre and post-fire. Post-fire recovery rates were approximated using model treatment and calibration options. Erosion modeling results were compared with measured data to assure reasonable ranges of estimates. Rates of erosion represent hillslope or road erosion produced from these sources. Sediment delivery to streams is controlled by the variable sources of erosion, and complex storage and routing processes (discussed under Process considerations, this document).

WEPP applications used in the analysis were:

- GeoWEPP, used to model catchment-scale fire effects and erosion probabilities with and without BAER stabilization treatments (Elliot et al. 2005);
- Disturbed WEPP and Road WEPP interfaces, used to model hillslope, skid trail, and road erosion rates pre-fire, post-fire, and post activity;
- FuME interface used to compare the range and frequency of erosion and sediment under different management conditions to display rates from average natural background forested conditions, compared to wildfire, and other management activities.

The GeoWEPP model was used during the BAER evaluation to calculate erosion potential probabilities with and without stabilization treatment (Elliot et al. 2005). Because erosion is closely linked to future climate conditions, and climate is highly variable, the use of probabilities (or chance) allows for consideration of different possibilities (normal vs. more extreme conditions). A total of ten catchments were analyzed. Hillslope erosion rates for a 10 percent exceedance (or 90 percent chance value would be less) in the first year after the fire ranged from 6 to 14 tons/acre. "Average" sediment delivery from catchments ranged from 0.09 to 56 tons/acre. GeoWEPP assumptions were documented in Elliot et al (2005).

The Disturbed WEPP model was used to characterize the affected environment pre-fire and post-fire years 1-5[1] with and without management activities. The analysis compared pre-fire (unburned vegetation conditions), low and high fire severity, and activity effects. Road and skid trail contributions were also estimated. Results are averages, in tons/ac/yr, and percent increase as a result of fire and existing disturbances (roads). Activities were assumed to occur over three years, years 2-4 after the fire.

FuME (Fuel Management Erosion Analysis) was used to compare the amount of erosion and sediment produced from different sources to show differences in amount and timing of erosion from undisturbed forest compared to wildfire and management activities (Table 3-13 in Affected Environment). FuME allows managers to compare potential rates of hillslope erosion and sediment from different types of treatments.

Model Assumptions

Disturbed, Road, and FuME WEPP interfaces were used for evaluating hillslope and road erosion rates. Climate was modified for the project area based on a nearby station (Pomeroy, WA), adjusted for elevation and location. Soil textures were modeled as silt loam. Rock content was assumed to be 10 percent. Slope lengths and gradients were varied for each simulation.

Hillslope erosion

Percent cover was varied depending on fire severity, recovery, and activity type. Erosion factors were developed for multiple slope and fire severity categories. Activity rates were estimated by adjusting treatment options and percent cover in the model. Three modeling runs (approximations) were used to estimate hillslope erosion.

First Approximation – Initial model runs were used to estimate the probable range of hillslope erosion in the analysis area pre-fire and post-fire years 1-3. Ten to twenty representative hillslopes were analyzed in each of the four main subwatersheds in the analysis area. Topography (slope segment lengths and gradients) were derived from a digital elevation model. Each run simulated 30 years of climatic events. Vegetation conditions were selected to represent conditions pre- and post-fire. Pre-fire ground cover was assumed to vary by vegetation type (short grass to 20-year old trees), and aspect, with cover values ranging from 40-100 percent. Post-fire conditions were modeled as unburned (pre-fire vegetation), low or high fire severity (using BAER fire severity maps). Fire severity classes 1-3 (unburned to moderate) were considered low, class 4 (high) was considered high for initial modeling purposes. Cover input values were then adjusted based on aspect and fire severity, (for example, on north aspect slopes, cover was increased, and on slopes with moderate fire severity, cover values were decreased).

Second Approximation – Total hillslope erosion from the four main subwatersheds and the entire analysis area pre-fire, and post-fire years 1-3 was estimated using multiple slope and fire severity categories, with Year 1 erosion estimated by acres within each category (Table I-1). Year 2 moderate and high severity acres were adjusted to low fire severity rates, and acres in low fire severity were adjusted to unburned rates. Erosion estimates for pre-fire and Year 3 were based on category 1 (unburned or very low).

[1] Year 1 is Aug. 05- Jul. '06, Year 2 is Aug. 06-Jul. '07, and so on

Table I-1 Hillslope Erosion Factors (tons)

Fire Severity Class	Slope Category							
	0-10%		11-30%		31-60%		>60%	
	forested	grass	forested	grass	forested	grass	forested	grass
1 unburned or very low	0	0.2	0	1.3	0	2.6	0	3.5
2 low	0.4	0.4	1.2	2.1	2.5	2.5	5.7	5.7
3 moderate	1.1	1.1	5.6	5.6	10.4	10.4	13.5	13.5
4 high	2.5	2.5	10.7	10.7	23.4	23.4	29.2	29.2

Third Approximation – Activity effects were estimated by adjusting cover factors for treatment types using the following assumptions: yarding system effects on cover would be positive (forwarder – logging slash moved onto trails), neutral (helicopter – no change, i.e., no yarding), or negative (skyline – due to soil exposure on trails). Site prep and fuels treatment would change cover as follows: lop and scatter (L&S) alone would increase ground cover because of dispersal of tops and limbs; broadcast (BC) and jackpot burning would reduce cover. Cover factors were then adjusted to simulate positive and negative effects on erosion rates (Table I-2 and I-3). Activity and no activity rates were applied to the entire analysis area for Years 2-4 using simplified slope-severity-recovery categories.

Harvest activity effects were modeled over two years, beginning in Year 2 with harvest of high mortality acres (>90%), and harvest of the remaining acres in Year 3. Completion of fuels treatments would likely occur in Year 4 but effects were assumed to be so small as to be no different than background. Activity effects would occur in a changing background; differences in activity and no activity effects in Years 2 and 3 were approximated by applying erosion factors developed to simulate post-fire recovery.

Table I-2 Salvage Harvest Activity and Relative Effect on Cover Factors

Yarding system	Site Prep	Pr_Fuel	Sec_Fuel (Year 3 only)	Cover Factor - Yarding	Cover Factor- Prep/fuel	Combined Effect on Cover Factors
Forwarder		L&S		positive	positive	positive
Forwarder		L&S	Jackpot	positive	negative-Yr3	positive/neutral
Forwarder	slash/BC	L&S		positive	negative	neutral
Helicopter		L&S		neutral	positive	positive
Helicopter		L&S	Jackpot	neutral	negative-Yr 3	positive/neutral
Helicopter	slash/BC	L&S		neutral	negative	negative
Skyline		L&S		negative	positive	neutral
Skyline		L&S	Jackpot	negative	negative-Yr 3	neutral
Skyline	slash/BC	L&S		negative	negative	negative
Skyline		YTA		negative	neutral	negative

Table I-3 Erosion Rates for Activity* and No Activity (in tons)

All Analysis Area	Slope Category	Activity effect	Erosion rate Year 2	Erosion rate Year 3
TREAT	Slope<30	neutral	3.716	0.08
	Slope <30	negative	3.916	0.178
	Slope <30	positive	3.026	0.027
	Slope >30	neutral	5.367	0.178
	Slope >30	negative	5.638	0.378
	Slope >30	positive	4.379	0.076
NO TREAT	Slope <30	High Severity	3.716	0.757
	Slope <30	Low Severity	0.178	0.08
	Slope >30	High Severity	5.367	1.397
	Slope >30	Low Severity	0.378	0.178

Assumes Treat Year 2 = all high severity acres, Year 3 = all low severity acres (recovered)

Road Erosion

Design factors were adjusted to approximate pre and post-fire conditions, traffic use, and mitigation as follows:

First year post-fire erosion rates were modeled by road category using the following assumptions: all roads were modeled as 13-foot width, bare and high traffic to simulate first year fire effects.
Upland open roads, insloped and bare, native surface high traffic, 6 percent slope.
Upland closed road, outsloped, rutted and bare, native surface high traffic, 6 percent slope,
Riparian open roads, insloped and bare, native surface high traffic, 4 percent slope,
Riparian closed road, outsloped, rutted and bare, native surface high traffic, 4 percent slope,
Buffers were modeled as 100-foot and 50-foot for upland and riparian roads, respectively.

Temporary/unauthorized roads were modeled as 10-foot width, outsloped, rutted and bare, native surface high traffic, 6 percent slope.

Previously decommissioned roads were modeled to show pre-fire reduction in sediment contribution. This contribution was slightly reduced the first year after the fire, then resumes to pre-fire levels. New decommissioning was modeled in Years 4 and 5 to show reduction.

Years 2 and 3 post-fire were adjusted to account for recovery and activities as follows:
Open roads were modeled with bare (activity) or vegetated (no activity) design. In Year 3, gravel surface rates were incorporated. No activity closed roads were modeled as no traffic, with half of the roads modeled as unrutted. These conditions were assumed to represent pre-fire rates by Year 3 (Table I-4).

Temporary/Unauthorized roads were modeled as 6%, outsloped, rutted, native surface and low traffic for no activity. These conditions were considered representative of pre-fire conditions. Activity effects were determined by changing traffic level.

Salvage harvest and related road activities were assumed to occur Years 2-5, with all roads used for harvest in Years 2 and 3, limited use in Year 4 with partial road decommissioning, and completion of decommissioning in Year 5.

Values presented are estimates of average first, second, and third year post-fire erosion rates with and without use/treatment. Third year no activity rates were assumed to represent conditions pre-fire.

Erosion estimates represent sediment leaving the roadway and do not represent sediment delivery to streams; however, many road segments are connected to streams by ditches, drainage outlets and proximity, so sediment delivery is assumed to be high especially in the first post-fire years and with activity.

Table I-4 Road category erosion rates pre and post-fire, with and without activity (t/ac)

Road Category	Year 1	Year 2		Year 3*	
	No Activity	No Activity	Activity	No Activity	Activity
CLOSED	5.5	1.9	3.7	0.8	3.7
OPEN	7.3	3.1	5.2	2.4	5.2
DECOMMISSION	-1.2	-1.7	3.7	-1.7	3.7
TEMPORARY Road Not Existing	NA	NA	3.7	NA	3.7
TEMPORARY Road Existing	5.3	1.7	3.7	1.7	3.7

*Prefire rates same as Year 3 No Activity, NA = not applicable

Erosion and Sediment Process Considerations

FS WEPP Disturbed WEPP, Roads, and FuME interfaces are hillslope scale models. Applying hillslope estimates across landscapes and watersheds generalizes actual rates of erosion that may occur. Erosion rates are expected to be highest in the first few years after the fire; however, all hillslopes will not deliver sediment to streams at 100 percent. Only severely burned slopes directly connected to the stream network have a high likelihood of direct delivery. Total estimated erosion from the fire will take decades to route through the watershed.

There are several problems with linking downstream sediment yields to upstream rates of erosion, including the extent and location of sediment sources, relief and slope characteristics, soil type, and vegetation cover (Walling 1988). The sediment budget is one approach to conceptualizing sediment delivery from a watershed. Sediment budgets identify the various sediment sources in a watershed, and sediment mobilized from these sources is routed to and through the channel system by considering various sinks, or storage sites. Sediment sources modeled in the analysis area were hillslopes and roads, considered dominant sources. Other sources not modeled include landslides and channel erosion. Sediment sinks in the analysis area include colluvial deposits on hillslopes and in upland valleys, ephemeral channels, tributary and main valleys, and channel storage.

Total first year hillslope erosion production estimated from School Fire analysis area using the WEPP model was 254,262 tons (in the four main subwatersheds). Distributing this on a unit-area basis equates to 5515 tons/mi^2. This mass of sediment will eventually move through the watershed. Assuming a 40 year interval between large wildfires, this would equate to an average annual sediment yield of 138 t/mi^2/yr. This value is comparable to measured suspended sediment yields from the Umatilla River at the Forest boundary (a watershed of similar size and geology) which ranged from 33 tons/mi^2 to 197 tons/mi^2, over a 10 year period (Harris et al. 1999).

Comparable rates of measured hillslope erosion ranged from 85 tons/ac in the first year, 5 tons/ac, in the second year, and 2.24 tons/ac in the third year after a wildfire in the nearby Imnaha drainage (Robichaud and Brown (1999).

Suspended sediment monitoring data from the Tucannon at Panjab and the Tucannon at the Forest boundary may be indicative of channel and valley storage processes in the Tucannon watershed. Higher sediment concentrations were noted at the upper site which is largely a wilderness watershed. The valley and channel gradient declines downstream and, at the Forest boundary, measured sediment concentrations were generally lower, potentially due to channel and floodplain storage within this reach of river (McCown 2002).

Appendix J

Forest Plan Amendments

School Fire

Salvage Recovery Project

APPENDIX J

Lynx and Old Growth Forest Plan Amendments

<u>Lynx Amendment</u>

The following are lynx management objectives, standards, and guidelines incorporated into the Land and Resource Management Plan, Umatilla National Forest (1990) for the site-specific project called School Fire Salvage Recovery Project. The standards and guidelines address the risk to lynx productivity, movement, and mortality, in order to conserve lynx, and to reduce or eliminate adverse effects from management activities (Ruediger et al. 2000) on the Umatilla National Forest lands. Implementation of the following standards and guidelines is expected to support the management of lynx and their habitat and lead to the conservation of the species (Ruediger et al. 2000).

Objectives would be incorporated into the Forest Plan on page 4-29 below Table 4-10 and above the paragraph staring with "Biological evaluation…" Standards and guidelines would be incorporated into the Forest Plan on page 4-91, bottom of the page following Peregrine Falcon Habitat, with a heading for Canada lynx. This amendment would apply only for the duration of, and to those actions proposed in lynx habitat for the site-specific project called School Fire Salvage Recovery Project.

1. All Programs and Activities

1.1. Programmatic

1.1.1. Objectives

Design vegetation management strategies that are consistent with historical succession and disturbance regimes. The broad-scale strategy should be based on a comparison of historical and current ecological processes and landscape patterns, such as age-class distributions and patch size characteristics. It may be necessary to moderate the timing, intensity, and extent of treatments to maintain all required habitat components in lynx habitat, to reduce human influences on mortality risk and interspecific competition, and to be responsive to current social and ecological constraints relevant to lynx habitat.

To sustain lynx populations through time, maintain or enhance the snowshoe hare prey base by providing vegetation with dense horizontal cover.

1.1.2. Standards

Management direction will generally apply only to lynx habitat on federal lands within Lynx Analysis Units (LAUs).

Lynx habitat will be mapped using criteria specific to each geographic area to identify appropriate vegetation and environmental conditions. Primary vegetation includes those types necessary to support lynx reproduction and survival. It is recognized that other vegetation types that are intermixed with the primary vegetation will be used by lynx, but are considered to contribute to lynx habitat only where associated with the primary vegetation.

To facilitate project planning, delineate LAUs. To allow for assessment of the potential effects of the project on an individual lynx, LAUs should be at least the size of area used by a resident lynx and contain sufficient year-round habitat.

To be effective for the intended purposes of planning and monitoring, LAU boundaries will not be adjusted for individual projects, but must remain constant.

Prepare a broad-scale assessment of landscape patterns that compares historical and current ecological processes and vegetation patterns, such as age-class distributions and patch size characteristics. In the absence of guidance developed from such an assessment, limit disturbance within each LAU as follows: if more than 30 percent of lynx habitat within a LAU is currently in unsuitable condition, no further reduction of suitable conditions shall occur as a result of vegetation management activities by federal agencies.

1.1.3. Guidelines

The size of LAUs should generally be 16,000 - 25,000 acres (25-50 square miles) in contiguous habitat, and likely should be larger in less contiguous, poorer quality, or naturally fragmented habitat. Larger units should be identified in the southern portions of the Northern Rocky Mountains Geographic Area (Oregon, and SE Washington). In the west, we recommend using watersheds (e.g., 6th code hydrologic unit codes (HUCs) in more northerly portions of geographic areas, and 5th code HUCs in more southerly portions). Coordinate delineation of LAUs with adjacent administrative units and state wildlife management agencies, where appropriate.

Areas with only insignificant amounts of lynx habitat may be discarded, or lynx habitat within the unit incorporated into neighboring LAUs. Based on studies at the southern part of lynx range in the western U.S., it appears that at least 6,400 acres (10 square miles) of primary vegetation should be present within each LAU to support survival and reproduction. The distribution of habitat across the LAU should consider daily movement distances of resident females (typically up to 3-6 miles).

After LAUs are identified, their spatial arrangement should be evaluated. Determine the number and arrangement of contiguous LAUs needed to maintain lynx habitat well distributed across the planning area.

1.2. Project

1.2.1. Standards

Within each LAU, map lynx habitat. Identify potential denning habitat and foraging habitat (primarily snowshoe hare habitat, but also habitat for important alternate prey such as red squirrels), and topographic features that may be important for lynx movement (major ridge systems, prominent saddles, and riparian corridors). Also identify non-forest vegetation (meadows, shrub-grassland communities, etc.) adjacent to and intermixed with forested lynx habitat that may provide habitat for alternate lynx prey species.

Within a LAU, maintain denning habitat in patches generally larger than 5 acres, comprising at least 10 percent of lynx habitat. Where less than 10 percent denning habitat is currently present within a LAU, defer any management actions that would delay development of denning habitat structure.

Maintain habitat connectivity within and between LAUs.

2. Timber Management

2.1. Programmatic

2.1.1. Objectives

Evaluate historical conditions and landscape patterns to determine historical vegetation mosaics across landscapes through time. For example, large infrequent disturbance events may have been more characteristic of lynx habitat than small frequent disturbances.

Maintain suitable acres and juxtaposition of lynx habitat through time. Design vegetation treatments to approximate historical landscape patterns and disturbance processes.

If the landscape has been fragmented by past management activities that reduced the quality of lynx habitat, adjust management practices to produce forest composition, structure, and patterns more similar to those that would have occurred under historical disturbance regimes.

2.2. Project

2.2.1. Objectives

Design regeneration harvest, planting, and thinning to develop characteristics suitable for snowshoe hare habitat.

Design project to retain/enhance existing habitat conditions for important alternate prey (particularly red squirrel).

2.2.2. Standards

Management actions (e.g., timber sales, salvage sales) shall not change more than 15 percent of lynx habitat within a LAU to an unsuitable condition within a 10-year period.

Following a disturbance, such as blowdown, fire, insects/pathogens mortality that could contribute to lynx denning habitat, do not salvage harvest when the affected area is smaller than 5 acres. Exceptions to this include:

- Areas such as developed campgrounds; or
- LAUs where denning habitat has been mapped and field validated (not simply modeled or estimated), and denning habitat comprises more than 10% of lynx habitat within a LAU.

In these cases, salvage harvest may occur, provided that at least the minimum amount is maintained in a well-distributed pattern.

In lynx habitat, pre-commercial thinning will be allowed only when stands no longer provide snowshoe hare habitat (e.g., self-pruning processes have eliminated snowshoe hare cover and forage availability during winter conditions with average snowpack).

In aspen stands within lynx habitat in the Northern Rocky Mountains Geographic Areas, apply harvest prescriptions that favor regeneration of aspen.

2.2.3. Guidelines

Plan regeneration harvests in lynx habitat where little or no habitat for snowshoe hare is currently available, to recruit a high density of conifers, hardwoods, and shrubs preferred by hares. Consider the following:

- Design regeneration prescriptions to mimic historical fire (or other natural disturbance) events, including retention of fire-killed dead trees and coarse woody debris;
- Design harvest units to mimic the pattern and scale of natural disturbances and retain natural connectivity across the landscape. Evaluate the potential of riparian zones, ridges, and saddles to provide connectivity; and
- Provide for continuing availability of foraging habitat in proximity to denning habitat.

In areas where recruitment of additional defining habitat is desired, or to extend the production of snowshoe hare foraging habitat where forage quality and quantity is declining due to plant succession, consider improvement harvests (commercial thinning, selection, etc). Improvement harvests should be designed to:

- Retain and recruit the understory of small diameter conifers and shrubs preferred by hares;
- Retain and recruit coarse woody debris, consistent with the likely availability of such material under natural disturbance regimes; and
- Maintain or improve the juxtaposition of denning and foraging habitat.

Provide habitat conditions through time that support dense horizontal understory cover, and high densities of snowshoe hares. This includes, for example, mature multi-storied conifer vegetation in the west. Focus vegetation management, including timber harvest and use of prescribed fire, in areas that have potential to improve snowshoe hare habitat (dense horizontal cover) but that presently have poorly developed understories that have little value to snowshoe hares.

3. Fire Management

3.1. Programmatic

3.1.1. Objectives

Restore fire as an ecological process. Evaluate whether fire suppression, forest type conversions, and other forest management practices have altered fire regimes and the functioning of ecosystems.

Revise or develop fire management plans to integrate lynx habitat management objectives. Prepare plans for areas large enough to encompass large historical fire events.

Use fire to move toward landscape patterns consistent with historical succession and disturbance regimes. Consider use of mechanical pre-treatment and management ignitions if needed to restore fire as an ecological process.

Adjust management practices where needed to produce forest composition, structure, and patterns more similar to those that would have occurred under historical succession and disturbance regimes.

Design vegetation and fire management activities to retain or restore denning habitat on landscape settings with highest probability of escaping stand-replacing fire events. Evaluate current distribution, amount, and arrangement of lynx habitat in relation to fire disturbance patterns.

3.2. Project

3.2.1. Objectives

Use fire as a tool to maintain or restore lynx habitat.

When managing wildland fire, minimize creation of permanent travel ways that could facilitate increased access by competitors.

3.2.2. Standards

In the event of a large wildfire, conduct a post-disturbance assessment prior to salvage harvest, particularly in stands that were formerly in late successional stages, to evaluate potential for lynx denning and foraging habitat.

Design burn prescriptions to regenerate or create snowshoe hare habitat (e.g., regeneration of aspen and lodgepole pine).

3.2.3. Guidelines

Design burn-prescriptions to promote response by shrub and tree species that are favored by snowshoe hare.

Design burn prescriptions to retain or encourage tree species composition and structure that will provide habitat for red squirrels or other alternate prey species.

Consider the need for pre-treatment of fuels before conducting management ignitions.

Avoid constructing permanent firebreaks on ridges or saddles in lynx habitat.

Minimize construction of temporary roads and machine fire lines to the extent possible during fire suppression activities.

Design burn prescriptions and, where feasible, conduct fire suppression actions in a manner that maintains adequate lynx denning habitat (10% of lynx habitat per LAU).

6. Forest Roads and Trails

6.1. Programmatic

6.1.1. Objectives

Maintain the natural competitive advantage of lynx in deep snow conditions.

6.1.2. Standards

On federal lands in lynx habitat, allow no net increase in groomed or designated over-the-snow routes and snowmobile play areas by LAU. Winter logging activity is not subject to this restriction.

6.1.3. Guidelines

Determine where high total road densities (>2 miles per square mile) coincide with lynx habitat, and prioritize roads for seasonal restrictions or reclamation in those areas.

Minimize roadside brushing in order to provide snowshoe hare habitat.

Locate trails and roads away from forested stringers.

Limit public use on temporary roads constructed for timber sales. Design new roads, especially the entrance, for effective closure upon completion of sale activities.

Minimize building of roads directly on ridgetops or areas identified as important for lynx habitat connectivity.

Old–Growth Amendment

A Forest Plan amendment would reallocate Management area C1-Dedicated Old Growth to the following: Management Area C3 - Big Game Winter Range; Management Area E2 - Timber and Big Game; Management Area C8 - Grass Tree Mosaic; and Management Area C5 - Riparian (Fish and Wildlife). The amendment would also designate areas outside of the fire area as Management Area C1-Dedicated Old Growth. Selection factors for replacement old growth included: location; aspect; stand size and shape; and stand composition and structure.

The following tables show changes from burned C1 to new management area allocations, and new areas reallocated to C1- Dedicated Old Growth.

Table J-1 Change from C1 to New Management Area Allocation (acres) within School Salvage Recovery Project Area.

Burned C1 Number	0012	0022	0032	2612	
Location	**Pataha Creek**	**Upper Cummings Creek**	**Camp Wooten**	**Abel's Ridge Cummings Creek**	**Totals**
C1-Dedicated Old Growth	-373	-375	-507	-345	-1,600
C3-Big game Winter Range	0	0	+493	0	+493
C4-Wildlife Habitat	0	0	0	0	0
C5-Riparian	+80	+85	+14	0	+179
C8-Grass-Tree Mosaic	0	0	0	+345	+345
E2-Timber and Big Game	+293	+290	0	0	+583

Table J-2 Previous Management Areas Reallocated to New C1-Dedicated Old Growth (acres)

Replacement C1 Number	**0012R**	**0022R**	**0032R**	**2612R**	
Location	**North Fork Asotin Creek**	**Cow Canyon Creek**	**Little Tucannon River**	**Sheep Creek**	**Totals**
C1-Dedicated Old Growth	+817*	+445	+372	+371	+2005
C3-Big game Winter Range	0	-127	-321	0	-448
C4-Wildlife Habitat	-803	-281	0	0	-1084
C5-Riparian	0	-37	-51	0	-88
C8-Grass-Tree Mosaic	-14	0	0	0	-14
E2-Timber and Big Game	0	0	0	-371	-371

*0012 R - large size is due to inclusions of young forest and nonforest areas.

Appendix K

Response to Beschta and Others

School Fire

Salvage Recovery Project

APPENDIX K

Responses To Beschta And Others

VEGETATION

Beschta et al. Reports

The original Beschta Report (Beschta et al. 1995) was commissioned by Pacific Rivers Council. It was neither peer-reviewed nor published in a journal or other widely accepted science outlet.

A lack of peer review and the fact it was not published by a credible source are two criteria indicating that the scientific credibility of the original Beschta report is limited. It is generally agreed that science does not include articles, comments, editorials and other input considered to be opinion, even if it is offered by scientists (Devlin 1998a).

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 readily available from an accepted source, it is considered to have scientific credibility.

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.

The non-intervention respondents also 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 selling 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, 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 Forest Vegetation portion of 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 proposed 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 congruence between the Beschta (1995, 2004) recommendations and the School Fire Salvage Recovery Project proposed action is not surprising because Beschta describes ecosystem restoration goals, whereas the School Fire Salvage Recovery Project is focused on recovery of economic value only.

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 and it was not published in a scientific journal or similar source. These facts limit the scientific credibility of this report.

It is generally agreed that science does not include articles, comments, editorials and other input considered to be opinion, even if it is offered by scientists (Devlin 1998a).

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).

It is likely that the US Forest Service response to the ALA report was not peer reviewed and it is not available to the wider scientific community through a traditional scientific outlet such as a journal.

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 Beschta et al. (1995, 2004) also pertains to the ALA report and is hereby incorporated by reference.

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 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 2001).

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 Forest Vegetation 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.

Although 14 studies might seem like an acceptable number in another context, it is actually not very many when considering the wide variety of site conditions and forest ecosystem types exposed to salvage logging, particularly since the McIver and Starr report considered literature from around the world (salvage studies in Eucalypt forests in Australia, for example).

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).

We reviewed the McIver and Starr report (McIver and Starr 2000) and its associated journal article (McIver and Starr 2001). In our judgment, the McIver and Starr offerings 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 School Fire Salvage Recovery Project.

ICBEMP Scientific Assessment for Ecosystem Management

One respondent 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 “Salvage Rider” bill passed by the US Congress in 1995 (PL 104-19). Note that the 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 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 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 article (Donato et al.. 2006a, 2006b) was published in a peer-reviewed journal and is readily available from an accepted source, so it is considered to have scientific credibility.

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, and it used a spatially nested sampling design of both logged and unlogged plots replicated across the fire area.

Relevance to the Forest Vegetation portion of 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 aspects:

1. The School Fire proposed action includes 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 activity in the School Fire proposed action would help compensate for any salvage-caused loss of naturally regenerated seedlings.
2. As described in chapter 3 of this document, many of the planting areas are considered to be at high risk of complete tree loss if another fire should happen to occur in the next 20-30 years, primarily because of uncharacteristically high fuel loads. This reburn 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 (see fuel specialist report).

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 much longer than what is expected for the School Fire.

Because the Donato article lacks specifics about when the salvage harvest occurred, it is not 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. If post-fire weather conditions were conducive to establishment of natural regeneration, then we would expect obvious amounts of natural regeneration to be present after three growing seasons (and the amounts in year 3 were probably greater than in year 1 or 2);
2. If post-fire weather conditions were conducive to establishment of natural regeneration, and if obvious amounts of natural regeneration actually became established, then we would expect salvage harvest to have a negative effect on natural regeneration density because new seedlings are too small and vulnerable to resist harvest-related impact.

As described in chapters 2 and 3 of this document, the proposed salvage timber harvest activity is expected to occur during the first growing season following the School Fire, although some salvage activity might also occur during the second growing season. Since the time interval between the School Fire and the School Fire Salvage Recovery Project salvage harvest activity is much shorter than for the Donato study, then it is our judgment that School Fire salvage effects on natural regeneration would be negligible.

If the salvage timber harvest activity is implemented as envisioned, which would remove a reasonable proportion of the large-fuel component from these areas, and if the associated fine-fuel treatments are completed as envisioned (see fuel specialist report), then it is our judgment that salvage-related effects on reburn potential to ensure plantation sustainability 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 article (Lindenmayer et al. 2004) was published in a peer-reviewed journal and is readily available from an accepted source, so it is considered to have scientific credibility.

We reviewed the Lindenmayer et al. (2004) article. 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 Lindenmayer et al. (2004) – the No Action alternative.

Our discussion about Beschta et al. (1995, 2004) and the ALA report (American Lands Alliance 2005) also pertains to Lindenmayer et al. (2004) and is hereby incorporated by reference.

Logging and forest health (insects/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 damage to timber stands. They 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).

Although it is not certain, the Black report might have been peer-reviewed (as based on the acknowledgments section). It was not published in a scientific journal or similar source. These facts limit the scientific credibility of this report. Note that it is generally accepted that science does not include articles, comments, editorials and other input considered to be opinion, even if offered by scientists (Devlin 1998a).

The United States Forest Service prepared a response to the Black report. 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" (USDA Forest Service 2006).

It is likely that the US Forest Service response to the Black report was not peer reviewed and it is not available to the wider scientific community through a traditional scientific outlet such as a journal.

We reviewed the Black (2005) report. In our judgment, the School Fire Salvage Recovery Project appropriately considers insect and disease susceptibility by adopting the Scott Guidelines protocol for determining tree mortality (Scott et al. 2002, 2003).

As described in chapter 1 of this document, the Scott Guidelines use three insect or disease agents specifically 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 fire-caused tree damage such as bark char, scorched foliage and duff consumption at the tree base) when predicting tree mortality.

Comments About Use of the Scott Guidelines

One or more respondents to the School Fire Salvage Recovery Project scoping activity 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).

At least one respondent specifically mentioned the High Roberts salvage sale (Malheur National Forest), and he contended that it had been difficult for Malheur National Forest employees to distinguish between live and dead trees when preparing the High Roberts project. This respondent further contended that measurements of water stress or photosynthesis could have been used to reliably identify live and dead trees.

Relevance to the Forest Vegetation portion of 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-damaged trees might succumb to their injuries over a specific period of time (one year for all species and size classes except mature, large-diameter ponderosa pine, for which the time period is five years).

The decision to adopt the Scott Guidelines for tree mortality determination follows established protocol for the Pacific Northwest Region of the U.S. Forest Service. Two administrative policy letters produced in 1998 (Devlin 1998a, 1998b) allow damaged (dying) trees to be considered as dead if there is a professional determination that the tree would definitely be dead in five years or less.

The Pacific Northwest Region Regional Forester has directed that these letters be considered when making tree mortality determinations (Goodman 2005). According to the Regional Forester's letter, the Scott Guidelines establish a scientific basis for determining the relative probability of post-fire tree survival because they provide a detailed characterization of conditions resulting in tree death or leading to delayed mortality and, therefore, they implicitly define "tree mortality" (Goodman 2005, Schmitt and Filip 2005).

It is our judgment that using the Scott Guidelines (Scott et al. 2002, 2003), which were prepared by experts in the fields of tree mortality, forest pathology and forest entomology, to predict the probability of tree survival is deemed a "professional determination" in the context of the Regional Forester's direction (Goodman 2005, Schmitt and Filip 2005).

It is our observation that adopting the Scott Guidelines for use with the School Fire Salvage Recovery Project is also consistent with similar projects in the Pacific Northwest Region of the U.S. 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).

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 criteria 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 criteria 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 criteria 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 criteria 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 criteria 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 criteria 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 criteria (Table 2-5) 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 DEIS project design criteria 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 criteria (Table 2-5) 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 DEIS, 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 criteria 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 criteria 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 criteria 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

<u>Beschta et al. Reports</u> - **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 L

Social Issues

School Fire

Salvage Recovery Project

APPENDIX L

Social Issues of School Fire Salvage Harvesting

The Social Environment

The immediate social environment around the Pomeroy Ranger District is clearly rural. Surrounding local communities (including, those of pre-European origin) have a tradition of an intimate relationship with the land to provided for material, cultural and recreational wants and needs. Inhabited for hundreds, (and likely thousands) of years by indigenous peoples, the landscape has been largely dominated for the last 125 or so years by the institutions and land use patterns of Euro-American society. Until the last 20 or so years, the relationships of these local Euro-American populations to land and natural resources has been framed in the largely utilitarian terms of people who make their livelihoods directly or indirectly from the land.

There are longstanding local traditions associated with recreational use of forest lands in particular; and as transportation networks have improved, an increasing influx of non-local recreational land users whose physical and economic impacts have been felt in the communities surrounding the forest. Also as local populations have both grown and diversified in recent decades, concerns about the environmental effects of land use practices particularly timber harvest, cattle grazing and the use of all terrain vehicles in the back country have been on the increase.

The Interview Process

In light of this general background, this small scale, analysis was designed to gain some perspective on the probable social impacts and the views and values of local stakeholders concerning the proposed harvesting of forest stands which were directly impacted by the School Fire. To this end 17 telephone interviews were conducted with local stakeholders in the area surrounding the proposed action. Interviewees were chosen purposively to represent as broadly as possible within the bounds of a small scale project, a sampling of perspectives concerning post fire salvage in the burned area with a particular emphasis on any positive or negative local or regional social impacts that might accrue from such a project.

Interviewees included a tribal representative from the Nez Perce nation, county commissioners from the three adjacent counties, representatives of two major environmental groups with an interest in the Pomeroy District, a representative of the forest products industry in the region and a small sampling of local residents and community leaders with a variety of interests/roles in the national forest ranging from various types of consumptive and recreational uses to public safety.

Telephone interviews began with some questions about the interviewees background in the local area, his or her prior involvements with the national forest and then quickly turned to questions about his/her perspectives on the salvage proposal. Interviewees were also asked to comment on any social/community impacts the proposed project might have.

Emergent School Fire Social Issues

Six major themes emerged from these interviews:

1. Concerns about 'waste" of burned trees and the time window before timber value diminishes due to deterioration and decay;
2. Concerns about hazards including the possibility "re-burn" if all the dead material is left on the site;
3. Concerns about speed and success of forest stand regeneration;
4. Possible harmful environmental effects of salvaging operations including soil disturbance, further disturbance of wildlife habitat, stream siltation and its possible impacts on fish populations (Salmon in particular);
5. Possible impacts of salvage operations on certain plants in the forest floor of particular significance to tribal people; and
6. Employment impacts.

1. Waste

The idea that not utilizing wood from trees killed in forest fires is wasteful is a sentiment that has emerged repeatedly in the literature on human response to wildfire[1 2 3] In this case it was expressed spontaneously by most stakeholders interviewed with the exception of those affiliated with environmental groups and one tribal commentator. The following quote is typical of those holding this point of view:

> *I feel it's a waste not to do it (salvage)…They should take it all-everything worth taking*.

Said another:

> *It would be a crime to let it (dead woody material) set up there and destroy it self (through decay)*

Said another:

> *On the first warm days (of the Spring) the value of the pine will go fast*

Others however, who held this general point of view did include a caveat:

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[1] Rodriguez-Mendez, S., M.S. Carroll, K.A. Blatner, A.J. Findley, G.B. Walker and S.E. Daniels. 2003. Smoke on the Hill: A Comparative Study of Wildfire and Two Communities. *Western Journal of Applied Forestry*. 18(1): 60-70.

[2] Carroll, M.S., Cohn P.J. D.N. Seesholtz and L. Higgins. 2005 Fire as a Galvanizing and Fragmenting Influence on Communities: The Case of the Rodeo-Chediski Fire**.** *Society and Natural Resources*.18(4):301-320.

[3] Carroll, M.S., A.J. Findley, K.A. Blatner and S. Rodriguez-Mendez. 2000. Social Assessment for the Wenatchee National Forest Wildfires of 1994: Targeted Analysis for Leavenworth, Entiat and Chelan Ranger Districts. US Forest Service, Pacific Northwest Station, Portland OR, General Technical Report. GTR-479. 114 pp.

I hope some dead trees are left for birds, etc…

The representatives of environmental groups however saw this issue very differently. Said one:

Looking at dead trees as waste is wrongheaded.

This individual went on to say that cutting dead trees to avoid waste "sends the wrong message" that dead trees have only one use (lumber) and that fire is a "bad thing". He also suggested that post fire harvest sets up an incentive for forest arson.

2. Hazards

Another concern expressed by a number of interviewees is that "doing nothing" in the burned over stands will create at least two kinds of hazards: that of dead trees falling on people and the possibility of a re-burn of the dead material. One interviewee for example talked about "many dangerous trees" in areas that are likely to be frequented by recreationists.

3. Forest Regeneration

Another issue on the minds of those in favor of post fire harvest was that of the speed and success of forest regeneration. The commonly held view on this issue is that clearing way some of the dead will allow for more rapid and successful regeneration. A related view held by those more familiar with the Forest Service's funding picture suggested that a failure to derive financial value from the dead material would hamstring other restoration efforts from a budgetary standpoint.

4. Possible Harmful Environmental Effects

Most of those interviewed felt that the current regulatory structure under which the Forest Service operates would ensure adequate environmental protection in the face of any salvage operation. That view was not shared at all however by the representatives of environmental groups interviewed, nor completely by tribal representatives. As one environmental representative said:

The worst time to actually log, is post-fire.

Among the major environmental concerns expressed were stability of forest soil post fire, further wildlife habitat disruption and increased siltation of the Tucannon river system and the effects of that on Salmon and other aquatic life. A related concern expressed involved potential cumulative environmental effects from current logging on burned state and private forest land in the area added to those feared from proposed federal actions.

In light of the potential cumulative environmental effects (particularly siltation) on salmon in the Tucannon drainage, one environmental representative suggested salvage harvest might violate the Endangered Species Act. Some concern about impacts of salvaging actions on salmon habitat was also expressed by tribal interviewees.

Another related issue expressed by an environmental representative had to do with the policy message embedded in post fire harvest:

The policy sends the message that it's easier to log after fires. It creates incentives (for the Forest service) to log.

It should also be noted however that the forest industry representative interviewed felt that more adverse environmental impacts (i.e. erosion and stream siltation) would occur from 'doing nothing" than from a well designed salvage/ restoration effort.

5. Traditional Plants

Tribal interviewees also expressed some concern about the possible effects of salvage operations on understory plants that are traditionally harvested by tribal members in the Tucannon drainage. In particular, habitats on open ridge tops that may contain kause and huckleberry plants were of concern to them.

6. Employment Effects.

One fairly striking theme in the interviews was a feeling on the part of most interviewed that the employment effects of the any salvage operation would not be very significant. This view on employment was held even by those who felt to not salvage is "a waste." A local economic development specialist called such harvesting "not a long term solution to [local] economic issues." A forest industry representative suggested by way of broader context that the three national forests in the region manage 68 percent of the forest land but only provide 10 to 15 percent of the harvested volume and that the remaining mills remaining in the region require significantly more volume of timber than they currently receive to remain competitive. Thus he saw the possibility of salvage on the School fire as a part of a larger picture of needed volume for the region's mills. He also felt however that although he is strongly in favor of a salvage effort on the School fire, that any volume taken on the School fire would likely be mostly a substitute for other national forest volume that would otherwise be harvested during the period.

The general sentiment that employment effects would unlikely to be significant seems due in part to the fact that any employment associated with harvest or processing of logs would likely be geographically scattered across the region (depending, of course, on what firm(s) would be the successful bidders) and that the harvested volume would likely be more of a replacement rather than a large augmentation other national forest harvested volume that would otherwise be harvested. [4]

<u>Summary</u>

Based on the interviews conducted, it seems fair to say that the most obvious and substantial social impact of post fire harvest salvage on the School fire is likely to be the same kinds of social disagreement

[4] Personal communication USDA Forest Service, Pomeroy District Ranger

and conflict over post-fire harvest that has occurred in places such as Wenatchee, Washington in 1994[5] and around the Hayman fire in Colorado[6] and Rodeo-Chediski fires in Arizona [7]. As in those cases, there appears to be fairly strong general local support of post-fire savage but with environmental opposition that is passionate, politically sophisticated and quite willing to expend time and resources opposing such actions. It is also fair to say that the conflict will likely exist, whatever decision is made concerning post fire harvest on the School Fire.

[5] Carroll, M.S., A.J. Findley, K.A. Blatner and S. Rodriguez-Mendez. 2000. Social Assessment for the Wenatchee National Forest Wildfires of 1994: Targeted Analysis for Leavenworth, Entiat and Chelan Ranger Districts. US Forest Service, Pacific Northwest Station, Portland OR, General Technical Report. GTR-479. 114 pp.

[6] Carroll, M.S., A.J. Findley, K.A. Blatner and S. Rodriguez-Mendez. 2000. Social Assessment for the Wenatchee National Forest Wildfires of 1994: Targeted Analysis for Leavenworth, Entiat and Chelan Ranger Districts. US Forest Service, Pacific Northwest Station, Portland OR, General Technical Report. GTR-479. 114 pp.

[7] Carroll, M.S., Cohn P.J. D.N. Seesholtz and L. Higgins. 2005 Fire as a Galvanizing and Fragmenting Influence on Communities: The Case of the Rodeo-Chediski Fire**.** *Society and Natural Resources*.18(4):301-320.