USDA United States Department of Agriculture | Forest Service | Malheur National Forest | P.O. Box 909
John Day, OR 97845
(541) 575-3000
Fax (541) 575-3001
TDD (541) 575-3089

File Code: 1950

Date: May 21, 2007

Dear Interested Party:

Enclosed for your review and comment, is a copy of the Draft Environmental Impact Statement (DEIS) for the Thorn Fire Salvage Recovery Project. The project planning area is approximately 7,783 acres and is located in Grant County.

The DEIS examines a "No Action" alternative and two "Action" alternatives for salvage of dead and dying trees resulting from the 2006 Shake Table Fire complex on the Malheur National Forest. In addition to the salvage of the dead and dying trees, other actions include removal of potential danger trees for public safety along haul routes and open forest travel routes and reforestation of the areas burned to restore wildlife habitat, riparian shade and visual quality. Alternative 2 has been identified as the preferred alternative. This alternative would commercially salvage approximately 3,907 acres and include several site-specific non-significant Forest Plan Amendments which include: modification of East Side Screens to define both live and dead trees; relocate dedicated old growth; short term modification of visual quality objectives; timber harvest within Semi-Primitive Non-Motorized Recreation areas; and others as needed. No activities are proposed in Appendix C Inventoried Roadless Areas. No new roads or temporary roads would be built. Alternative 3 would commercially salvage approximately 2,769 acres and have similar actions to Alternative 2 with the exception that salvage of dead and dying trees would not occur within the Semi-primitive Non-motorized (MA 10) area.

In addition, it is anticipated that the Forest Supervisor will seek a determination from the Chief of the Forest Service that an emergency situation exists in the Thorn Fire Salvage Recovery Project area 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 is 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. The final determination by the Chief will be published in the legal notice of the decision, 36 CFR 215.10(d), that the Forest Service made a determination that all or part of a project decision is an emergency situation.

Reviewers should provide Malheur Forest Supervisor Gary L. "Stan" Benes, Responsible Official, 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 decision making 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).

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 June 1, 2007. Timing for the request for comments is in accordance with 36 CFR 215.5 dated June 4, 2003. The 45 day comment period ends on July 16, 2007 and comments must meet content requirements of 36 CFR 215.6.

Written comments can be sent to the Responsible Official, Gary L. "Stan" Benes, Forest Supervisor, P.O. Box 909, John Day, Oregon 97845 or by fax (541) 575-3001. Electronic comments can be sent to comments-pacificnorthwest-malheur@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 431 Patterson Bridge Road, John Day, Oregon between 7:45 a.m. and 4:30 p.m., Monday through Friday.

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).

I want to encourage you to review and comment on this DEIS. Your interest in the management of the Malheur National Forest is appreciated. If you have questions regarding this project, please contact Brooks Smith, Blue Mountain District Ranger at 541-575-3401, or Ryan Falk, Thorn Project Leader, at 541-820-3800.

Sincerely,

Gary L Benes

GARY L. "STAN" BENES
Forest Supervisor

Enclosure

United States Department of Agriculture | Forest Service | Malheur National Forest | P.O. Box 909
John Day, OR 97845
(541) 575-3000
Fax (541) 575-3001
TDD (541) 575-3089

File Code: 1950

Date: May 21, 2007

Dear Interested Party:

Enclosed for your review and comment, is a copy of the Draft Environmental Impact Statement (DEIS) for the Thorn Fire Salvage Recovery Project. The project planning area is approximately 7,783 acres and is located in Grant County.

The DEIS examines a "No Action" alternative and two "Action" alternatives for salvage of dead and dying trees resulting from the 2006 Shake Table Fire complex on the Malheur National Forest. In addition to the salvage of the dead and dying trees, other actions include removal of potential danger trees for public safety along haul routes and open forest travel routes and reforestation of the areas burned to restore wildlife habitat, riparian shade and visual quality. Alternative 2 has been identified as the preferred alternative. This alternative would commercially salvage approximately 3,907 acres and include several site-specific non-significant Forest Plan Amendments which include: modification of East Side Screens to define both live and dead trees; relocate dedicated old growth; short term modification of visual quality objectives; timber harvest within Semi-Primitive Non-Motorized Recreation areas; and others as needed. No activities are proposed in Appendix C Inventoried Roadless Areas. No new roads or temporary roads would be built. Alternative 3 would commercially salvage approximately 2,769 acres and have similar actions to Alternative 2 with the exception that salvage of dead and dying trees would not occur within the Semi-primitive Non-motorized (MA 10) area.

In addition, it is anticipated that the Forest Supervisor will seek a determination from the Chief of the Forest Service that an emergency situation exists in the Thorn Fire Salvage Recovery Project area 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 is 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. The final determination by the Chief will be published in the legal notice of the decision, 36 CFR 215.10(d), that the Forest Service made a determination that all or part of a project decision is an emergency situation.

Reviewers should provide Malheur Forest Supervisor Gary L. "Stan" Benes, Responsible Official, 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 decision making 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, l986) 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).

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 June 1, 2007. Timing for the request for comments is in accordance with 36 CFR 215.5 dated June 4, 2003. The 45 day comment period ends on July 16, 2007 and comments must meet content requirements of 36 CFR 215.6.

Written comments can be sent to the Responsible Official, Gary L. “Stan” Benes, Forest Supervisor, P.O. Box 909, John Day, Oregon 97845 or by fax (541) 575-3001. Electronic comments can be sent to comments-pacificnorthwest-malheur@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 431 Patterson Bridge Road, John Day, Oregon between 7:45 a.m. and 4:30 p.m., Monday through Friday.

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).

I want to encourage you to review and comment on this DEIS. Your interest in the management of the Malheur National Forest is appreciated. If you have questions regarding this project, please contact Brooks Smith, Blue Mountain District Ranger at 541-575-3401, or Ryan Falk, Thorn Project Leader, at 541-820-3800.

Sincerely,

/S/ *GARY L. BENES*

GARY L. "STAN" BENES
Forest Supervisor

Enclosure

USDA

United States
Department
of Agriculture

Forest
Service

June
2007

Draft Environmental Impact Statement

Thorn Fire Salvage Recovery Project

Blue Mountain Ranger District
Malheur National Forest
Grant County, Oregon

Document Structure

The US Department of Agriculture (USDA) – Forest Service (FS) has prepared this draft environmental impact statement (EIS) in compliance with the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations (40 CFR Parts 1500-1508), agency regulations, and all applicable federal and state laws. The document is organized into the following sections:

Abstract

Table of Contents

Summary of the DEIS: an executive summary of the DEIS.

Chapter 1. Purpose and Need for Action: This chapter includes background information on the project proposal, the purpose and need for the project, and the proposal for achieving that purpose and need. This section also describes how the Forest Service informed the public of the proposal and identifies the key issues that drive the analysis.

Chapter 2. Alternatives, including the Proposed Action: This chapter provides a more detailed description of the Proposed Action as well as alternative methods for achieving the stated purpose and need. These alternatives were developed based on significant issues raised by the public, the interdisciplinary team (IDT), and other agencies. This section also provides a number of summary tables comparing the alternative actions and the environmental consequences associated with each alternative.

Chapter 3. Affected Environment and Environmental Consequences: This chapter describes the physical, biological, and human environments potentially affected by the Proposed Action and alternatives, and describes the potential effects of the Proposed Action and alternatives, including the No Action Alternative.

Chapter 4. Consultation and Coordination: This chapter provides a list of preparers and agencies consulted during the development of the environmental impact statement, and a list of those who the document was distributed to.

Chapter 5: The chapter includes a glossary, a list of acronyms, a list of references, and an index.

Additional documentation, including more detailed analyses of project area resources may be found in the project planning record files. Permanent project planning record files would be located at the Malheur National Forest Supervisors Office, 431 Patterson Bridge Road, P.O. Box 909, John Day, OR 97845. For information regarding planning record files please contact Jerry Hensley, Project Manager at (541) 575-3100.

Thorn Fire Salvage Recovery Project
Draft Environmental Impact Statement
Grant County, Oregon

Lead Agency:	**USDA Forest Service, Malheur National Forest**
Responsible Official:	**Gary L. "Stan" Benes, Forest Supervisor** **Malheur National Forest Supervisors Office** **431 Patterson Bridge Road, P.O. Box 909** **John Day, OR 97845**
For Information Contact:	**Jerry Hensley, Project Manager** **Thorn Fire Salvage Recovery Project** **Malheur National Forest** **431 Patterson Bridge Road, P.O. Box 909** **John Day, OR 97845** **Phone: (541)-575-3000**

ABSTRACT

The purpose of this analysis document is to disclose the proposed actions and environmental effects of salvaging dead and dying timber resulting from the Shake Table Fire Complex on the Malheur National Forest in the summer of 2006. Starting August 22, 2006, the Shake Table Fire Complex, located 20 miles south west of John Day, Oregon, burned approximately 14,527 acres across mixed land ownership. Of those acres, approximately 13,536 acres were on National Forest System Lands administered by the Blue Mountain Ranger District, Malheur National Forest. The **Thorn Fire Salvage Recovery Project** (abbreviated hereafter as TFSR Project) (7, 783 acres) is that portion of the Shake Table Fire Complex area on National Forest System Lands, but excluding any inventoried roadless areas. The legal location is primarily in T14S, R28E and T15S, R28E, and area landmarks are the Aldrich Mountains and Chrome Ridge. The Shake Table Fire Complex occurred within the Upper John Day subbasin. Subwatersheds (6^{th} field level) include Dry Creek, Fields Creek, Todd Creek, and Murderers Creek-Duncan Creek. These subwatersheds are delineated into 7^{th} level subwatersheds including Widows Creek, West Dry Creek, Dry Creek, Wickiup Creek, Buck Cabin Creek and Upper Todd Creek. The TFSR project area totals approximately 7,783 acres. The proposed action includes salvage of dead and dying trees on approximately 3,907 acres of those acres and removal of potential danger trees for public safety for approximately 43.4 miles along haul routes and open forest travel routes. Salvage harvest methods would include ground-based and helicopter logging systems. Approximately 3,411 acres would be salvaged by helicopter (87%) and approximately 496 acres would be salvaged using ground-based yarding (13%). No activities are proposed within Appendix C Inventoried Dry Cabin, Cedar Grove and Shake Table Roadless Areas. No new roads or temporary roads would be built. Approximately 6,428 acres would be planted with conifer seedlings within the project area. Forest Plan amendments related to old growth replacement, snag levels, visuals, timber harvest within Semiprimitive Nonmotorized Recreation Areas are included. In addition, a request for an Emergency Situation Determination (36 CFR 215.10) would be sought from the Chief of the Forest Service. The Forest Service developed three alternatives: the No Action, the Proposed Action, and one other action alternative generated in response to scoping issues.

Submission of Comments: Reviewers should provide the Agencies with their comments during the 45-day comment period on the DEIS. This would enable the Agencies 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 decision-making 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 (9^{th} Circuit, l986) 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).

Send Comments to:

Jerry Hensley, Project Manager
Thorn Fire Salvage Recovery Project
Malheur National Forest
431 Patterson Bridge Road, P.O. Box 909
Phone: (541)-575-3000
Fax: (541)-575-3001

TDD/TTY: (541) 575-3001
Send electronic comments to: comments-pacificnorthwest-malheur@fs.fed.us

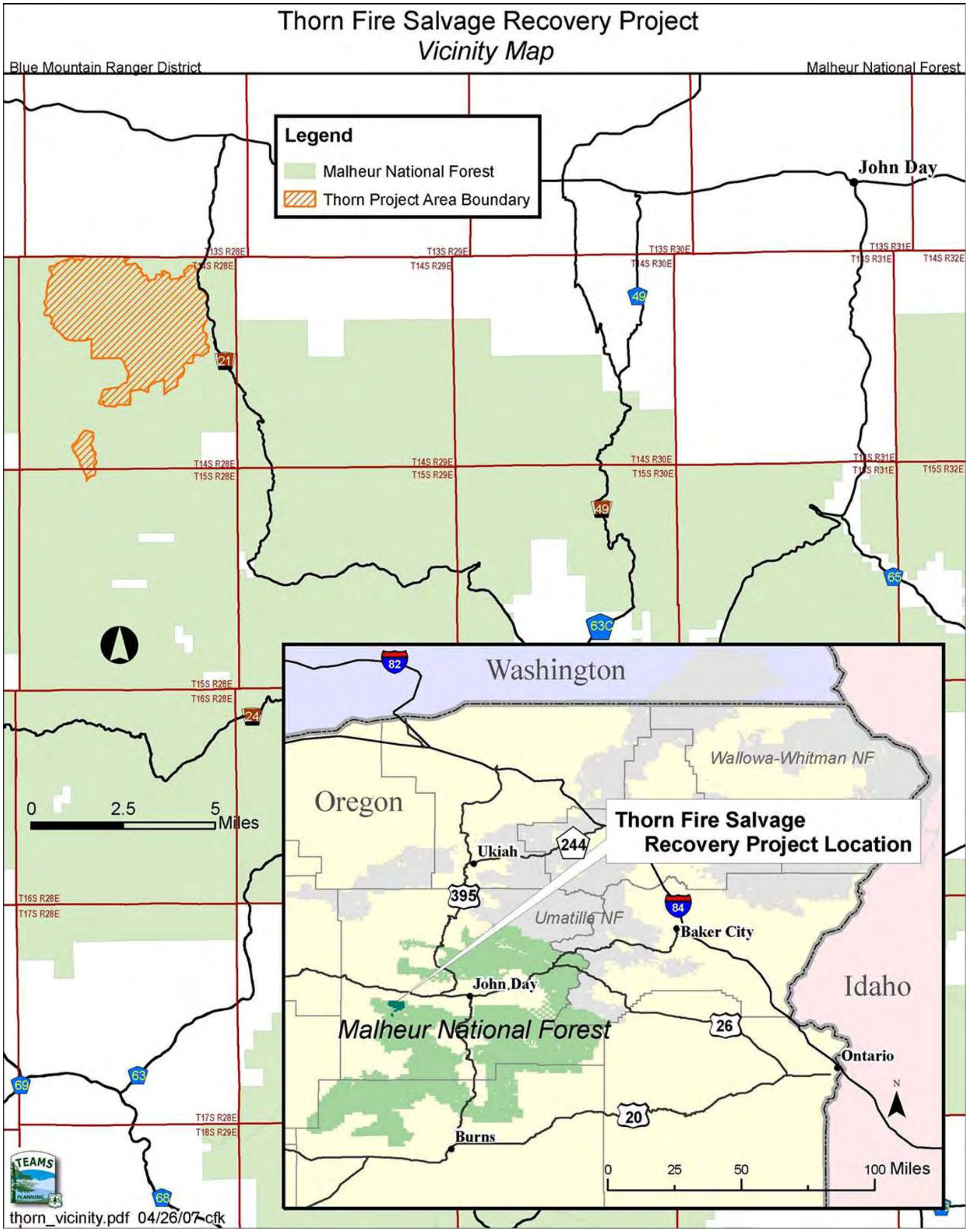
Date Comments Must Be Received:	**45 days after publication of the Environmental Protection Agency's Notice of Availability (NOA) in the Federal Register (NOA estimated to be in the Federal Register on June 1, 2007)**
Check project website for updates:	**http://www.fs.fed.us/r6/malheur/projects/**

TABLE OF CONTENTS

List of Tables

List of Figures

Figure 1. Project Location Map



This page left intentionally blank

SUMMARY OF THE DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)

INTRODUCTION

The purpose of this analysis document is to disclose the proposed actions and environmental effects of salvaging dead and dying timber resulting from the Shake Table Fire Complex on the Malheur National Forest in the summer of 2006. Starting August 22, 2006, the Shake Table Fire Complex, located 20 miles south west of John Day, Oregon, burned approximately 14,527 acres across mixed land ownership. Of those acres, approximately 13,536 acres were on National Forest System Lands administered by the Blue Mountain Ranger District, Malheur National Forest. The **Thorn Fire Salvage Recovery Project** (abbreviated hereafter as TFSR Project) (7, 783 acres) is that portion of the Shake Table Fire Complex area on National Forest System Lands, but excluding any inventoried roadless areas. The legal location is primarily in T14S, R28E and T15S, R28E, and area landmarks are the Aldrich Mountains and Chrome Ridge. The Shake Table Fire Complex occurred within the Upper John Day subbasin. Subwatersheds (6^{th} field level) include Dry Creek, Fields Creek, Todd Creek, and Murderers Creek-Duncan Creek. These subwatersheds are delineated into 7^{th} level subwatersheds including Widows Creek, West Dry Creek, Dry Creek, Wickiup Creek, Buck Cabin Creek and Upper Todd Creek. See Figure 1 for a general project location map for reference. Detailed project maps are in **DEIS Appendix A.**

PURPOSE AND NEED FOR ACTION

The purpose and need of the TFSR Project includes the following specific objectives:

(1) Recover the economic value of the dead and dying trees as rapidly as practicable to maximize potential economic benefits consistent with reasonable protection of other resource values; and,

(2) Improve public safety within the burned area by removing potential trees for public safety along open forest travel routes; and,

(3) Rapidly reforest areas burned in the Shake Table Fire to achieve Forest Plan objectives. These include restoration of big game habitat, riparian shade, visual quality, old growth habitat, stand structural development and timber production.

PROPOSED ACTION IN BRIEF

The TFSR project area totals approximately 7,783 acres. The proposed action includes salvage of dead and dying trees on approximately 3,907 acres of those acres and removal of potential danger trees for public safety for approximately 43.4 miles along haul routes and open forest travel routes. Salvage harvest methods would include ground-based and helicopter logging systems. Approximately 3,411 acres would be salvaged by helicopter (87%) and approximately 496 acres would be salvaged using ground-based yarding (13%). No activities are proposed within Appendix C Inventoried Dry Cabin, Cedar Grove and Shake Table Roadless Areas. Road activities associated with salvage and restoration would be limited to opening and re-closing existing roads, and maintenance. No new roads or temporary roads would be built. Following site preparation, approximately 6,428 acres would be planted with conifer seedlings within the project area. See Appendix A -Figure A-1 for a locale map of project area and maps of the Proposed Action. The Proposed Action is described in detail in Chapter 2, Section 2.2.2 of this document.

PROPOSED FOREST PLAN AMENDMENTS

Forest Plan amendments related to modification of East Side Screens to define live and dead trees, old growth replacement, snag levels, visuals, timber harvest within Semiprimitive Nonmotorized Recreation Areas, and goshawks would be included in this analysis. The list of proposed FP amendments is noted in the table below.

Table S- 1. List of Proposed Forest Plan Amendments

FP Item #	Description of Proposed Forest Plan Amendment
Recreation 1	MA-10 – Semi-Primitive Non-Motorized • Existing Standard: Forest Plan Standard #1, p. IV-97. Manage dispersed recreation for goals of semi-primitive non-motorized recreation. Ensure that the Recreation Opportunity Spectrum (ROS) setting criteria for social encounters and remoteness are met. • Need: Alternative 2 would not meet recreation standard direction for goals of semi-primitive non-motorized recreation as it is anticipated that harvest activities of the dead and dying trees due to a catastrophic event in Alternative 2 may result in changes from a naturally appearing environment to a modified setting, especially in areas with ground-based removal. (*Alternative 3 would not require this amendment since salvage harvest activities are not occurring in MA 10. Under Alternative 3, MA 10 would continue to have a naturally appearing setting consistent with semi-primitive non-motorized recreation goals.)* • Amended Standard: Allow short-term degradation of "semi-primitive" goals to "roaded modified". *Manage dispersed recreation for goals of semi-primitive non-motorized recreation within 5 years after completion of the Project. In addition, ensure that the Recreation Opportunity Spectrum (ROS) setting criteria for social encounters and remoteness are met within* five years. *This amendment would apply only for the duration of, and to those actions proposed in MA-10 for the site-specific project called Thorn Fire Salvage Recovery Project.* • See Effects Analysis Summary in Recreation section. • *This amendment would be needed for Alternative 2. This amendment would not be needed for Alternative 3.*
Recreation 2	MA 20A – Dry Cabin Wildlife Emphasis Area (with Scheduled Timber Harvest) • Existing Standard: Standard # 1, p. IV- 121. Manage dispersed recreation for goals of semi-primitive non-motorized recreation in a natural appearing environment with emphasis on quality big game hunting. • Need: Proposed harvest activities of the dead and dying trees due to a catastrophic event in Alternatives 2 and 3 would not meet recreation standard direction for goals of semi-primitive non-motorized recreation as it is anticipated that harvest activities may result in changes from a naturally appearing environment to a modified setting, especially in areas with ground-based removal.. • Amended Standard: Allow short-term degradation of "semi-primitive" goals to "roaded modified". *Manage dispersed recreation for goals of semi-primitive non-motorized recreation within 5 years after completion of the Project.* • See Effects Analysis Summary in Recreation section. • *This amendment would be needed for both Alternatives 2 and 3.*
Recreation 3	MA 21 –Wildllife Emphasis Area (with Non-Scheduled Timber Harvest) • Existing Standard: Standard #1 p. IV-131. Manage for semi-primitive motorized recreation on designated roads and trails. Manage for semi-primitive non-motorized recreation on the remainder of the area. • Need: Proposed harvest activities of the dead and dying trees due to a catastrophic event in Alternatives 2 and 3 would not meet recreation standard direction for goals of semi-primitive non-motorized as it is anticipated that harvest activities may result in changes from a naturally appearing environment to a modified setting, especially in areas with ground-based removal.

FP Item #	Description of Proposed Forest Plan Amendment
	• Amended Standard: Allow short-term degradation of "semi-primitive" goals to "roaded modified". Manage for semi-primitive motorized goals for recreation on designated roads and trails within 5 years after completion of the Project. Manage for semi-primitive non-motorized recreation goals on the remainder of the area within 5 years after completion of the Project. *This amendment would apply only for the duration of, and to those actions proposed in MA-21 for the site-specific project called Thorn Fire Salvage Recovery Project.* • See Effects Analysis Summary in Recreation section. • *This amendment would be needed for both Alternatives 2 and 3.*
Visuals 1	MA-10 – Semi-Primitive Non-Motorized • Existing Standard: Standard #3, p. IV-97. Meet visual quality objective of foreground retention. • Need: Proposed harvest activities of the dead and dying trees due to a catastrophic event in Alternative 2 would not meet visuals standard direction of retention VQO as salvage activities would be noticeable to the average viewer. (*Alternative 3 would not require this amendment since salvage harvest activities are not occurring in MA 10. Under Alternative 3, MA 10 would continue to have a naturally appearing setting consistent with retention VQO and semi-primitive non-motorized recreation goals.)* • Amended Standard: Allow short-term degradation of scenery resources from "retention VQO" to "partial retention VQO". *Manage for goals of retention VQO within 5 years after completion of the Project. This amendment would apply only for the duration of, and to those actions proposed in MA-10 for the site-specific project called Thorn Fire Salvage Recovery Project.* • See Effects Analysis Summary in Visual section. • *This amendment would be needed for Alternative 2. This amendment would not be needed for Alternative 3.*
WL 1	MA-13 (Dedicated Old Growth) • Need: The designated old growth areas burned in the Shake Table Complex fire do not meet suitable habitat requirements for dedicated old growth (DOGS) or replacement old growth (ROGS). • Amendment: Dedicated Old Growth Areas within the project area would be relocated to suitable habitat outside the fire area. The amendment would last beyond project duration and would remain in effect until the Forest Plan is amended or revised. • See Effects Analysis in Wildlife section. • *This amendment would be needed for both Alternatives 2 and 3.*
WL 2	MA-21 (Wildlife Emphasis with Non-Scheduled Timber Harvest) • Existing Standard: Forest Plan Standard #10, p. IV-133,- Exclude scheduled timber harvest. Lands are classified as "unsuitable" for timber management. Harvest may occur to accomplish wildlife habitat or fish habitat objectives, as established in a project-level environmental analysis: • Need: The economic value of the dead and dying trees needs to be recovered as rapidly as practicable to maximize potential economic benefits. • Amended Standard: *Lands are classified as "unsuitable for timber harvest", however, due to the catastrophic nature of the Shake Table Complex fire, timber harvest would occur in order to rapidly recover economic value of the dead and dying trees." This amendment would apply only for the duration of, and to those actions proposed in MA-21 for the site-specific project called Thorn Fire Salvage Recovery Project.* • See Effects Analysis Summary in Fisheries section and Wildlife section. • *This amendment would be needed for both Alternatives 2 and 3.*
WL 3	MA-21 (Wildlife Emphasis with Non-Scheduled Timber Harvest) • Existing Standard: Forest Plan Standard #5, p. IV-132, Develop a long-range plan for achievement of wildlife objectives through use of non-scheduled timber harvest.

FP Item #	Description of Proposed Forest Plan Amendment
	• Need: The economic value of the dead and dying trees needs to be recovered as rapidly as practicable to maximize potential economic benefits. • Amended Standard: *A long-range plan for achievement of wildlife objectives through the use of timber harvest would not be required due to the catastrophic nature of the fire event and the need to rapidly recover economic benefits. This amendment would apply only for the duration of, and to those actions proposed in MA-21 for the site-specific project called Thorn Fire Salvage Recovery Project.* • See Effects Analysis Summary in Wildlife section. • *This amendment would be needed for both Alternatives 2 and 3.*
WL 4	MA-20A (Wildlife Emphasis with Scheduled Timber Harvest) • Existing Standard: Forest Plan Standard #6, p. IV-123, - Develop a long-range plan for achievement of wildlife objectives through use of timber harvest that will be the basis of scheduled entries. • Need: The economic value of the dead and dying trees needs to be recovered as rapidly as practicable to maximize potential economic benefits. • Amended Standard: *A long-range plan for achievement of wildlife objectives through the use of timber harvest would not be required due to the catastrophic nature of the fire event and the need to rapidly recover economic benefits. This amendment would apply only for the duration of, and to those actions proposed in MA-20A for the site-specific project called Thorn Fire Salvage Recovery Project.* • See Effects Analysis Summary in Wildlife section. • *This amendment would be needed for both Alternatives 2 and 3.*
WL5	The Malheur Forest Plan was amended in 1995 by Regional Forester's Forest Plan Amendment #2 (commonly referred to as the "Eastside Screens"). Eastside Screen wildlife standard at 6d(2)(a). • *Existing Standard at 6d(2)(a): Maintain all remnant late and old seral and/or structural live trees >=21"dbh at currently exist within stands proposed for harvest activities.* • *Need: Modify East Side Screens wildlife standard at 6d(2)(a) to define both live and dead trees.:* • Amended standard: *(a) Maintain all remnant late and old seral and/or structural live trees >=21" diameter at breast height that currently exist within stands proposed for harvest activities. A live tree is defined as a tree rated to have a high or moderate probability to survive the effects of a fire as determined by the ``Factors Affecting Survival of Fire Injured Trees: A Rating System for Determining Relative Probability of Survival of Conifers in the Blue and Wallowa Mountains" (Scott et al. 2002, as amended) (commonly referred to as the Scott Guidelines). This amendment would apply only for the duration of, and to those actions proposed for the site-specific project called Thorn Fire Salvage Recovery Project.* • *See Effects Analysis* Summary in Wildlife section. • *This amendment would be needed for both Alternatives 2 and 3.*
WL 6	The Malheur Forest Plan was amended in 1995 by Regional Forester's Forest Plan Amendment #2 (commonly referred to as the "Eastside Screens"). The Interim wildlife standard in this amendment includes protection measures for goshawk. • Existing Standard: Protect every known active and historically used goshawk nest-site from disturbance. Seasonal restrictions (typically from April 1- September 30) on activities near nest sites will be required for activity types that may disturb or harass pair while bonding and nesting. • Need: There are no known goshawk nest sites existing in or adjacent to the project area. If nest sites are found during the 2007/2008 surveys, the project economic viability would be adversely affected if log haul is restricted during the period April 1 to September 30. • Amended Standard: Log haul would not be restricted if a nest site is found adjacent to a haul route." *All other protections would remain in force as noted in the Regional Foresters Amendment #2. This amendment would apply only for the duration of, and to those actions*

FP Item #	Description of Proposed Forest Plan Amendment
	proposed for the site-specific project called Thorn Fire Salvage Recovery Project. • See Effects Analysis Summary in Wildlife section. • *This amendment may be needed for both Alternatives 2 and 3 if goshawk nests are identified during 2007/2008 surveys.*

EMERGENCY SITUATION DETERMINATION

A request for an Emergency Situation Determination (36 CFR 215.10) would be sought from the Chief of the Forest Service[1].

PUBLIC INVOLVMENT

Initial scoping notices published in the Federal Register (12.08.2006) or sent to the public (141 addresses) via postal mail, indicated that two separate EIS projects were being considered (Thorn Project and Chrome Project). Subsequently direction was changed to propose and scope a single EIS project (TFSR Project) rather than two. An updated scoping letter (12.11.2006) was sent to the project mailing list and an updated NOI was published in the Federal Register (12.15.2006).

The Forest Service received initial scoping comments on the project from approximately 31 parties during scoping. Original letters, phone records, emails and other scoping comments are contained in the project files. A list of Tribal governments, Government agencies, organizations, businesses and individuals that were consulted and responded to the scoping is noted in Chapter 4, Section 4.2. Scoping comments were used to identify issues, concerns and potential alternatives.

SIGNIFICANT ISSUES

Internal and external scoping identified the following significant issues and these issues were used to develop the action alternatives and project design features. Issues were separated into significant issues and analysis issues. A definition of each issue group is discussed below:

- Significant issues are defined as those directly or indirectly caused by implementing the proposed action; however, the effects cannot be reduced by normal Best Management Prescriptions (BMPs) or Project Design Features (PDFs). Usually an alternative is developed to address significant issues.

- Analysis issues are defined as those directly or indirectly caused by implementing the proposed action; however, the effects could be reduced with normal (BMPs) and (PDFs), and an alternative was usually not developed to address these analysis issues. However, these analysis issues would be tracked in the relevant resource area effects analysis in Chapter 3 and in the Comparison of Alternatives section at the end of Chapter 2. Most of the issues for the TFSR Project fall into this category.

There were a total of 15 issues identified, with one significant issue and 14 analysis issues. Issues are discussed in detail in Chapter 1, Section 1.7 The project significant issue is noted below:

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

Table S- 2. Significant Issue

Issue Topic	Cause and Effect
1. Effects on semiprimitive nonmotorized recreation in Aldrich MA 10 area.	Salvage logging and removal of large trees resulting in a changed landscape by leaving a large number of stumps, and loss of cover could affect the experiences expected in a semiprimitive nonmotorized (SPNM) environment such as privacy, solitude and the possibility of experiencing natural ecosystems in an environment that is largely unmodified by human activity. The experiences associated with SPNM are represented/characterized in the planning area by the Aldrich Mountain SPNM area (MA 10) as mapped in the Malheur Land and Resource Management Plan (LMRP – 1990) • Alternative #3 was developed to address this significant issue. • Indicator(s): 1. Acres of salvage in (MA 10) Aldrich Mountain Area 2. Open Road density – miles/sq. mile 3. Recreation Opportunity Spectrum (ROS) standard. a. Remoteness indicator b. Naturalness indicator 4. Visual Quality Objectives (VQO) for retention.

ALTERNATIVES CONSIDERED IN DETAIL

The Forest Service developed three alternatives: the No Action, the Proposed Action, and one other action alternative generated in response to issues raised by the public. The three alternatives considered in detail for this analysis are listed in the table below. Project alternatives are discussed in detail in DEIS Chapter 2 – Section 2.2.

S- 3. List of Alternatives

No Action Alternative 1	The No Action is the baseline for comparing the other alternatives. No salvage of dead and dying trees would occur in the project area. A prior CE decision to salvage trees cut down during the Shake Table Fire Complex suppression actions and subsequent BAER process would still occur.
Proposed Action Alternative 2	This is the agency proposed action that would respond to the purpose and need. Commercial Salvage would occur on approximately 3,907 acres. An estimated 87 percent of the area would be helicopter logged, no new roads would be constructed and no Inventoried Roadless Areas would be entered. In addition, danger tree removal along an estimated 43.4 miles of roads would occur and post harvest planting would occur on approximately 6,428 acres.
Alternative 3	This alternative is in response to the significant issue (Issue #1) of the public's concern over salvage harvest and reforestation planting within the Management Area 10, Semiprimitive Nonmotorized Recreation Area. In this alternative, salvage would not occur in MA 10 area. Commercial Salvage would occur outside the MA 10 area on approximately 2,769 acres. Reforestation planting would still occur within MA 10. An estimated 85 percent of the area would be helicopter logged, no new roads would be constructed and no Inventoried Roadless Areas would be entered. In addition, danger tree removal along an estimated 43.2 miles of roads would occur and post harvest planting would occur on approximately 6,428 acres.

AFFECTED ENVIROMENT AND ENVIRONMENTAL CONSEQUENCES

The environmental consequences of implementing this project, by alternative, are described in detail in Chapter 3 of this document. However, at the end of Chapter 2 are a series of alternative comparison tables that provide a concise summary of the effects by the purpose and need, the significant issues, and the resource areas affected (e.g. Wildlife, Recreation). These tables are not repeated in this section in order to avoid duplication, but can be found in **Chapter 2, Section 2.4 - Comparison of Alternatives, on pages 44 to 52.**

IDENTIFICATION OF THE PREFERRED ALTERNATIVE

The Proposed Action (Alternative #2), with associated project design features (PDFs) and monitoring items, is the Agency Preferred Alternative.

This page left intentionally blank

1 PURPOSE AND NEED FOR ACTION

1.1 INTRODUCTION

The purpose of this analysis document is to disclose the proposed actions and environmental effects of salvaging dead and dying timber resulting from the Shake Table Fire Complex on the Malheur National Forest in the summer of 2006. The Shake Table Fire was a complex of 10 individual lightning caused fires ignited near Aldrich Mountain southeast of Dayville, Oregon on August 22, 2006. The Shake Table Complex was the name given to this cluster of fires which together burned 14,527 acres (13,536 on National Forest System Lands administered by the Blue Mountain Ranger District, Malheur National Forest. The Shake Table complex resulted in a high intensity burn in most of the upper drainages of Widows and Todd Creeks, and much of upper Fields Creek.

The project area (7, 783 acres) is that portion of the Shake Table Fire Complex area on National Forest System Lands, but excluding any Inventoried Roadless Areas (IRAs). The legal location is primarily in T14S, R28E and T15S, R28E, and area landmarks are the Aldrich Mountains and Chrome Ridge. The Shake Table Fire Complex occurred within the Upper John Day subbasin. Subwatersheds (6th field level) include Dry Creek, Fields Creek, Todd Creek, and Murderers Creek-Duncan Creek. These subwatersheds are delineated into 7th level subwatersheds including Widows Creek, West Dry Creek, Dry Creek, Wickiup Creek, Buck Cabin Creek and Upper Todd Creek. See Figure 1 for a general project location map for reference. Detailed project maps are in **DEIS Appendix A.**

Gary L. "Stan" Benes, Forest Supervisor of the Malheur National Forest, as responsible official, has decided to prepare an Environmental Impact Statement (EIS) to disclose environmental effects on a proposed action to recover the economic value of dead and dying trees damaged in the Shake Table Fire Complex, and remove potential danger trees from open forest travel routes within and outside the project area. The proposed action would be referred to as the **Thorn Fire Salvage Recovery Project** (abbreviated hereafter as TFSR Project)**.**

1.2 BACKGROUND INFORMATION

The Shake Table Fire Complex was a complex of 10 fires found in a cluster near Aldrich Mt southeast of Dayville, OR. The Shake Table Complex burned 14,527 acres, starting on August 22, 2006 from a lighting strike and resulted in a high severity burn in most of the upper drainages of Widows and Todd Creeks, and much of upper Fields Creek. See Figure 2 Photo. See **Appendix A-Figure A-4** for a fire severity map of the entire Shake Table Fire Complex area.

Figure 2. Shake Table Fire Complex – Late August 2006.

A Burned Area Evaluation Report (BAER) was completed (dated Sept 26, 2006) after the fire suppression actions and summarized the fire affected acres on

NFS lands by burn severity as:

- Acres Forest Service: 6,663 (unburned/low), 3,311 (moderate), 3,561 (high)

In addition the following post-fire resource conditions of concern were noted:

- Water-Repellent Soil (acres): (NFS land only)
    - severe repellency 3,600 acres; moderate repellency 850 acres
- Soil Erosion Hazard Rating (acres): NFS land only.
    - 200 (low), 3,200 (moderate), 10,100 (high)
- Erosion Potential: 13 tons/acre
- Sediment Potential: 666 cubic yards / square mile

The BAER Report noted that the primary objective of Burned Area Emergency Restoration is to take prompt actions deemed necessary and reasonable to protect, reduce or minimize significant threats to human life and property and prevent unacceptable resource degradation. The emergency treatments recommended by the BAER Assessment Team are specifically designed to achieve the following:

(1) Encourage soil stabilization and recovery of hydrophobic soil conditions through vegetative regeneration to maintain long term productivity and watershed hydrologic function.

(2) Reduce the possibility that flooding and debris flows could threaten infrastructure within the Malheur National Forest and residential and commercial developments in Widows, Fields and Todd Creek drainages.

(3) Encourage recovery of critical habitat for steelhead salmon.

(4) Provide for public safety and promote fire recovery by communicating the post fire hazards to the public, most noticeably – flooding hazards.

(5) Limit colonization of noxious weeds and invasive plant species onto Forest System lands.

The BAER Report recommended some specific rehabilitation and monitoring measures. The specific BAER treatments completed or pending are found in the BAER report in the project files. In addition, BAER actions that were completed or still pending are summarized in the **DEIS Appendix N – List of Potential Cumulative Actions.**

1.3 PURPOSE AND NEED FOR ACTION

Specific objectives have been developed for the purposes and need statements described below. Each objective briefly compares the existing condition and desired condition to show why actions are being proposed. Within each objective a link between the desired condition and management direction in the Malheur Forest Plan is provided.

(1) Recover the economic value of the dead and dying trees as rapidly as practicable to maximize potential economic benefits consistent with reasonable protection of other resource values; and,

(2) Improve public safety within the burned area by removing potential danger trees for public safety along open forest travel routes; and,

(3) Rapidly reforest areas burned in the Shake Table Fire to achieve Forest Plan objectives. These include restoration of big game habitat, riparian shade, visual quality, old growth habitat, stand structural development and timber production.

OBJECTIVE #1: TO RECOVER THE ECONOMIC VALUE OF FIRE-KILLED TIMBER

Field reconnaissance and post-fire satellite imagery were used to identify areas of low, moderate, and high mortality (burn severity) 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 TFSR project area, approximately 5,537 forested acres (includes very high, high and moderate fire severity acres) may have experienced first-order[2] fire effects severe enough to kill 75 percent or more of the trees (See Table 1). 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 would result in tree mortality.

Table 1. Acres by fire intensity in the TFSR project area.

Fire Severity	Acres
Very High	3,766
High	659
Moderate	1,112
Low	1,940
Unburned	306
Total Acres	7,783

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 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.

Timber harvesting plays an important role in the economic stability of the local area. There is a need to make wood products available for local, regional, and national needs to provide jobs in the most cost-effective manner, while being sensitive to resource conditions such as loss of ground vegetation during the fire, soil sensitivity to erosion, and steepness of slopes. There is a management objective and need to remove the fire-killed timber in a timely manner to ensure that the highest economic value is obtained prior to deterioration. The Malheur Forest Plan gives direction to provide public economic return and maximize outputs, consistent with the various resource objectives and environmental standards (Forest Plan goal 25 and 26, IV-2).

Ten non-significant Forest Plan amendments are proposed to allow recovery of the economic value of fire-killed timber. These are described in detail in Chapter 2 - Table 16.

[2] First order fire effects refer to the direct or immediate consequences of fire-caused heat injury (Reinhardt et al. 1997). Very high, high and moderate fire severity can produce first order fire effects and most of, if not all, of the trees are dead or dying.

OBJECTIVE #2: IMPROVE PUBLIC SAFTEY BY REMOVING DANGER TREES

During the Shake Table Fire Complex suppression efforts, trees that posed an imminent danger were removed; however, additional standing dead, dying, and unsound green trees that represent a threat and a danger to public safety have been identified. Within the burned vicinity there is a management objective and need to improve public safety by removing danger trees along open forest travel routes, forest trails, and haul routes used for timber sale activity. The LRMP Forest Plan gives direction to locate snags to minimize safety hazards (Forest Plan – Forest-Wide Standard #46). Forest Goal #35 – Operate and maintain a safe and economical transportation system.

OBJECTIVE #3: REFOREST BURNED TIMBER STANDS

The Shake Table Fire Complex burned areas with moderate to high fire intensity and those areas generally result in timber stands that have most of the trees killed or would die in the near future. There is the management objective and need to quickly reforest suitable timber stands in order to restore big game habitat, riparian shade, visual quality old growth habitat, stand structural stage development and timber production. The LRMP Forest Plan gives direction to reforest areas to restore habitats, and Forest Goals 10, 17 and 18 –relate to wildlife and fish habitat.

1.4 PROPOSED ACTION IN BRIEF

A brief description of the proposed action is provided in this section. The proposed action and other alternatives are described in detail in Chapter 2.

The TFSR project area totals approximately 7,783 acres. The proposed action includes salvage of dead and dying trees on approximately 3,907 acres of those acres and removal of potential danger trees for public safety for approximately 43.4 miles along haul routes and open forest travel routes. Salvage harvest methods would include ground-based and helicopter logging systems. Approximately 3,411 acres would be salvaged by helicopter (87%) and approximately 496 acres would be salvaged using ground-based yarding (13%). No activities are proposed within Appendix C Inventoried Dry Cabin, Cedar Grove and Shake Table Roadless Areas (See Appendix A-Figure A-9). Road activities associated with salvage and restoration would be limited to opening and re-closing existing roads, and maintenance. No new roads or temporary roads would be built. Following site preparation, approximately 6,428 acres would be planted with conifer seedlings within the project area. Forest Plan amendments related to modification of East Side Screens to define live and dead trees, old growth replacement, snag levels, visuals, timber harvest within Semiprimitive Nonmotorized Recreation Areas, and goshawks would be included. A request for an Emergency Situation Determination (36 CFR 215.10) would be sought from the Chief of the Forest Service. The proposed project area would be that area on Forest Service System Lands, within the fire boundary but excluding any Inventoried Roadless Areas. See Appendix A -Figure A-1 for project area.

1.5 MANAGEMENT DIRECTION

This section briefly summarizes the management direction that is applicable to the TFSR Project. The Malheur NF Land and Resource Management Plan (LRMP) (1990 as amended) give direction that is applicable to the proposed action.

1.5.1 RELATIONSHIP TO THE MALHEUR FOREST PLAN (LRMP)

This DEIS tiers to and relies upon the analysis found in the 1990 Final Environmental Impact Statement for the Malheur National Forest Land and Resource Management Plan 1990 (Forest Plan), as amended. Amendments include but are not limited to the Regional Forester's Eastside Forest Plan Amendment #2 and the Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (1995) (PACFISH). Those analyses are documented in the Final Environmental Impact Statement and Record of Decision for the Forest Plan, and the Interim Management Direction Establishing Riparian Ecosystem and Wildlife Standards for Timber Sales (Eastside Forest Plan Amendment #2), and other related documents. These documents are incorporated by reference, as appropriate, throughout this environmental assessment. The Forest Plan, as amended, contains Forest-Wide Standards and Guidelines as well as Standards and Guidelines for specific management areas.

REGIONAL FORESTER'S FOREST PLAN AMENDMENTS

Regional Forester's Eastside Forest Plan Amendment #2 (1995) is a Forest-Wide Standard and Guideline that contains direction for the development of timber sales. Amendment #2 changed standards for harvest of live trees, snag and down logs, goshawk habitat, connectivity of old forest, and riparian habitat. Salvage sales that do not harvest live trees, except for incidental live trees, are exempt from the ecosystem standards; but the riparian and wildlife standards still apply. The ecosystem standards do not apply since the only live trees to be cut are for landing construction or for safety. The riparian and wildlife standards still apply since they have concerns for resources still present in a recently burned forest (and could be affected by salvage harvest).

MANAGEMENT AREAS (MA)

Management areas define where different management activities may be carried out and where different kinds of public uses occur. The management area prescription guides the activities taking place within each management area. Management area prescription includes a management area theme, description, desired conditions and management area-specific standards and guidelines beyond that provided by the forest-wide standards and guidelines. The proposed TFSR project is within the following Malheur NF Management Areas (MAs) and summarized in the following table. MAs are described in detail in the Malheur LRMP, IV-46-139. **See DEIS Appendix A-7** for MAs in project area.

Table 2. Malheur NF Management Areas in TFSR Project area.

MA #	Management Area Name	Acres
#1- #2	General Forest - Rangeland	607
#3B	Anadromous Riparian Areas - RHCAs	1183
#4A	Big Game Winter Range	2,244
#10	Semiprimitive Nonmotorized Recreation	2,233
#13	Old Growth Habitat	371
#14	Visual Corridors, Middleground	446
#20A	Dry Cabin Wildlife Emphasis Area with Scheduled Harvest	420
#21	Wildlife Emphasis Area without Scheduled Harvest	279
	Total Acres	7,783

Management Area #1 – General Forest

Management Area #1 provides for timber production on a sustained yield basis while providing for other resource values. The goal is to develop equal distribution of age classes to optimize sustained timber production. Generally, acres for MA 1 and MA 2 (see below) are combined as acres for MA 2 are not separated. The Forest Plan establishes an objective in MA 1 of creating a healthy forest condition characterized by a variety of age classes, through control of stocking levels, species mix, and protection from fire, insects, disease, and other damage.

Management Area #2 – Rangeland (acreage included in MA 1)

Management Area #2 consists primarily of non-forested grasslands and low elevation ponderosa pine sites unsuitable for timber production, and is usually included as non-forested lands within other management areas, primarily MA 1 – General Forest. The goal of this MA is to emphasize forage production on a sustained yield basis while providing for other resources and values.

Management Area #3B – Anadromous Riparian Areas– and Riparian Habitat Conservation Areas

Management Area #3B consists of perennial streams and seasonally flowing streams, wetlands, and wet/moist areas such as meadows, springs, seeps, bogs, and wallows. The goal of MA 3B is to manage riparian areas to protect and enhance their value for wildlife, anadromous fish habitat, and water quality. MA 3B acres are also accounted for on an acre-basis within the Riparian Habitat Conservation Areas (RHCAs). The Forest Plan amendment (Regional Forester's Amendment 2) for the Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (1995) (PACFISH) amended the Description and Standards for this management area by creating a management area called Riparian Habitat Conservation Areas (RHCAs). However, MA3B includes areas not addressed in PACFISH, for which standard RHCAs were not defined; these areas include dry aspen stands and ephemeral draws.

Riparian-dependent resources receive primary emphasis in all RHCAs. All project actions must be in compliance with PACFISH. The project area is not under the direction from Inland Native Fish Strategy (1995) (INFISH) because it is contains anadromous fish. Therefore, INFISH direction was not used for this project.

Standard Riparian Habitat Conservation Area widths are as follows:

> Fish-bearing streams (Category 1: The area on either side of the steam extending from edges of active stream channel to the top of the inner gorge, or the outer edges of the 100-year floodplain, or the outer edges of riparian vegetation, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance (600 feet, including both sides of the stream channel), which ever is greatest.
>
> Permanently flowing non-fish-bearing Streams (Perennial Streams or Category 2): The area on either side of the stream extending from edges of active stream channel to the top of the inner gorge, or the outer edges of the 100-year floodplain, or the outer edges of riparian vegetation, or to a distance equal to the height of one site-potential trees, or 150 feet slope distance (300 feet, including both sides of the stream channel), which ever is greatest.
>
> Ponds, lakes, reservoirs, and wetlands greater than 1 acre (Category 3): the body of water or wetland and the area to the outer edges of the riparian vegetation, or to the extent of the seasonally saturated soil, or to the extent of moderately and highly unstable areas, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance from the edge of

the maximum pool elevation of constructed ponds and reservoirs or from the edge of the wetland, pond or lake, whichever is greatest.

Seasonally flowing or intermittent streams and wetlands less than 1 acre (Category 4): (1) The intermittent stream channel and the area to the top of the inner gorge, (2) the intermittent stream channel or wetland and the area to the outer edges of the riparian vegetation, and (3) the area from the edge of the stream channel or wetland to a distance equal to the height of one site potential tree, or 100 feet slope distance, which ever is greatest.

Management Area #4A – Big-Game Winter Range

Management Area #4A provides winter habitat for big game, including Rocky Mountain elk and mule deer. These areas are primarily below 5,200 foot elevation and include nonforested grasslands, bitterbrush and mountain mahogany brushfields, and forested lands Nonforested areas are generally on southern and western aspects. Landtypes and slope vary.

Primary goals for MA #4A are to maintain or enhance the quality of the winter range habitat for deer and elk through timber harvesting, prescribed burning, and other management practices. Manage for elk habitat by balancing cover quality, cover spacing, forage, and open road densities (LRMP IV-69-72).

Management Area #10 – Semiprimitive Nonmotorized Recreation Areas (SPNMA)

Management Area 10 consists of geographical areas on the Forest that are portions of, and lands adjacent to former inventoried roadless areas. The area that is within the TFSR project area includes the Aldrich Mountain SPNMA. The Aldrich Mountain Semi-primitive non-motorized area is adjacent to the Aldrich Mountain and Dry Cabin Inventoried Roadless Areas. A variety of physical and biological environments occur in these areas, both forested and nonforested, as determined by soil, slope, aspect, elevation, and climatic factors.

The primary goals of Management Area #10 are to protect, enhance, and maintain the natural beauty and character of the undeveloped areas through effective visitor-use and resource management. Manage to provide a wide range of semiprimitive nonmotorized recreation opportunities while protecting existing environmental quality. Manage to provide a high probability of experiencing tranquility and isolation from sights of human use and to test one’s self reliance and independence in an environment offering challenge and risk.

Management Area #13 – Old Growth

Management Area 13 is composed of mature and over mature trees (150 years or older). It is managed to provide: habitat for wildlife and plant species dependent on mature and over mature forest conditions; ecosystem diversity; and preservation of aesthetic qualities across the landscape. These areas are equally distributed across the Forest, providing an old growth network. Wildlife species dependent on these habitats include the pileated woodpecker and pine marten. MA-13 includes both dedicated and replacement old growth areas.

Replacement areas may not have all the characteristics of old growth, but are managed to achieve those characteristics so that when a dedicated old growth area no longer meets the needed habitat requirements, the replacement old growth can take its place.

Management Area 14 – Visual Corridors

Management Area 14 consists of visible and potentially visible landscapes along major travel routes, and state scenic waterways where the traveling public has a high to medium sensitivity to scenery. A portion of the project area is within Management Area 14 (Viewshed Corridors) and encompasses those areas that are seen from main roads. The goal of MA 14 is to manage corridors within scenic viewsheds with primary consideration given to their scenic quality and the growth of large diameter trees. Forest Plan Correction #1, dated January 31, 1995, allows salvage harvest in a visual corridor without a corridor viewshed plan. The direction is to manage the area with visual quality objectives of partial retention in the foreground and modification in the middleground while providing for other uses and resources. The area within Management Area 14 within the TFSR Project Area is in the middleground.

Management Area #20A – Dry Cabin Wildlife Emphasis Area - with scheduled timber harvest

Management Area 20A consists of lands adjacent to, the former Dry Cabin roadless area. The manageable boundary for this area is 15,829 acres. Within this boundary, 337 acres were previously considered part of Aldrich Mountain RARE II area and 1,200 acres overlap with old growth and are covered under Management Area 13. The area is located on the northwestern edge of the Malheur National Forest, the south side of the Aldrich Mountain Range, about 10 miles southeast of Dayville, Oregon. Stream courses include Chickenhouse Gulch and Cabin, Dry Cabin, Todd, North Duncan, and Duncan Creeks, plus many unnamed tributaries. Wildlife species of high public interest include Rocky Mountain elk and mule deer.

Goals for this MA are to maintain the natural beauty and character of the area through effective visitor-use and resource management. Provide opportunities for high quality semiprimitive dispersed recreation with emphasis on big game hunting. Manage for wildlife habitat and high quality water at the confluence with Murderers Creek, while allowing for scheduled timber harvest

Management Area #21 – Wildlife Emphasis Area with non-scheduled timber harvest

Management Area 21 consists of areas on the Forest that are in, or portions of, former roadless areas. A variety of physical and biological environments occur in these areas, both forested and nonforested, as determined by soil, slope, aspect, elevation, and climatic factors.

Manage to provide for high quality fish and wildlife habitat and water quality. Timber harvest would be on a non-scheduled basis and would be used only to meet a wildlife and/or fish habitat objectives. Provide opportunities for high quality semiprimitive dispersed recreation. Although road maintenance is allowed, overall objectives are to manage the area in an unroaded condition.

Other Ownership

All lands within the TFSR Project boundary are National Forest System lands. No other land ownership is directly affected by this proposal.

1.5.2 EXISTING LITIGATION STIPULATIONS

The Aldrich uninventoried unroaded portion of this project is covered under a prior litigation stipulation (Civil No. 97-1224-AA, dated March 16th, 1999. See **DEIS Appendix A-6** for the Aldrich Stipulation Area boundary. This agreement included the following stipulations for any management actions proposed within the Aldrich unroaded area:

- The FS would defer commercial timber harvest within the entire Aldrich uninventoried unroaded area, pending approval of a revised Malheur LRMP, except for timber harvest as a result of catastrophic damage.

- Any determination of whether catastrophic damage has occurred would be made by the Regional Forester for Region 6, after consultation with the Blue Mountains Natural Resources Institute in La Grande, Oregon.
- The FS also agreed to prepare an EIS for any proposal, prior to revision of the LRMP, to harvest catastrophically damaged timber within the Aldrich uninventoried unroaded area.

The Shake Table Fire Complex did impact the Aldrich unroaded area with catastrophic wildfire conditions, and the determination of catastrophic damage by the Regional Forester was given for the TFSR Project on December, 15th, 2006. In addition, the FS is preparing an EIS for the TFSR project.

1.6 PUBLIC INVOLVEMENT

The following sections summarize the actions taken to inform and request scoping comments from the general public, other agencies and governments, Tribal governments, permittees, organizations, groups, and individuals. All scoping letters and comments are contained in the project files. Initial scoping notices published in the Federal Register (12.08.2006) or sent to the public via postal mail, indicated that two separate EIS projects were being considered (Thorn Project and Chrome Project). Subsequently direction was changed to propose and scope a single EIS project (TFSR Project) rather than two. An updated scoping letter (12.11.2006) was sent to the project mailing list and an updated NOI was published in the Federal Register (12.15.2006).

1.6.1 SCOPING ACTIONS

Table 3 summarizes the scoping actions taken by the Malheur NF, including Federal Register Notices, press releases, public meetings and scoping letters sent to date. Requests for additional information were filled during and after the scoping period. Documentation of these scoping actions and any subsequent contacts are in the project files.

Table 3. Summary of Scoping Actions

Date	Scoping Item	Who/Where	Notes
2006.10.01	Project noted in Malheur NF Schedule of Proposed Actions (SOPA) on Forest Websites	Malheur NF website	Project listed for first time in the October, 2006, SOPA and in subsequent SOPAs.
2006.12.04	Mailing of Proposed Action Scoping Package (cover letter plus 4 pages including a map for each project) for Thorn Project and Chrome Project	Malheur NF project leader, John Day, Oregon	Scoping package sent out to 141 addresses by Malheur NF, Blue Mt. Ranger District.
2006.12.04	Scoping letter package sent to Burns Paiute Tribe, Confederated Tribes of the Umatilla Indian Reservation, Confederated Tribes of Warm Springs Reservation of Oregon and the Klamath Indian Tribe.	Malheur NF project leader, John Day, Oregon	Separate letters sent to Tribal leaders/contacts.
2006.12.08	NOI published in *Federal Register Vol. 71, No. 236, Friday, Dec. 08, 2006. Pg 71120-71122.*	*Federal Register*	Published NOIs for both the Thorn Project and Chrome Project.
2006.12.11	Second Scoping letter sent to project mailing list and tribal contacts.	Malheur NF project leader, John Day, Oregon	This 2nd scoping letter notified the public that the previous separate Thorn and Chrome Projects were combined into the single TFSR project.
2006.12.12	TFSR Project scoping package posted on	Malheur NF website	TFSR scoping package and map

Date	Scoping Item	Who/Where	Notes
	the Malheur NF public website		posted on Forest website.
2006.12.14	Cancellation Notice for Thorn Project and Chrome Project published in *Federal Register, Vol. 71, No. 240, Thursday, Dec. 14, 2006. pg 75227-75228*	*Federal Register*	Cancelled the separate Thorn and Chrome projects NOIs.
2006.12.15	NOI for TFSR Project published in *Federal Register Vol. 71, No. 241, Friday, Dec. 15, 2006. Pg 75480—75481.*	*Federal Register*	Published NOI for the TFSR Project.
2006.12.20	Third Scoping letter for TFRS Project.	Malheur NF project leader, John Day, Oregon	This 3rd scoping letter notified those additional addresses (25 addresses) inadvertently left off previous mail lists.
2006.12.20	Press Release for Public Meeting	Malheur NF PAO, John Day, Oregon	Press release to notify public of a planned public meeting for the TFSR Project scheduled for January 3, 2007.
2006.12.27	Newspaper Article in Blue Mt. Eagle	Blue Mt Eagle Newspaper, John Day, Oregon.	Article on the upcoming public meeting for the TFSR Project on January 3rd, 2007.
2006.12.29	Newspaper Article in Blue Mt. Eagle	Blue Mt Eagle Newspaper, John Day, Oregon.	Article on the rehabilitation efforts for the Shake Table Fire Complex and subsequent BAER actions.
2007.01.03	Public Meeting	Malheur NF, Supervisors Office, John Day, Oregon	Public meeting to inform the public on the TFSR Project. Approximately 26 individuals attended.

TRIBAL GOVERNMENT CONSULTATION

Scoping letters were mailed to four Tribal governments (Burns Paiute Tribe, Confederated Tribes of the Umatilla Indian Reservation, Confederated Tribes of the Warm Springs Reservation of Oregon and Klamath Indian Tribe). Comments were received from Confederated Tribes of the Warm Springs Reservation of Oregon.

1.6.2 SCOPING LETTERS AND COMMENTS RECEIVED

The Forest Service received initial scoping comments on the project from approximately 31 parties during scoping. Original letters, phone records, emails and other scoping comments are contained in the project files. A list of Tribal governments, Government agencies, organizations, businesses and individuals that were consulted and responded to the scoping is noted in Chapter 4, Section 4.2. Scoping comments were used to identify issues, concerns and potential alternatives.

1.7 ISSUES

Scoping[3] is used to identify issues that relate to the effects of the proposed action. An issue is an unresolved conflict or public concern over a potential effect on a physical, biological, social, or

[3] Scoping is defined as the procedure by which a Federal Agency identifies important issues and determines the extent of analysis necessary for an informed decision on a proposed action. Scoping is an integral part of environmental analysis. Scoping includes refining the proposed action, determining the responsible official and lead and cooperating agencies, identifying preliminary issues, and identifying interested and affected persons. The results of scoping are used to identify

economic resource as a result of implementing the proposed action and alternatives to it. An issue is not an activity; instead, the projected effects of the proposed activity create the issue. Issues are generated by the public, other agencies, organizations, and Forest Service resource specialists and are in response to the proposed action. Issues provide focus for the analysis of environmental effects and may influence alternative development, including development of project design features and any additional mitigation measures. In this document issues are tracked and are used to display differing effects of the proposed action and the alternatives.

The issues were separated into three groups for the purpose of this analysis: Significant issues, Analysis Issues and Issues Eliminated from Detailed Study. The Council for Environmental Quality (CEQ) NEPA regulations give guidance (40 CFR Sec. 1501.7) to "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)". A definition of each issue group is discussed below:

- Significant issues are defined as those directly or indirectly caused by implementing the proposed action; however, the effects cannot be reduced by normal Best Management Prescriptions (BMPs) or Project Design Features (PDFs). Usually an alternative is developed to address significant issues.

- Analysis issues are defined as those directly or indirectly caused by implementing the proposed action; however, the effects could be reduced with normal BMPs and PDFs and an alternative was usually not developed to address these analysis issues. However, these analysis issues would be tracked in the relevant resource area effects analysis in Chapter 3 and in the Comparison of Alternatives section at the end of Chapter 2- Section 2.4. Most of the issues for the TFSR Project fall into this category.

- Issues Eliminated from Detailed Study are identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality (CEQ) NEPA regulations require identification and elimination from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3). The public scoping responses was very focused on this specific project and only a few issues were categorized into this group.

The IDT identified potential issues and the Responsible Official approved those issues to be carried through the analysis as either significant issues or analysis issues in order to fully develop and allow further comparison of the proposed action and alternatives. An IDT issue identification summary document is in the project record files. The environmental consequences of the proposal are disclosed in Chapter 3 for each resource affected by the significant or analysis issues. Each issue has indicators to allow members of the public and the Responsible Official to determine how well issues are addressed by the alternatives (See Comparison of Alternatives section at the end of Chapter 2 for effects of the alternatives on issues). A discussion of all issue groups, specific issues and the indicator(s) for each issue is given below.

1.7.1 SIGNIFICANT ISSUES

Table 4 below lists the significant issues considered for this analysis generated from public comments and/or the project interdisciplinary team (IDT).

---

public involvement methods, refine issues, select an interdisciplinary team, establish analysis criteria, and explore possible alternatives and their probable environmental effects.

Table 4. List of Significant Issues

Issue Topic	Issue Statement and Issue Indicator(s)
2. Effects on semiprimitive nonmotorized recreation in Aldrich MA 10 area.	Salvage logging and removal of large trees resulting in a changed landscape by leaving a large number of stumps, and loss of cover could affect the experiences expected in a semiprimitive nonmotorized (SPNM) environment such as privacy, solitude and the possibility of experiencing natural ecosystems in an environment that is largely unmodified by human activity. The experiences associated with SPNM are represented/characterized in the planning area by the Aldrich Mountain SPNM area (MA 10) as mapped in the Malheur Land and Resource Management Plan (LMRP – 1990) • Alternative #3 was developed to address this significant issue. • Indicator(s): 5. Acres of salvage in (MA 10) Aldrich Mountain Area 6. Open Road density – miles/sq. mile 7. Recreation Opportunity Spectrum (ROS) standard. a. Remoteness indicator b. Naturalness indicator 8. Visual Quality Objectives (VQO) for retention.

1.7.2 ANALYSIS ISSUES

Table 5 below lists the analysis issues considered for this analysis generated from public comments and/or the project interdisciplinary team.

Table 5. List of Analysis Issues

Issue Topic	Issue Statement and Issue Indicator(s)
3. Effects on Soils	Ground-based salvage logging could have adverse impacts on detrimentally disturbed soil in fire affected areas. Detrimental soil disturbance from salvage actions could increase soil compaction, decrease site productivity, accelerate erosion, and increase sediment delivery to streams, especially on soils burned with high and moderate severity. • Project design features were developed to address this analysis issue and reduce impacts to the soils resource. Approximately 87 percent of the salvage acres would be harvested with helicopter logging to reduce impacts of heavy equipment on soils. • Indicator(s): 1. Detrimental Disturbed Soils Standard of < 20% by unit
4. Effects on Watersheds, Water Quality, Sedimentation and Erosion	Areas burned in the Shake Table Fire Complex are especially susceptible to accelerated runoff, erosion, and sedimentation. Salvage harvest actions, reforestation, and road use may affect erosion rates, sedimentation loads and water quality. • Project design features were developed to address this analysis issue and reduce impacts to the watershed resource. RHCA buffers are used per PACFISH standards. • Indicator(s): 1. Sediment yields 2. Impacts to RHCAs
5. Effects on Fish Habitat and Fish Species	Anadromous and resident fish habitat is an important resource in the project area. Salvage activities, such as timber harvest, reforestation, and system road actions are ground disturbing activities. These activities could potentially increase

<table>
<tr><th>Issue Topic</th><th>Issue Statement and Issue Indicator(s)</th></tr>
<tr><td></td><td>sedimentation and stream turbidity, and the amount and timing of overland flow, which could affect fish habitat for resident and listed anadromous species.
• Project design features were developed to address this analysis issue and reduce impacts to the fish resource. RHCAs are buffered per PACFISH standards. No salvage would occur in RHCAs.
• <u>Indicator</u>(s):
1. Fish BE/BA determinations by fish species
2. PACFISH determinations
3. Sediment yields</td></tr>
<tr><td>6. Effects on snag retention and snag dependent wildlife species</td><td>Salvage logging could potentially have impacts on cavity dependent species by removing dead and dying trees that provide snag habitat for snag-dependent species. Salvage logging activities could adversely affect management indicator species, including primary cavity excavators. Wildlife species use burned forest habitats differently than live, green forests. Snag density, size, and distribution influence use levels and vary by individual species.
• Project Design Features were developed to address this analysis issue and reduce impacts to snag levels and snag-dependent species. The DecAID advisory tool was used to develop recommendations for snag retention in the fire area, project area and treatment units. Effects to dead wood habitats were analyzed using comparisons to Forest Plan standards, inventory and wildlife data in the DecAID advisory tool, and future estimates of snags based on FVS runs.
• <u>Indicator</u>(s):
1. # Snags per acre retained in harvest units
2. Treated acres (% of forested acres in Shake Table fire)
3. Untreated acres (% of forested acres in Shake Table fire)
4. Comparison to Forest Plan standards
5. DecAID advisory tool results
6. Length of snag gap[1]
[1] Length of time in future when snags are not available because all snags have fallen and new green trees are not large enough to provide snag replacements.</td></tr>
<tr><td>7. Effects on Down Wood (Coarse Woody Debris - CWD) recruitment</td><td>Salvage actions that remove large amounts of dead trees may result in a shortage of available wood to fall to the ground and provide for long-term soils productivity.
• Project Design Features were developed to address this analysis issue and reduce impacts to the existing down wood resource. Minimum 10-tons/acre of CWD would be left in each harvest unit area. Trees would be lopped and tops and branches would be left on-site. In addition, sufficient snags would be retained in treatment units to provide for future down logs at or above Forest Plan standards.
• <u>Indicator</u>(s):
1. Tons/acre CWD remaining on site</td></tr>
<tr><td>8. Impacts of increased activity fuels</td><td>There is an issue that salvage actions may result in large amounts of activity fuels left on-site, and that would result in an increased fire risk in those stands. After a wildfire, much of the ground and ladder fuels are eliminated or reduced significantly. In fact, large wood and smaller diameter wood is desirable to be left on site after fires and salvage logging to maintain soil productivity and provide wildlife habitat.
• Project Design Features were developed to address this analysis issue and keep activity fuels levels and desirable CWD levels balanced.
• <u>Indicator</u>(s):
1. Tons/acre fuels (3” diameter and less) remaining
2. Tons/acre fuels (> 3” diameter) remaining</td></tr>
</table>

Issue Topic	Issue Statement and Issue Indicator(s)
9. Effects of re-opening closed roads and effects on open road density	Re-opening closed level 1 system roads for salvage harvest used would impact wildlife, introduce noxious weeds and temporarily increase open-road density. • Project Design Features were developed to address this analysis issue. Any roads closed prior to salvage action would be closed post activities. PDFs are proposed to reduce the risk of invasive species/noxious weeds being introduced into the project area. • Indicator(s): 1. Open road density pre and post project 2. Open road density during project implementation 3. Wildlife analysis impact determination to wildlife
10. Impacts of invasive species and noxious weeds	Noxious weeds and other invasive species would be introduced into the project area on disturbed soils by salvage logging equipment, landing construction, road use and logging traffic. • Project Design Features were developed to address this analysis issue and reduce the risk of invasive species/noxious weeds being introduced into the project area. • Indicator(s): 1. Estimated acres of ground-based tractor harvest 2. Miles of road maintenance impacts 3. Estimated helicopter landings constructed
11. Effects on T&E species and FS Sensitive species	Aquatic, terrestrial, and plant T&E and FS Sensitive species and their habitats could be affected by proposed salvage activities. • Project Design Features were developed to address this analysis issue and reduce the impacts to T&E and Sensitive species. • Indicator(s): 1. Wildlife, Fish and Plant BE/BA determinations and analysis for TE&S species
12. Effects on Dedicated Old Growth areas	Dedicated Old Growth areas (DOGs) were identified in the project area and stand replacing fire affected DOGs in the project area that may need to be replaced. Salvage logging and associated activities could change the quantity, quality, and sustainability of DOGs, ROGs and PWFAs. • Project Design Features were developed to address this analysis issue and reduce the impacts to DOGs/ROGs/PWFAs. • Indicator(s): 1. Acres of Dedicated Old Growth areas (DOGS) Replacement Old Growth Areas (ROGs), and Pileated Woodpecker Feeding Areas (PWFAs).
13. Impacts to P.W. Schneider Wildlife Management Area (ODFW area)	Salvage activities could impact big-game critical wintering habitat in the adjacent Oregon Dept. of Fish and Wildlife P.W Schneider WMA. • Project Design Features were developed to address this analysis issue and reduce the impacts to big-game wintering habitat. • Indicator(s): 1. Impacts to Big-game wintering habitat and big game populations as noted in wildlife analysis section
14. Effects on Cultural Resources	Salvage activities could impact known or unknown cultural resource sites exposed by the Shake Table Fire Complex. • Project Design Features were developed to address this analysis issue and reduce or eliminate impacts to any known cultural resource sites. In addition, surveys would be completed in areas of disturbance (landings) prior to those actions. . • Indicator(s):

Issue Topic	Issue Statement and Issue Indicator(s)
	1. Impacts to cultural resources - # sites disturbed
15. Negative economic impacts	There is an issue that FS projects to salvage fire-killed timber costs more to plan and implement than the economic value returned to the public. • Project salvage design is to maximize economic return while reducing impacts to the affected resources. In addition, salvage is planned before the economic value of the fire-killed timber is reduced by weathering and checking. • Indicator(s): 1. MMBF salvaged 2. PNV $$ returned
16. Bark Beetles	Bark beetles could increase in fire-injured trees and cause additional tree mortality both inside and outside the project area. • Indicator(s): 1. Analysis in the Silviculture section.

1.7.3 ISSUES ELIMINATED FROM DETAILED STUDY

Table 6 below lists issues eliminated from detail study for this analysis:

Table 6. List of Issues Eliminated from Detailed Study

Issue Topic	Issue Statement and Issue Indicator(s)
17. Use of Scott Guidelines[4] (dying trees identification) process	A number of respondents, who commented during the scoping period, expressed concern the proposed action would harvest trees that may have lived. The controversy centers on the use of the Scott Guidelines to determine what constitutes a dead tree in a post-fire context and how that determination is made. • The Scott Guidelines (as amended) would be applied using trained crews and adequate supervision. • DEIS Appendix B-10 includes discussion of alternative methods and why the Scott guidelines are the best and most practical for use in this project.
18. Effects on natural conifer regeneration success and natural conifer seed sources	Salvage of large cone-bearing trees would reduce any remaining live seed trees that could provide natural seed sources for natural conifer regeneration. Trees with green needles may survive even if Scott Guidelines indicate a low probability of survival. • The use of the Scott Guidelines (as amended) would be done with trained crews and adequate supervision. Only trees that have a low probability of survival would be harvested. Any tree with a higher probability of survival would be left.
19. Impacts of planting trees on natural systems	There is a concern by the public that reforestation is not needed and that planting with seedlings grown in a FS nursery would not achieve goals for a natural system. • Seedlings for reforestation would come from appropriate seed sources for this area. Site-adapted seed sources are selected from trees all over the Malheur NF for use by FS nurseries to grow for site-adapted seedling stock. Seedlings used would be from local Malheur seed stock collections.
20. Use of Forest Plan Amendments	There is a perception by the public that the Malheur NF is using Forest Plan amendments to allow projects to move forward and violate FP Standards and Guidelines.

[4] Scott, Donald W.; Schmitt, Craig L.; Spiegel, Lia; Factors Affecting Survival of fire Injured Trees: A Rating System For Determining Relative Probability of Survival of Conifers in the Blue and Wallowa Mountains (Amended 2006). BMPMSC-0301, 2006.

Issue Topic	Issue Statement and Issue Indicator(s)
	• Malheur Forest Wide Standard #3 states: "If it is determined during project analysis that the best way to meet the management area goals of the forest plan conflicts with a Forest Plan Standard, the Forest Supervisor may approve a non-significant amendment to that standard for that project; such exemptions and the rationale must be described in the project's documentation.
21. Impacts of a loss of economic value by not salvaging in Inventoried Roadless Areas (IRAs)	There is an issue that not salvaging timber in the IRA affected by the Shake Table Fire Complex is a significant loss of economic value. • Current national IRA management direction only allows incidental tree harvest subject to restrictions noted in IRAs (36 CFR 294.13). Lost of economic value is not applicable as a primary reason to timber harvest in IRAs.

1.8 DECISION FRAMEWORK

This Draft EIS is not a decision document. Its main purpose is to disclose the potential consequences of implementing a proposed action and alternatives to that action. Comments on the DEIS are used to prepare a final EIS. After reviewing the final EIS and public comments, the responsible official would issue a Record of Decision (ROD) documenting which alternative has been selected and why.

The scope of the project and decisions to be made are limited to:

- Commercial salvage and potential hazard tree removal along open forest routes, reforestation, salvage haul routes, and road maintenance.
- Potential Forest Plan amendments.
- Request for an Emergency Situation Determination from the Chief of the Forest Service.
- Best Management Practices, project design features (PDFs) and monitoring tasks within the project area.

This project and any subsequent decisions are limited to National Forest System lands. The Responsible Official for this proposal is the Forest Supervisor of Malheur National Forest. The decision would 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.

<u>The Responsible Official can decide to:</u>

- 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, and
- Identify what project design features, monitoring tasks, and any additional mitigation measures would apply, and
- Amend the Malheur National Forest LRMP to incorporate Forest Plan Amendments, and
- Request an Emergency Situation Determination[5] from the Chief of the Forest Service in order to avoid substantial loss of economic value.

---

[5] **Definition of Emergency Situation from §36 CFR 215.10**

Emergency situation - 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 those 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.

This page left intentionally blank

2 ALTERNATIVES, INCLUDING THE PROPOSED ACTION

2.1 INTRODUCTION

This chapter describes and compares the alternatives considered for the TFSR project. It includes a description and map of each alternative considered along with a list of criteria for locating potential routes. This section also presents the alternatives in comparative form, defining the differences between each alternative and providing a basis for alternative selection. Some of the information used to compare the alternatives is based upon the design of the alternatives and some of the information is based upon the environmental, social and economic effects of implementing each alternative.

2.2 ALTERNATIVES CONSIDERED IN DETAIL

The Forest Service developed three alternatives: the No Action, the Proposed Action, and one other action alternative generated in response to issues raised by the public. The three alternatives considered in detail for this analysis are listed in Table 7 below.

Table 7. List of Alternatives

No Action Alternative 1	The No Action is the baseline for comparing the other alternatives. No salvage of dead and dying trees would occur in the project area. A prior CE decision to salvage trees cut down during the Shake Table Fire Complex suppression actions and subsequent BAER process would still occur.
Proposed Action Alternative 2	This is the agency proposed action that would respond to the purpose and need. Commercial Salvage would occur on approximately 3,907 acres. An estimated 87 percent of the area would be helicopter logged, no new roads would be constructed and no Inventoried Roadless Areas would be entered. In addition, danger tree removal along an estimated 43.4 miles of roads would occur and post harvest planting would occur on approximately 6,428 acres.
Alternative 3	This alternative is in response to the significant issue (Issue #1) of the public's concern over salvage harvest within the Management Area 10, Semiprimitive Nonmotorized Recreation Area. In this alternative, salvage would not occur in MA 10 area. Commercial Salvage would occur outside the MA 10 area on approximately 2,769 acres. Reforestation planting would occur in MA 10. An estimated 85 percent of the area would be helicopter logged, no new roads would be constructed and no Inventoried Roadless Areas would be entered. In addition, danger tree removal along an estimated 43.2 miles of roads would occur and post harvest planting would occur on approximately 6,428 acres.

2.2.1 NO ACTION - ALTERNATIVE 1

This is the baseline used to compare the effects of the proposed action and alternatives. Under the No Action Alternative, no salvage of fire-killed timber would occur, no reforestation would occur and no danger tree removal would occur. However, a prior decision to salvage trees cut down during the Shake Table Fire Complex suppression actions and subsequent BAER process would still occur. Other ongoing actions such as recreation, hunting, firewood gathering would continue as permitted.

2.2.2 PROPOSED ACTION - ALTERNATIVE 2

This action includes salvage of dead and dying trees from approximately 3,907 acres and removal of potential danger trees for public safety along 43.4 miles of haul routes and open forest travel routes. Salvage harvest methods would include ground-based (13%) and helicopter logging systems (87%). Approximately 3,411 acres of the harvest area would be salvaged by helicopter and approximately 496 acres would be salvaged using ground-based yarding. No commercial harvest or road maintenance is proposed within Appendix C Inventoried Dry Cabin, Cedar Grove and Shake Table Roadless Areas (**See DEIS Appendix A-9**). Road activities associated with salvage and reforestation would be limited to opening and re-closing existing roads, and maintenance. No new roads would be built. Approximately 24 landings would be used to facilitate helicopter harvest operations and tractor harvest would need approximately 40 landings. Existing landings would be used where available. Following site preparation, as many as 6,428 acres would be planted. Forest Plan amendments related to modification of East Side Screens to define live and dead trees, old growth replacement, snag levels, visuals, timber harvest within Semiprimitive Nonmotorized Recreation Areas would be needed (See Table 16). In addition, a request for an Emergency Situation Determination (36 CFR 215.10) would be sought from the Chief of the Forest Service. The proposed project area would be that area on Forest Service System Lands, within the fire boundary outside Appendix C Inventoried Roadless Areas. See Table 8 for a summary list of project activities.

Table 8: Proposed Action: Summary of Salvage Treatments and Road Management Activities.

Salvage Harvest Treatment Description	Acres
Helicopter yarding	3,411
Tractor skidding	496
Commercial salvage harvest (total)	3,907
Reforestation Activities	Acres
Reforestation planting	6,428
Road Management Activities	Miles
Danger tree removal along roads	43.4
Maintenance of Existing Classified Roads (Haul Routes)	55.5

DANGER TREE REMOVAL

Danger trees have an imminent or likely potential to fail. Danger trees would be felled along all haul routes used for timber sale activity (regardless of maintenance level), and maintenance level 3, 4, and 5 Forest roads. Danger trees would be felled along an estimated 43.4 miles of roads (within 150' on each side of roads for a total buffer width of 300') inside and outside the project area boundary (see Table 9 below). An estimated 4 danger trees per mile would be removed along roads outside of the project area. Within the project area, danger tree numbers vary depending on burn severity; an estimated 8 trees per mile would be removed along areas of moderate burn severity, and 60 trees per mile would be removed along areas of very-high burn severity. Danger trees that are within Riparian Habitat Conservation Areas (RHCAs) would be cut and left to provide additional coarse woody debris. All other merchantable danger trees would be removed and sold as part of a salvage sale if economically feasible. Identification of potential danger trees would follow Regional guidelines[6]. Slash from danger trees would remain in place, on site. Concentrations of slash in key visual areas would be hand-piled and burned or chipped.

[6] Toupin, Richard; Michael Barger; Field Guide for Danger Tree Identification and Response; USDA Forest Service, Forest Health Protection, Pacific Northwest Region. 2005.

Table 9. Proposed Action - Danger Tree Removal Summary.

Treatment	Miles[1]
Danger trees within project boundary	8.5
Danger trees outside project boundary	34.9
Total miles	43.4
Treatment	Acres[2]
Danger trees within project boundary	289
Danger trees outside project boundary	1252
Total acres	1541

[1] An estimated 4 danger trees per mile would be removed along roads outside of the project area. Within the project area, danger tree numbers vary depending on burn severity; an estimated 8 trees per mile would be removed along areas of moderate burn severity, and 60 trees per mile would be removed along areas of very-high burn severity .
[2] Acres estimated using a 300 ft buffer, 150' each side of road

SALVAGE HARVEST

Salvage harvest would cut and remove merchantable logs from dead and dying trees 9 inches diameter at breast height (DBH) and greater. A summary of salvage actions and estimated net salvage volume is displayed in Table 11 and Table 12. Dying trees designated for salvage harvest would be selected based on published guidelines for estimating fire-caused mortality[7]. The published guidelines are referred to as the "Scott Guidelines" and these guidelines are a rating system that enables the determination of relative tree survival up to one year after the fire. Dying trees to be salvage harvested would have a low probability of survival based on Scott Guidelines.

Trees within areas of very high burn severity with any green foliage would remain uncut and only trees with no remaining green foliage would be harvested. Trees with no remaining green foliage and trees with a low probability of survival would be salvaged within areas of low, moderate and high burn severity (See Table 10 below).

Table 10. Burn Severity and Salvage Harvest Tree Selection

Burn Severity	Salvage Harvest Tree Selection
Low	Dead and low probability of survival
Moderate	Dead and low probability of survival
High	Dead and low probability of survival
Very High	Dead only, trees with no green needles

Salvage harvest operations would include landing construction adjacent to existing roads. Logs are skidded or flown to landings and decked prior to truck transport. Twenty-four possible helicopter landings are identified on proposed action maps. Helicopter landing size would range from one to four acres, depending on topography. Tractor harvest would need approximately 40 landings and landing size would range from 1/10 to two acres. Existing landings would be used where possible. In

[7] Scott, Donald W.; Schmitt, Craig L.; Spiegel, Lia; Factors Affecting Survival of fire Injured Trees: A Rating System For Determining Relative Probability of Survival of Conifers in the Blue and Wallowa Mountains (Amended 2006). BMPMSC-0301, 2006.

some cases landing locations may require felling of healthy, live trees (may include incidental amounts of live trees greater than 21 inches) to facilitate safe, efficient, cost-effective operations.

Tree felling would be accomplished by manually operated chainsaws or mechanized fellers, however mechanized felling equipment (feller bunchers) would be limited to units designated for tractor skidding.

Table 11. Salvage Harvest Area Summary

	Burn Severity				
Logging System	Low	Moderate	High	Very High	Total
Helicopter	816	459	358	1,778	3,411
Tractor	203	9	20	264	496
Total	1,019	468	378	2,042	3,907

Table 12. Salvage Harvest Volume

Harvest System	Net Sawtimber Volume – MBF[1]
Tractor	4,735
Helicopter	36,690
Total	41,425
Harvest volume may be lower due to minor changes during layout and areas eliminated from harvest through project design features	

REFORESTATION

Burned areas would be reforested through site preparation and hand planting, or prescribed natural regeneration. As many as 6,428 acres would be planted, and site preparation for planting would be limited to a 2' square scalp at each tree planting site to clear away debris or vegetation that may interfere with planting a tree, and to reduce competing vegetation immediately adjacent to planted seedlings. Trees would be placed when possible into favorable micro-site to take advantage of favorable site and provide irregular spacing of planted trees. Hand planting of conifer seedlings is proposed for all harvest units that became non-stocked or under-stocked as a result of the fire, or as a result of secondary fire effects (insects and disease). All units with very high, high, or moderate burn severity are planned for hand planting. Units or parts of units that burned at low severity, but have inadequate forest understory would be planted. Ponderosa pine would be planted on the lower and warmer environments. Other units would be planted with a mix of ponderosa pine, Douglas-fir and western larch. Planting density would be determined after salvage and slash treatments are completed, however planting densities are expected to range between 170 and 350 seedlings per acre. Planting of salvage harvest units is required by Regional Forester policy and is considered essential K-V[8] reforestation. See Table 13 for a summary of reforestation planting acres.

Table 13. Proposed Action, Reforestation Summary

Planting	Acres
Within harvest units	3404
Outside harvest units	3024
Total	6428

[8] K-V indicates funds available for reforestation and timber sale area improvement under the Knutsen-Vandenburg Act.

Planting is also planned for Alaska yellow cedar stands, but only in those stands outside of the Cedar Grove Botanical Area / IRA. After the fire, seed was collected from surviving cedars specifically to re-establish seedlings in this area.

Planting is planned along Road 2150 in the burned area, but outside salvage units, to accelerate recovery of visual objectives along this popular route.

Planting is proposed for all other burned areas in the project area that supported forested cover prior to the fire and is now under-stocked or non-stocked. This includes re-planting the Widows Creek burn area, and areas within ¼ mile of salvage harvest units. It also includes planting in Riparian Habitat Conservation Areas (RHCA), which could include conifer and hardwood planting, if native hardwood planting stock such as aspen, dogwoods, and cottonwood, are available. Planting outside salvage harvest units is desirable, but not required, and would be accomplished with non-essential KV or appropriated funds if and when they become available. Seedlings may need protection from animal damage; however the need is not known, and is not planned for the first year after planting. Specific techniques for protecting seedlings from animal damage are available. If planting success is diminished because of animal damage, then netting could be used to protect seedlings.

SLASH TREATMENTS

Trees to be salvaged would be limbed and topped on-site within areas designated for helicopter yarding and areas of high or very high burn severity designated for tractor skidding.

Tree tops would be removed within the areas of low and moderate burn severity designated for tractor skidding. Limbs would remain on site. The tops would be piled and burned at landings.

The intent is to leave unmerchantable trees standing. Timber sale purchasers would not be required to remove non-saw logs. Incidental amounts of non-sawlog material skidded or yarded to the landing would be decked separately and made available for public firewood use based on availability and location. Where possible, non-saw logs would be decked near access roads to prevent disturbance to rehabilitated landings.

Concentrations of slash within immediate foreground (300 feet) of Aldrich Ridge Road (2150), Cedar Grove National Scenic Trail, dispersed campsites, and Fields Creek Road (21) would be hand-piled and burned or chipped.

AREA CLOSURE FOR PUBLIC SAFETY

For public safety during harvest operations, National Forest lands within the salvage area will be closed to all public entry, including foot travel. In addition, Forest Service Roads 2140, 2150 and 2170 and associated roads will be closed to all vehicles to reduce safety concerns associated with logging and log haul. An area closure[9] to motorized use is currently in effect for the Shake Table Fire Complex Area with the exception of Road 2150. During harvest operations Road 2150 within the Shake Table Fire Complex Area would be closed to public use

TRANSPORTATION SYSTEM

Approximately 55.5 miles of existing roads would be used to transport (haul) the harvested logs (See Table 14. These roads would receive maintenance prior to the commencement of log hauling.

[9] Malheur National Forests Order Number 060401-011-07

Table 14. Summary of Haul Road Maintenance

Haul Road Maintenance	Miles
Inside project area	20.4
Outside project area	35.1
Total	55.5

The existing gate on Road 2140 located 0.3 miles west of the junction with Road 2100 would be closed prior to commercial harvest activities, during commercial harvest activities, through completion of reforestation activities. Upon completion of reforestation activities area roads would be returned to pre-fire conditions. Roads to be closed are displayed on the Post Project Closure map. Earth berms would block vehicle traffic. Table 15 summarizes the post-sale road access within the project area.

Table 15. Post-sale Road Access

Road Access	Miles
Closed to use	1.2
CFR Closed to use	10.7
Open to use	19.3

PROJECT DESIGN FEATURES AND MONITORING TASKS

See Table 24 and Table 25 for a complete list of design features applicable to the alternatives and the list of specific monitoring tasks.

PROPOSED FOREST PLAN AMENDMENTS

This proposed action would require several Forest Plan Amendments. The specific plan amendments would be determined by the effects analysis of the Proposed Action and any alternatives on the specific resource area. Proposed amendments are noted in the following table:

Table 16. List of Proposed Forest Plan Amendments

FP Item #	Description of Proposed Forest Plan Amendment
Recreation 1	MA-10 – Semi-Primitive Non-Motorized • Existing Standard: Forest Plan Standard #1, p. IV-97. Manage dispersed recreation for goals of semi-primitive non-motorized recreation. Ensure that the Recreation Opportunity Spectrum (ROS) setting criteria for social encounters and remoteness are met. • Need: Alternative 2 would not meet recreation standard direction for goals of semi-primitive non-motorized recreation as it is anticipated that harvest activities of the dead and dying trees due to a catastrophic event in Alternative 2 may result in changes from a naturally appearing environment to a modified setting, especially in areas with ground-based removal. (*Alternative 3 would not require this amendment since salvage harvest activities are not occurring in MA 10. Under Alternative 3, MA 10 would continue to have a naturally appearing setting consistent with semi-primitive non-motorized recreation goals.)* • Amended Standard: Allow short-term degradation of “semi-primitive” goals to “roaded modified”. *Manage dispersed recreation for goals of semi-primitive non-motorized recreation within 5 years after completion of the Project. In addition, ensure that the Recreation Opportunity Spectrum (ROS) setting criteria for social encounters and remoteness are met within* five years. *This amendment would apply only for the duration of, and to those actions proposed in MA-10 for the site-specific project called Thorn Fire Salvage Recovery Project.*

FP Item #	Description of Proposed Forest Plan Amendment
	• See Effects Analysis Summary in Recreation section. • *This amendment would be needed for Alternative 2. This amendment would not be needed for Alternative 3.*
Recreation 2	MA 20A – Dry Cabin Wildlife Emphasis Area (with Scheduled Timber Harvest) • Existing Standard: Standard # 1, p. IV- 121. Manage dispersed recreation for goals of semi-primitive non-motorized recreation in a natural appearing environment with emphasis on quality big game hunting. • Need: Proposed harvest activities of the dead and dying trees due to a catastrophic event in Alternatives 2 and 3 would not meet recreation standard direction for goals of semi-primitive non-motorized recreation as it is anticipated that harvest activities may result in changes from a naturally appearing environment to a modified setting, especially in areas with ground-based removal. • Amended Standard: Allow short-term degradation of "semi-primitive" goals to "roaded modified". *Manage dispersed recreation for goals of semi-primitive non-motorized recreation within 5 years after completion of the Project.* • See Effects Analysis Summary in Recreation section. • *This amendment would be needed for both Alternatives 2 and 3.*
Recreation 3	MA 21 –Wildlife Emphasis Area (with Non-Scheduled Timber Harvest) • Existing Standard: Standard #1 p. IV-131. Manage for semi-primitive motorized recreation on designated roads and trails. Manage for semi-primitive non-motorized recreation on the remainder of the area. • Need: Proposed harvest activities of the dead and dying trees due to a catastrophic event in Alternatives 2 and 3 would not meet recreation standard direction for goals of semi-primitive non-motorized as it is anticipated that harvest activities may result in changes from a naturally appearing environment to a modified setting, especially in areas with ground-based removal. • Amended Standard: Allow short-term degradation of "semi-primitive" goals to "roaded modified". Manage for semi-primitive motorized goals for recreation on designated roads and trails within 5 years after completion of the Project. Manage for semi-primitive non-motorized recreation goals on the remainder of the area within 5 years after completion of the Project. *This amendment would apply only for the duration of, and to those actions proposed in MA-21 for the site-specific project called Thorn Fire Salvage Recovery Project.* • See Effects Analysis Summary in Recreation section. • *This amendment would be needed for both Alternatives 2 and 3.*
Visuals 1	MA-10 – Semi-Primitive Non-Motorized • Existing Standard: Standard #3, p. IV-97. Meet visual quality objective of foreground retention. • Need: Proposed harvest activities of the dead and dying trees due to a catastrophic event in Alternative 2 would not meet visuals standard direction of retention VQO as salvage activities would be noticeable to the average viewer. (*Alternative 3 would not require this amendment since salvage harvest activities are not occurring in MA 10. Under Alternative 3, MA 10 would continue to have a naturally appearing setting consistent with retention VQO and semi-primitive non-motorized recreation goals.)* • Amended Standard: Allow short-term degradation of scenery resources from "retention VQO" to "partial retention VQO". *Manage for goals of retention VQO within 5 years after completion of the Project. This amendment would apply only for the duration of, and to those actions proposed in MA-10 for the site-specific project called Thorn Fire Salvage Recovery Project.* • See Effects Analysis Summary in Visual section. • *This amendment would be needed for Alternative 2. This amendment would not be needed for Alternative 3.*

FP Item #	Description of Proposed Forest Plan Amendment
WL 1	MA-13 (Dedicated Old Growth) • Need: The designated old growth areas burned in the Shake Table Complex fire do not meet suitable habitat requirements for dedicated old growth (DOGS) or replacement old growth (ROGS). • Amendment: Dedicated Old Growth Areas within the project area would be relocated to suitable habitat outside the fire area. The amendment would last beyond project duration and would remain in effect until the Forest Plan is amended or revised. • See Effects Analysis in Wildlife section. • *This amendment would be needed for both Alternatives 2 and 3.*
WL 2	MA-21 (Wildlife Emphasis with Non-Scheduled Timber Harvest) • Existing Standard: Forest Plan Standard #10, p. IV-133, - Exclude scheduled timber harvest. Lands are classified as "unsuitable" for timber management. Harvest may occur to accomplish wildlife habitat or fish habitat objectives, as established in a project-level environmental analysis: • Need: The economic value of the dead and dying trees needs to be recovered as rapidly as practicable to maximize potential economic benefits. • Amended Standard: *Lands are classified as "unsuitable for timber harvest"; however, due to the catastrophic nature of the Shake Table Complex fire, timber harvest would occur in order to rapidly recover economic value of the dead and dying trees." This amendment would apply only for the duration of, and to those actions proposed in MA-21 for the site-specific project called Thorn Fire Salvage Recovery Project.* • See Effects Analysis Summary in Fisheries section and Wildlife section. • *This amendment would be needed for both Alternatives 2 and 3.*
WL 3	MA-21 (Wildlife Emphasis with Non-Scheduled Timber Harvest) • Existing Standard: Forest Plan Standard #5, p. IV-132, Develop a long-range plan for achievement of wildlife objectives through use of non-scheduled timber harvest. • Need: The economic value of the dead and dying trees needs to be recovered as rapidly as practicable to maximize potential economic benefits. • Amended Standard: *A long-range plan for achievement of wildlife objectives through the use of timber harvest would not be required due to the catastrophic nature of the fire event and the need to rapidly recover economic benefits. This amendment would apply only for the duration of, and to those actions proposed in MA-21 for the site-specific project called Thorn Fire Salvage Recovery Project.* • See Effects Analysis Summary in Wildlife section. • *This amendment would be needed for both Alternatives 2 and 3.*
WL 4	MA-20A (Wildlife Emphasis with Scheduled Timber Harvest) • Existing Standard: Forest Plan Standard #6, p. IV-123, - Develop a long-range plan for achievement of wildlife objectives through use of timber harvest that will be the basis of scheduled entries. • Need: The economic value of the dead and dying trees needs to be recovered as rapidly as practicable to maximize potential economic benefits. • Amended Standard: *A long-range plan for achievement of wildlife objectives through the use of timber harvest would not be required due to the catastrophic nature of the fire event and the need to rapidly recover economic benefits. This amendment would apply only for the duration of, and to those actions proposed in MA-20A for the site-specific project called Thorn Fire Salvage Recovery Project.* • See Effects Analysis Summary in Wildlife section. • *This amendment would be needed for both Alternatives 2 and 3.*
WL5	The Malheur Forest Plan was amended in 1995 by Regional Forester's Forest Plan Amendment #2

FP Item #	Description of Proposed Forest Plan Amendment
	(commonly referred to as the "Eastside Screens"). Eastside Screen wildlife standard at 6d (2)(a). • *Existing Standard at 6d (2)(a): Maintain all remnant late and old seral and/or structural live trees >=21"dbh at currently exist within stands proposed for harvest activities.* • *Need: Modify East Side Screens wildlife standard at 6d(2)(a) to define both live and dead trees.:* • Amended standard: *(a) Maintain all remnant late and old seral and/or structural live trees >=21" diameter at breast height that currently exist within stands proposed for harvest activities. A live tree is defined as a tree rated to have a high or moderate probability to survive the effects of a fire as determined by the ``Factors Affecting Survival of Fire Injured Trees: A Rating System for Determining Relative Probability of Survival of Conifers in the Blue and Wallowa Mountains" (Scott et al. 2002, as amended) (commonly referred to as the Scott Guidelines). This amendment would apply only for the duration of, and to those actions proposed for the site-specific project called Thorn Fire Salvage Recovery Project.* • *See Effects Analysis* Summary in Wildlife section. • *This amendment would be needed for both Alternatives 2 and 3.*
WL 6	The Malheur Forest Plan was amended in 1995 by Regional Forester's Forest Plan Amendment #2 (commonly referred to as the "Eastside Screens"). The Interim wildlife standard in this amendment includes protection measures for goshawk. • Existing Standard: Protect every known active and historically used goshawk nest-site from disturbance. Seasonal restrictions (typically from April 1- September 30) on activities near nest sites will be required for activity types that may disturb or harass pair while bonding and nesting. • Need: There are no known goshawk nest sites existing in or adjacent to the project area. If nest sites are found during the 2007/2008 surveys, the project economic viability would be adversely affected if log haul is restricted during the period April 1 to September 30. • Amended Standard: Log haul would not be restricted if a nest site is found adjacent to a haul route." *All other protections would remain in force as noted in the Regional Foresters Amendment #2. This amendment would apply only for the duration of, and to those actions proposed for the site-specific project called Thorn Fire Salvage Recovery Project.* • See Effects Analysis Summary in Wildlife section. • *This amendment may be needed for both Alternatives 2 and 3 if goshawk nests are identified during 2007/2008 surveys.*

EMERGENCY SITUATION DETERMINATION

An Emergency Determination per (36 CFR 215.10)[10] would be sought from the Chief of the Forest Service to implement the project immediately after the Record of Decision is approved. This would avoid substantial loss of economic value of the dead timber.

2.2.3 ALTERNATIVE 3

This alternative is in response to the significant issue (Issue #1) of the public's concern over salvage harvest within Management Area 10, Aldrich Semiprimitive Nonmotorized Area. In this alternative,

---

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

commercial salvage activities would not occur in MA 10 area; however, reforestation planting would still occur within MA 10.

This alternative does include salvage of dead and dying trees (outside the MA 10 area) from approximately 2,769 acres and removal of potential danger trees for public safety along 43.2 miles of haul routes and open forest travel routes. Salvage harvest methods would include ground-based (15%) and helicopter logging systems (85%). Approximately 2,346 acres of the harvest area would be salvaged by helicopter and approximately 423 acres would be salvaged using ground-based yarding. No commercial harvest or road maintenance is proposed within Appendix C Inventoried Dry Cabin, Cedar Grove and Shake Table Roadless Areas. Road activities associated with salvage and restoration would be limited to opening and re-closing existing roads, and maintenance. No new roads would be built. Approximately 23 landings would be constructed to facilitate helicopter harvest operations and 34 landings would facilitate tractor harvest operations. Existing landings would be used where available. Following site preparation, approximately 6,428 acres would be planted with conifer seedlings. Forest Plan amendments related to old growth replacement, snag levels, and visuals would be included as needed. In addition a request for an Emergency Situation Determination (36 CFR 215.10) would be sought from the Chief of the Forest Service. See Table 17 for a summary list of project activities for Alternative #3.

Table 17. Alternative #3: Summary of Salvage Treatments and Road Management Activities.

Salvage Harvest Treatment Description	Acres
Helicopter yarding	2,346
Tractor skidding	423
Commercial salvage harvest (total)	2,769
Reforestation Activities	Acres
Reforestation planting	6,428
Road Management Activities	Miles
Danger tree removal along roads	43.2
Maintenance of Existing Classified Roads (Haul Routes)	54.4

DANGER TREE REMOVAL

Danger trees have an imminent or likely potential to fail. Danger trees would be felled along all haul routes used for timber sale activity (regardless of maintenance level), and maintenance level 3, 4, and 5 Forest roads. Danger trees would be felled along an estimated 43.2 miles of roads inside and outside the project area boundary (see Table 18). An estimated 4 danger trees per mile would be removed along roads outside of the project area. Within the project area, danger tree numbers vary depending on burn severity; an estimated 8 trees per mile would be removed along areas of moderate burn severity, and 60 trees per mile would be removed along areas of very-high burn severity. Danger trees that are within Riparian Habitat Conservation Areas (RHCAs) would be cut and left to provide additional coarse woody debris. All other merchantable danger trees would be removed and sold as part of a salvage sale if economically feasible. Identification of potential danger trees would follow Regional guidelines[11]. Slash from danger trees would remain in place, on site. Concentrations of slash in key visual areas would be hand-piled and burned or chipped.

[11] Toupin, Richard; Michael Barger; Field Guide for Danger Tree Identification and Response; USDA Forest Service, Forest Health Protection, Pacific Northwest Region. 2005.

Table 18. Alternative #3: Danger Tree Removal Summary.

Treatment	Miles[1]
Danger trees within project boundary	8.7
Danger trees outside project boundary	34.5
Total miles	43.2
Treatment	Acres2
Danger trees within project boundary	306
Danger trees outside project boundary	1,235
Total acres	1,542
[1] An estimated 4 danger trees per mile would be removed along roads outside of the project area. Within the project area, danger tree numbers vary depending on burn severity; an estimated 8 trees per mile would be removed along areas of moderate burn severity, and 60 trees per mile would be removed along areas of very-high burn severity . *[2] Acres estimated using a 300 ft buffer, 150' each side of road*	

SALVAGE HARVEST

Salvage harvest would cut and remove merchantable logs from dead and dying trees 9 inches diameter at breast height (DBH) and greater. A summary of salvage actions and estimated net salvage volume is displayed in Table 19 and
Table 20. Dying trees designated for salvage harvest would be selected based on published guidelines for estimating fire-caused mortality[12]. The published guidelines are referred to as the "Scott Guidelines" and these guidelines are a rating system that enables the determination of relative tree survival up to one year after the fire. Dying trees to be salvage harvested would have a low probability of survival based on Scott Guidelines.

Trees within areas of very high burn severity with any green foliage would remain uncut and only trees with no remaining green foliage would be harvested. Trees with no remaining green foliage and trees with a low probability of survival would be salvaged within areas of low, moderate and high burn severity (See Table 10 above).

Salvage harvest operations would include landing construction adjacent to existing roads. Logs are skidded or flown to landings and decked prior to truck transport. Twenty-three possible helicopter landings are identified on Alternative 3 maps. Approximately 34 landings would be needed for tractor harvest operations. Existing landings would be used where possible. Helicopter landing size would range from one to four acres, depending on topography. Tractor landing size would range from 1/10 to two acres. In some cases landing locations may require felling of healthy, live trees (may include incidental amounts of live trees greater than 21 inches) to facilitate safe, efficient, cost-effective operations.

Tree felling would be accomplished by manually operated chainsaws or mechanized fellers, however mechanized felling equipment (feller bunchers) would be limited to units designated for tractor skidding.

[12] Scott, Donald W.; Schmitt, Craig L.; Spiegel, Lia; Factors Affecting Survival of fire Injured Trees: A Rating System For Determining Relative Probability of Survival of Conifers in the Blue and Wallowa Mountains (Amended 2006). BMPMSC-0301, 2006.

Table 19. Alternative #3: Salvage Harvest Area Summary (acres by burn severity and yarding system)

	Burn Severity				
Logging System	Low	Moderate	High	Very High	Total
Helicopter	641	434	323	947	2,346
Tractor	203	9	20	191	423
Total	844	444	343	1,138	2,769

Table 20. Alternative #3: Salvage Harvest Volume

Harvest System	Net Sawtimber Volume – MBF[1]
Tractor	3,640
Helicopter	23,166
Total	26,806
Harvest volume may be lower due to minor changes during layout and areas eliminated from harvest through project design features	

REFORESTATION

Burned areas would be reforested through site preparation and hand planting, or prescribed natural regeneration. As many as 6,428 acres would be planted, and site preparation for planting would be limited to a 2' square scalp at each tree planting site to clear away debris or vegetation that may interfere with planting a tree, and to reduce competing vegetation immediately adjacent to planted seedlings. Trees would be placed when possible into favorable micro-site to take advantage of favorable site and provide irregular spacing of planted trees. Hand planting of conifer seedlings is proposed for all harvest units that became non-stocked or under-stocked as a result of the fire, or as a result of secondary fire effects (insects and disease). All units with very high, high, or moderate burn severity are planned for hand planting. Units or parts of units that burned at low severity, but have inadequate forest understory would be planted. Ponderosa pine would be planted on the lower and warmer environments. Other units would be planted with a mix of ponderosa pine, Douglas-fir and western larch. Planting density would be determined after salvage and slash treatments are completed, however planting densities are expected to range between 170 and 350 seedlings per acre. Planting of salvage harvest units is required by Regional Forester policy and is considered essential K-V[13] reforestation. See Table 21 for a summary of reforestation planting acres.

Table 21. Alternative #3: Reforestation Summary

Planting	Acres
Within harvest units	2353
Outside harvest units	4074
Total	6428

[13] KV indicates funds available for reforestation and timber sale area improvement under the Knutsen-Vandenburg Act.

Planting is also planned for Alaska yellow cedar stands outside of the Cedar Grove Botanical Area and IRA. After the fire, seed was collected from surviving cedars specifically to re-establish seedlings in this area. Rooted cuttings may also be used in conjunction with seedlings

Planting is planned along Road 2150 in the burned area, but outside salvage units, to accelerate recovery of visual objectives along this popular route.

Planting is proposed for all other burned areas in the project area that supported forested cover prior to the fire and is now under-stocked or non-stocked. Conifers planted would be those appropriate and desired for the site. This includes re-planting the Widows Creek burn area, and areas within ¼ mile of salvage harvest units. It also includes planting in Riparian Habitat Conservation Areas (RHCA), which could include conifer and hardwood planting, if native hardwood planting stock such as aspen, willow, dogwoods, and cottonwood, are available. Planting outside salvage harvest units is desirable, but not required, and would be accomplished with non-essential KV or appropriated funds if and when they become available..

Seedlings may need protection from animal damage; however the specific areas are not known, and protection is not planned for the first year after planting. Specific techniques for protecting seedlings from animal damage are available in the form of netting placed around seedlings. If planting success is diminished because of animal damage, then netting could be used to protect seedlings in areas experiencing or expected to experience animal damage.

SLASH TREATMENT

Trees to be salvaged would be limbed and topped onsite within areas designated for helicopter yarding and areas of high or very high burn severity designated for tractor skidding.

Tree tops would be removed within the areas of low and moderate burn severity designated for tractor skidding. Limbs would remain on site. The tops would be piled and burned at landings.

The intent is to leave unmerchantable trees standing. Timber sale purchasers would not be required to remove non-saw logs. Incidental amounts of non-sawlog material skidded or yarded to the landing would be decked separately and made available for public firewood use based on availability and location. Where possible, non-saw logs would be decked near access roads to prevent disturbance to rehabilitated landings.

Concentrations of slash within immediate foreground (300 feet) of Aldrich Ridge Road (2150), Cedar Grove National Scenic Trail, dispersed campsites, and Fields Creek Road (21) would be hand-piled and burned or chipped.

AREA CLOSURE FOR PUBLIC SAFETY

For public safety during harvest operations, National Forest lands within the salvage area will be closed to all public entry, including foot travel. In addition, Forest Service Roads 2140, 2150 and 2170 and associated roads will be closed to all vehicles to reduce safety concerns associated with logging and log haul. An area closure[14] to motorized use is currently in effect for the Shake Table Fire Complex Area with the exception of Road 2150. During harvest operations Road 2150 within the Shake Table Fire Complex Area would be closed to public use

[14] Malheur National Forests Order Number 060401-011-07

TRANSPORTATION SYSTEM

Approximately 54.4 miles of existing roads would be used to transport (haul) the harvested logs (See Table 22). These roads would receive maintenance prior to the commencement of log hauling.

Table 22. Summary of Haul Road Maintenance

Haul Road Maintenance	Miles
Inside project area	19.3
Outside project area	35.1
Total	54.4

The existing gate on Road 2140 located 0.3 miles west of the junction with Road 2100 would be closed prior to commercial harvest activities, during commercial harvest activities, through completion of reforestation activities. Upon completion of reforestation activities area roads would be returned to pre-fire conditions. Roads to be closed are displayed on the Post Project Closure map. Earth berms would block vehicle traffic. Table 23 summarizes the post-sale road access within the project area.

Table 23. Alternative #3: Post-sale Road Access

Road Access	Miles
Closed to use with gates	1.2
CFR Closed to use	10.7
Open to use	19.3

PROJECT DESIGN FEATURES AND MONITORING TASKS

See Table 24 and Table 25 for a complete list of design features applicable to the alternatives and monitoring tasks.

PROPOSED FOREST PLAN AMENDMENTS

The list of proposed Malheur Forest Plan amendments for <u>either or both</u> the Proposed Action and Alternative #3 are disclosed in Table 16 above in the description for the Proposed Action.

EMERGENCY SITUATION DETERMINATION

A request for an Emergency Situation Determination (36 CFR 215.10) from the Chief of the Forest Service would be sought for Alternative 3 as well as the Proposed Action.

2.2.4 PROJECT DESIGN FEATURES

Project design features (PDFs) are listed below in the tables below. These items were developed to reduce or eliminate impacts on analysis issues, affected resource areas and are incorporated as an integrated part of the proposed action and any action alternative as applicable. Project design features are based upon standard practices and operating procedures that have been employed and proven effective in similar circumstances and conditions. Project design features prescribe measures that would reduce or eliminate potential effects of the action alternatives. Project design features are nondiscretionary once approved in a decision. Table 24 below lists the PDFs for the Proposed Action and Alternative #3 (as applicable).

Table 24. Project Design Features List.

PDF Item	DESCRIPTION OF PROJECT DESIGN FEATURE
APPLICABLE - GENERAL	
AGEN-1	Warning or informational signs would be placed along major travel routes during project operations (timber, fire, engineering, restoration projects, etc) to alert and inform the public. Public access would be restricted in some areas during active haul for public and operational safety.
AGEN-2	No commercial harvest, planting or road maintenance activities would occur within the Cedar Grove Botanical Area and Forest Plan FEIS Appendix C inventoried Dry Cabin, Cedar Grove, and Shake Table Roadless Areas.
AGEN-3	Firewood cutting would generally not be permitted in the project area. Minor exceptions would be approved by the District Ranger where removal would not impact snags or down wood retained for habitat, including cutting of post harvest slash and non-saw log material at landings.
AGEN-4	The existing gates located at the junction of project access roads and the main Fields Creek road would be closed prior to commercial harvest activities, during commercial harvest activities, through completion of reforestation activities. Upon completion of reforestation activities area roads would be returned to pre-fire conditions.
AIR QUALITY	
AQ-1	Burning would not occur unless prior approval is granted by the Oregon Department of Forestry. The Clean Air Act sets air quality standards for particulate matter (PM) for particulates less than 10 microns(PM10) in diameter and less then 2.5(PM 2.5) microns in diameter. All PM10 and PM2.5 emissions would be calculated using the CONSUME software in the Fasttracks reporting system, which is also submitted with planned burn operations to the Oregon Department Forestry to determine compliance with the Clean Air Act.
AQ-2	Burning would be planned for times when the transport winds are sufficient to displace smoke away from .populated areas.
AQ-3	Even though no visibility-protection periods have been set for wilderness Class 1 Airsheds in Eastern Oregon, all burning would occur outside visibility-protection periods set for Central Oregon of July 1st to September 15th.
FISH	
FISH-1	PACFISH Buffer Standards Stream and riparian protection for the TFSR project 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.

PDF Item	DESCRIPTION OF PROJECT DESIGN FEATURE
	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.
FUELS	
FUELS-1	Timber sale purchasers would not be required to remove non-saw logs. Incidental amounts of non-sawlog material skidded or yarded to the landing would be decked separately and made available for public firewood use based on availability and location. Where possible non-saw logs would be decked near access roads to prevent disturbance to rehabilitated landings.
FUELS-2	Concentrations of slash resulting from the danger tree removal operation in visually sensitive areas would be hand piled and burned or chipped. A concentration of slash is defined as that amount of slash within a maximum 25-foot radius, that if piled would make four minimum size piles of 4 feet high and 6 feet in diameter. Individual danger tree slash that does not meet this concentration definition would be left.
HERITAGE	
HR-1	Identified historic properties within the Area of Potential Effect (APE) would be strictly protected during all phases of the project. Sites would be identified as Areas to Protect (ATPs) during commercial timber harvest, and/or the boundaries of harvest units would be configured so that they do not include sites.
HR-2	If cultural resources are located during implementation, work would be halted and the District Archaeologist would be notified. The cultural resource would be evaluated, and a mitigation plan developed in consultation with the Oregon State Historic Preservation Office (SHPO) if necessary.
NOXIOUS WEEDS	
NX-1	Use timber sale contract provisions to require that all off-road logging and maintenance equipment is free of noxious weeds, when moving equipment onto sale area and/or moving between units that are known to contain noxious weed. Specifically, use B6.35 – Equipment Cleaning.
NX-2	Use weed-free straw and mulch for all projects conducted or authorized by the Forest Service on National Forest System Lands. If State certified straw and/or mulch is not available, individual forests should require sources certified to be weed free using the North American Weed Free Forage Program standards, or a similar certification process
NX-3	Certified "weed free" seed mix would be required for areas seeded.
NX-4	Avoid weed-infested areas for use as landings or parking areas.
NX-5	Complete post-project surveys to document infestations and to allow treatment of noxious weeds.
RANGE	
RNG-1	In grazing pastures which burned with light (or low) intensity (intensity as described in Johnson 1998 or as mapped by the BAER Team) where elk sedge and pine grass are the dominant ground cover and 10 percent or less of the burned area is occupied by native bunchgrasses, grazing may resume once the percent ground cover, elk sedge, and pine grass is deemed sufficient. It is estimated that grazing may resume in these areas as early as the spring of 2007, provided that burned fences are reconstructed.
RNG-2	In grazing pastures which burned with light (or low) intensity (intensity as described in Johnson 1998 or as mapped by the BAER Team) where bunchgrass occupies more than 10 percent of the burned area, grazing may occur the second growing season after the burn, but only after seed has set (summer or fall of 2008). If the bunchgrass areas or unburned portions of pastures can be adequately protected from grazing, such as by electric fencing, then grazing may resume in the remainder of the area during the first growing season after the fire. Adjustments in the grazing rotation and livestock numbers may be necessary to meet standards.
RNG-3	In grazing pastures which burned with moderate to high intensity (intensity as described in Johnson 1998

PDF Item	DESCRIPTION OF PROJECT DESIGN FEATURE
	or as mapped by the BAER Team) grazing may resume after the vegetation has recovered sufficiently as described for the appropriate plant association type in Plant Association Guides developed for the Blue and Ochoco Mountains (Johnson and Clausnitzer 1992) in order to provide soil cover and stability (Typically 3-5 years). A team consisting of at least two resource specialists, such as a range conservationist, botanist, ecologist, silviculturist, or hydrologist, would conduct the monitoring to determine if the percent ground cover has been re-established. The method and results would be documented and submitted to the authorized official who would decide when to resume grazing. It is estimated that grazing would resume three full growing seasons after the fire occurred in moderately burned areas (Summer 2009). Research indicates vegetation usually recovers within this timeframe (C. G. Johnson, pers. Comm., February 2003). In high intensity burn areas, full recovery of vegetation may take longer than 3 years. Grazing would not resume prior to two growing seasons after the fire in high intensity burn areas, even if monitoring verified that the percent ground cover and species composition was deemed sufficient, to allow for plants to set seed.. If burned areas can be adequately protected from grazing, such as by fencing, then grazing may resume in unburned portions of pastures without rest. Adjustments in the grazing period and livestock numbers may be necessary to meet standards.
RNG-4	Before livestock grazing is reintroduced to burned areas, proposals would be reviewed by the District Silviculturist and Rangeland Management Specialist and approved by the District Ranger. Grazing activities would be coordinated to minimize damage to planted and natural seedlings.
RECREATION	
RE-1	Notify the recreating public there would be area, road, and trail closures due to the harvest activities that would be occurring in the project area. There would be public notifications at the major access roads, local newspaper, and Forest Web Page. All roads would be signed to Engineer Road Specifications.
RE-2	Do not issue new outfitter/guide permits whose time would conflict with area and road closures occurring due to harvest activities in the project area. Coordinate commercial harvest activities with outfitter/guides with active special use permits.
RE-3	Protect trailheads during harvest operations.
RE-4	Signs would be posted advising trail users when project activities are going to take place.
SENSITIVE PLANTS	
SP-1	Buffer known sensitive plant locations by 100 feet. Sensitive plant suitable habitat would be protected from commercial harvest activities.
SP-2	Apply the following PDF to non-inventoried areas of sensitive plant suitable habitat*: Directionally fell trees away from sensitive plant suitable habitat. Do not haul logs across sensitive plant suitable habitat. Vehicles and heavy machinery shall avoid sensitive plant suitable habitat. Slash and fuels shall not be piled and burned on or immediately adjacent to sensitive plant suitable habitat. *Note: PDF features would not be necessary where sensitive plant suitable habitat is inventoried beforehand and plants are not located.
SP-3	Avoid side-cast of road surface materials off down-slope portion of road prism along *Luina serpentina* locations within and en route to the project area.
SP-4	Inventory proposed landings sited in sensitive plant suitable habitat.
VISUALS	
VQ-1	Tie unit boundaries where possible to natural landform and vegetation edges. Minimize straight lines and geometric shapes to create vegetative shapes that mimic natural patterns.
VQ-2	Unit edges should mimic natural landscape edges to be as naturally appearing as possible.
VQ-3	Concentrations of slash within immediate foreground (300 feet) of Aldrich Ridge Road (2150), dispersed campsites, and Fields Creek Road (21) would be hand-piled and burned or chipped.

PDF Item	DESCRIPTION OF PROJECT DESIGN FEATURE
VQ-4	In areas with retention or partial retention visual quality objectives (VQOs) within 300 feet (or visual sight distance if less than 300 feet) of the Aldrich Ridge Road (2150), cut stumps low (less than 4 inches on the high side of the stump). Outside of this viewing distance, in Retention VQO, (including the semiprimitive nonmotorized recreation area), cut stumps low (less than 6 inches on the high side of the stump). In partial retention areas within 300 feet (or visual sight distance if less than 300 feet) of the Cedar Grove National Scenic Trail, Fields Creek Road, and dispersed campsites low cut stumps (less than 6 inches on the high side of the stump). In all other harvest areas cut stumps at standard timber sale contract height.
VQ-5	If vegetative clearing is needed at landings along Aldrich Ridge Road (2150), shape edges to mimic natural patterns and openings.
VQ-6	Where possible, skid trails would not be located perpendicular to the Aldrich Ridge Road (2150) and Fields Creek Road (21) corridors to eliminate direct views into log landings and skid trails from these roads.
VQ-7	Place large piles of slash out of view from Aldrich Ridge Road (2150) and Fields Creek Road (21) when possible. Remove large piles of trees and/or slash by burning, chipping, etc. as soon as possible after project is complete.
VQ-8	After logs have been removed from landing areas, all landing areas would be lightly scarified and seeded. Disperse planting and seeding to mimic existing patterns of the vegetative mosaic. All slash and debris would be removed from the main road surfaces when project activities are complete.
VQ-9	Reduce visibility of marking paint to the casual observer in Retention and Partial Retention VQOs and in other areas when possible. Mark unit boundary trees so paint is on the side away from view of Aldrich Ridge Road (2150), dispersed campsites and Fields Creek Road (21).
VQ-10	When planting along the Aldrich Ridge Road (2150), vary tree spacing and tree species within 300 feet of the Aldrich Ridge Road (2150) to mimic natural patterns of the vegetative mosaic.
WILDLIFE	
WL-1	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 largest available snag 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 and snags would be scattered across the unit in groups of 3 to 5 snags. Snags would be distributed as individuals, scattered across the unit and in groups (3-5 snags). Generally, non-merchantable snags, < 9 inches) would be maintained within the unit, however, harvest activities may knockdown and/or breakup a portion of these snags. 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 If designated snags and clumps are removed for safety or other operational considerations, the sale administrator would work with the contractor under appropriate contract provisions to maintain prescribed snag retention levels (as identified above) and clumps within harvest units. Avoid marking snags for retention within 150’ of open roads or within one tree height of such improvements as fences. In the event that undesignated trees (live or dead) fall down via windthrow or other natural events, or are accidentally knocked down during harvest, these trees shall be left to provide large down logs for wildlife. In the event that trees (live or dead) fall down via windthrow or other natural events outside designated units, trees would not be removed. .

<table>
<tr><th>PDF Item</th><th>DESCRIPTION OF PROJECT DESIGN FEATURE</th></tr>
<tr><td></td><td>Soft snags (non-saw material) would be retained above and beyond these retention standards. These include older dead trees with broken tops, and existing woodpecker cavities.</td></tr>
<tr><td>WL-2</td><td>Retain 100-foot, no-harvest buffers around unique wildlife habitat such as, seeps, springs, bogs, wallows, cliffs, talus, and caves. (FP Standard #56, p. IV-31).</td></tr>
<tr><td>WL-3</td><td>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 would be contacted immediately. The Contracting Officer would take appropriate action to insure individuals are protected. Provisions BT6.24 would apply. Protection measure for known federally listed species would be listed in CT6.24.</td></tr>
<tr><td>WL-4</td><td>Goshawk habitat. Currently no historic nests within project area or along haul routes.
If a nest is located within a salvage unit during spring surveys – all projection measures would be applied (a, b, and c).
Would restrict harvest activities (yarding and skidding) within a ½ mile of the nest tree (restriction period April 1- September 30). However, there would be no restriction in haul if the nest is located within a half mile of a haul road.
30 acres of the most suitable nesting habitat would be provided around the tree.
A 300 acre "Post Fledging Area" (PFA) will be established around every known active nest site.</td></tr>
<tr><td>WL-5</td><td>Raptor nests. Protect known or discovered raptor nest sites from management activities. Level of protection would vary by species and would be recommended by the district biologist.</td></tr>
<tr><td>WL-6</td><td>Maintain down logs for wildlife habitat and long-term site productivity by contractually providing and retaining the levels indicated below by leaving either standing dead/dying trees or existing down logs.
<table>
<tr><th>Species</th><th>Pieces per Acre</th><th>Minimum Diameter at Small End (inches)</th><th>Minimum Piece Length (feet)</th><th>Total Length (feet/acre)</th></tr>
<tr><td>Ponderosa Pine</td><td>3-6</td><td>12"</td><td>> 6 feet</td><td>20-40</td></tr>
<tr><td>Mixed Conifer</td><td>15-20</td><td>12"</td><td>> 6 feet</td><td>100-140</td></tr>
<tr><td>Lodgepole Pine</td><td>15-20</td><td>8"</td><td>> 8 feet</td><td>120-160</td></tr>
</table></td></tr>
<tr><td>WL-7</td><td>Portions of the project area are in the Murderer's Creek-Flagtail Cooperative Travel Management Area (also known as a green dot closure area). Restriction periods occur in the fall and correspond to general deer and elk hunting season. Restrictions can be waived, but only after consultation with a District wildlife biologist and approval by the Forest Supervisor.</td></tr>
<tr><td>WL-8</td><td>Helicopter landings will not be located within old forest structures (LOS)</td></tr>
<tr><td>WL-9</td><td>Tractor landings will be located to minimize removal of live trees. Will adjust size and position to minimize effects.</td></tr>
<tr><td>WL-10</td><td>Retain 4 large snags per acre in salvaged LOS stands</td></tr>
<tr><td>WATERSHED SOILS</td><td></td></tr>
<tr><td>WS-1</td><td>In units with low severity burn, ground-based equipment is generally restricted to slopes less than 35 percent, except for uphill skidding in which the restriction is to slopes less than 25 percent. A slope restriction for units in moderate and high severity burn is 25 percent. Exceptions would be on slopes 40 feet or less in length. On steeper slopes trees would be left as snags or would be directionally felled and winch line pulled to them.</td></tr>
<tr><td>WS-2</td><td>To minimize soil displacement and compaction, skid trail locations shall be designated and approved prior to logging. Skidtrails shall be spaced about 120 feet apart, except where skidtrails converge on a landing. Old skid trials in suitable locations should be reused. Ground-based equipment with ground pressure > 8.5 psi is restricted to trails, except if the soil is frozen 4 inches or deeper.</td></tr>
<tr><td>WS-3</td><td>Potential erosion from skid trails shall be controlled by the use of cross drains or comparable measures. The cross drains shall be spaced appropriately for slope and located on soil where water would infiltrate, not on shallow or impermeable soil. Drainage off of skid trails shall be unobstructed. Erosion control shall</td></tr>
</table>

PDF Item	DESCRIPTION OF PROJECT DESIGN FEATURE
	be installed within 15 days after skidding on a unit ceases.
WS-4	Skidding and landings would not occur within RHCAs or ephemeral draw bottoms or other areas that may channel or concentrate water, except designated crossings of ephemeral draws may be identified and approved by the timber sale administrator, prior to starting harvest of a given unit. Ephemeral draws with sign of water flow in tractor harvest units, would have 25 foot buffers which are exclusive of harvest or equipment entry,.
WS-5	Seeding, mulching, or slashing shall occur on skid trails on slopes 20 percent and above.
WS-6	Skid trails and landings would not be located within vegetative openings (nonforest, grassland, and shrublands) to avoid impacts to the shallow soils, unless approved by the Forest Service.
WS-7	10 or more tons, if available, of downed coarse woody material per acre shall be left for long term soil productivity.
WS-8	Low ground-pressure equipment (≤ 8.5 psi) can be allowed off skidtrails under dry, frozen or snow covered conditions. "Dry" means obviously dry to a depth of 4 inches. "Frozen means frozen to a depth of 4 inches or more. "Snow covered" means sufficient snow depth and strength to prevent soil disturbance and compaction. The use of ground-based equipment is prohibited under soil moisture conditions when ruts 6 inches or deeper would form for a continuous 50 feet or more.
WS-9	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, ditch lines, or fords.
WS-10	Timber sale purchaser would prepare a spill containment plan that would ensure that spilled fuel would not leave the site. Fuel would not be stored within any RHCA. . An oil and hazardous substance spill contingency plan would be in place. A delivery/storage/application plan, to prevent petroleum products or other deleterious materials from entering water systems, is required by the Forest Service prior to fuel deliveries in the project area.
WS-11	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.
WS-12	Riparian Habitat Conservation Areas (RHCAs) for Category 1, 2, and 4 streams and for Category 3 and 4 wetlands shall be consistent with PACFISH.
WS-13	To protect creeks during work on culverts within the RHCAs, sediment filter fences or sediment traps would be installed. These would be located at culvert removal sites and at the downstream end of all culverts prior to beginning culvert installations, catch basin cleaning, and inlet/outlet ditch cleaning or maintenance. Sediment devices would remain in place until soils become stabilized. Soils may be stabilized by natural seeding processes, or promoted by artificial methods.
WS-14	A Forest Service employee qualified/certified in road maintenance would monitor the maintenance activities to ensure resource objectives are met.
WS-15	Excess and unsuitable soil and rock material from road maintenance and landing construction would be taken to an upland disposal area.
WS-16	Approved water sources would be used for road maintenance and dust abatement.
WS-17	Areas of streambank disturbance would be seeded or planted. Existing vegetation would be retained, as possible, and replanted, to promote vegetation.
WS-18	Instream work on Category 1 and 2 streams would be accomplished during low-flow stream conditions, and outside of spawning seasons. Work would be ceased if storm events occur, that increase stream flows.
WS-19	Dust abatement is required to minimize dust during log haul. Dust palliatives such as magnesium chloride and lignin sulfate would not be applied within 50 feet of stream channels.
WS-20	Removal of danger trees within the RHCAs, for the purpose of public safety, is restricted. Only the portion of the tree within the roadway of the road or outside the RHCA can be removed.

PDF Item	DESCRIPTION OF PROJECT DESIGN FEATURE
WS-21	Harvest of treatment units #39, 40, 41, and 42 is restricted to frozen soil conditions to prevent excessive impacts to soil. "Frozen means frozen to a depth of 4 inches or more.
WS-22	No FS Rocky Mountain Research Station erosion plots would be logged and the silt fences would be protected.

2.2.5 PROJECT MONITORING ACTIVITIES

Project monitoring tasks are listed below in the table below. These items were developed to monitor the effectiveness of the project design features and best management practices and are incorporated as an integrated part of the proposed action and any action alternative as applicable. Forest Service personnel would 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 TFSR Project area is considered high. Table 25 below notes the monitoring activities that would take place during treatments and post-treatments for resource monitoring information.

Table 25. Monitoring Activities

Monitoring Item	DESCRIPTION OF MONITORING TASK
NOXIOUS WEEDS	
NX-m1	Monitor sites of soil disturbance (landings, 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. Task by range specialist or otherwise designated.
RANGE	
RNG-m1	Prior to authorizing livestock grazing in the allotment monitoring would occur to determine the level of recovery. Ground cover would be observed as it relates to soil stability to determine if livestock grazing could occur while minimizing impacts to the soil resource (erosion, compaction). Task by soils specialist or otherwise designated
SILVICULTURE	
SILVI-m1	Tree marking would be monitored to ensure compliance with the silvicultural prescription and marking guide. Monitoring would check for correct selection and designation of trees and snags to be left for wildlife habitat and resource protection. Task by silviculturist or otherwise designated
SILVI-m2	All areas planned for tree planting would be examined prior to planting. Exams would assess levels of competing vegetation, pocket gopher activity, and other environmental conditions. Seedling species and stock type would be prescribed as well as site preparation, planting, and protection methods. Task by silviculturist or otherwise designated
SILVI-m3	Planted areas would be monitored for seedling survival, growth, and damaging agents. Stocking surveys would occur periodically until planting areas are certified adequately stocked and "free to grow". Deficient areas would be replanted to at least minimum stocking. Protection measures may be implemented to increase tree survival. Task by silviculturist or otherwise designated
SENSTIVE PLANTS	
SP-m1	Complete R-6 TESP element occurrence form prior to and following project implementation to document effectiveness of project design features at known sensitive plant locations that may be affected by the project. Task by forest botanist or otherwise designated
WILDLIFE	

Monitoring Item	DESCRIPTION OF MONITORING TASK
WL-m1	Timber sale preparation monitoring would be conducted. This includes field checking of ongoing 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 contracts would be reviewed by the Interdisciplinary Team prior to sale offer.
WL-m2	During layout and marking the number, size, and distribution of snags and down logs would be field checked by wildlife and silviculture staff on a sample of harvest units to determine if dead wood habitat objectives are being met.
WATERSHED / SOILS	
WS-m1	Detrimental soil impacts would be monitored to check how closely they were predicted. Sampling would be done by a method similar to the soil assessment method used initially to determine the current soil conditions. About 25 percent of the tractor units would be sampled within three years of completion of activities. This would show the cumulative effects of harvest plus fuels treatment. Task by forest soils scientist or otherwise designated
WS-m2	Five percent of activity areas would be monitored. Task by silviculturist or otherwise designated activity areas by harvest system would be monitored to ensure BMPs are being implemented. Monitoring would be done by the District hydrologist, fisheries biologist, soil scientist, or trained technicians after completion of the project.
WS-m3	Monitor 10 percent of units adjacent to RHCAs to ensure adequate buffering of mechanized harvest/fuels reduction activities. Task by forest hydrologist, soils scientist, fisheries biologist or otherwise designated
WS-m4	Monitoring would be conducted along unit boundaries with sensitive soils to determine if sediment is transported outside of units. Amount of sediment and distance traveled would be estimated and documented if observed. Task by forest soils scientist, hydrologist or otherwise designated

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). During the development of the Proposed Action, the FS explored other possible alternatives. In addition, public comments received in response to the Proposed Action provided suggestions for alternative methods for achieving the purpose and need. Some of these alternatives considered may have been outside the purpose and need, duplicative of the alternatives considered in detail, determined to be components that would cause unnecessary environmental harm, or not practicable or feasible for economical or environmental reasons. Therefore, a number of alternatives were considered, but dismissed from detailed consideration and are noted below.

2.3.1 RESTORATION ACTIONS ONLY

A restoration alternative modeled on recommendation of Beschta reports and the Beschta snag recommendations 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 1-No Action, along with actions already completed would reflect a restoration-only alternative. Alternative 1 describes some of the components of this approach and the effects analysis for Alternative 1 (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 economic recovery through active management versus recovery through a limited passive approach. This alternative would not meet the primary purpose and need to recover the economic value of the burned timber. Based on this information this alternative was considered but not analyzed in detail.

2.3.2 SALVAGE WITHIN INVENTORIED ROADLESS AREAS

Some 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. However, experience has indicated that entering inventoried roadless areas to harvest timber is controversial and tends to lengthen the decision making and implementation process. In addition, current direction on IRAs has limited timber harvest in IRAs to only specific situations (36 CFR 294.13). Analysis of wood deterioration and the corresponding reduction in value indicates the need for haste. This resulted in a very narrow purpose and need, and an extremely short project completion timeframe to capture as much value as possible during the first open field season. Past experience tells us that a majority of the value can be lost after the first open field season due to staining, checking, and insect infestation. Also, as part of the purpose and need, other resource values need to be considered. Having a large block of undisturbed material in the Dry Cabin IRA provided opportunities relative to other resource values (snag retention, down wood) that enabled salvage consideration across the landscape in other proposed harvest units. 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 loses commercial value. Based on this information this alternative was considered but not analyzed in detail.

2.3.3 HARVEST WITHIN RIPARIAN HABITAT CONSERVATION AREAS (RHCAS)

An alternative to salvage harvest within RHCAs was considered early in the process but was dropped from further analysis. Retention of the fire damaged trees for resource needs in addition to the small amount of acres damaged by fire within RHCAs and the degree of controversy associated with a small amount of commercial harvest in RHCAs were considered in the decision to drop this alternative. The controversy over harvesting RHCAs could delay the entire project and prompt removal of the dead material in the areas outside RHCAs in the project area while it still has commercial value is important to accomplish the resource objectives. Based on this information this alternative was considered but not analyzed in detail.

2.3.4 DO NOT SELL DANGER TREES

An alternative was considered where hazards to public safety along roads could be reduced by simply felling the danger trees and leaving them in place. The Forest Service notes the danger would be reduced however this alternative would not address other aspects of the purpose and need to return economic value from the project treatments. This alternative would not meet the purpose and need to recover economic value of timber harvest actions; therefore, this alternative was considered but not analyzed in detail

2.3.5 HELICOPTER HARVEST ONLY

An alternative was considered by the FS that would yard all salvage units with a helicopter and not use any ground-based or forwarder yarding. Helicopter yarding is incorporated into the proposed action when there was no available road access or where resource protection warranted its use. In addition helicopter yarding is almost twice as expensive compared to skyline or ground-based methods. Helicopter yarding has less impacts on soils and allows harvest in areas that would have soils impact issues if logged using ground-based methods. 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.

2.3.6 SALAVGE ONLY 100 PERCENT BLACK/SCORCHED TREES

An alternative was suggested by the public that would only harvest trees that are 100 percent black or scorched. The issue seems to be the implementation of the Scott Guidelines[15] for determination of what is a "dying" tree. The Scott Guidelines would be implemented by trained crews with adequate supervision in order to correctly identify those trees with a low probability of survival. This alternative would not meet the Purpose and Need of recovering the economic value of dead and dying trees in the project area. In addition, a detailed analysis of best science pertaining to this subject is found in **DEIS Appendix B-10**. In addition, see more discussion below. Based on this information this alternative was considered but not analyzed in detail.

2.3.7 ASSESS PROBABILITY OF TREE MORTALITY USING METHODS OTHER THAN SCOTT GUIDELINES

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

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

The Forest Service agrees there are other methods available to predict tree mortality and differentiate between dying and living trees. The Forest Service recognizes there will always be uncertainty associated with any probabilistic rating system, because accounting for every combination of variables that could potentially result in tree death is not currently possible.

A detailed discussion of alternative methodologies that were considered but were not analyzed in detail is found in **DEIS Appendix B-10**.

---

[15] Scott, Donald W.; Schmitt, Craig L.; Spiegel, Lia. Factors Affecting Survival of fire Injured Trees: A Rating System for Determining Relative Probability of Survival of Conifers in the Blue and Wallowa Mountains (Amended 2006). BMPMSC-0301, 2006.

2.3.8 RESTRICT SALVAGE OPERATIONS DURING BIG GAME HUNTING SEASON AND DURING BIG GAME WINTER RANGE TIMING RESTRICTIONS

An alternative was considered by the FS to restrict salvage operations during big game hunting seasons. The salvage operations need to be implemented quickly to capture the economic value of the dead and dying timber. The salvage operations may begin in the fall of 2007. Restricting salvage operations for the big game hunting seasons would adversely impact critical fall months to implement this project. In addition, restricting salvage during big game winter range timing restrictions would also have serious adverse impacts on the economic recovery and salvage time period for this project. For these reasons, this alternative was considered but not studied in detail. Effects of forgoing restrictions would be analyzed in the recreation and wildlife sections of Chapter 3.

2.3.9 RESTRICT SALVAGE HARVEST TO TREES LESS THAN 15 INCHES IN DIAMETER

An alternative was proposed by the public, and considered by the IDT, that would limit salvage harvest to only those trees that are < 15 inches in diameter or less. The primary purpose and need for the TFSR project is to recover the economic value of burned timber. Adequate snags and large down wood to protect soil productivity would be left on site per the design features noted for the Proposed Action and Alternative 3. 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 reduce the economic benefits (purpose and need) of this project. Based on this information this alternative was considered but not analyzed in detail.

2.4 COMPARISON OF ALTERNATIVES

This section provides a tabular comparative summary of the effects of implementing each alternative as derived from Chapter 3 effects analysis. Information in the following tables is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

Table 26. Comparison of Alternatives: Project Objectives, Salvage / Reforestation Activities and Transportation.

Comparison Indicators	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3
Project Objectives / Purpose and Need			
1. Recover the economic value of dead and dying trees			
• *MMBF harvested*	0	41.4	26.8
• *Total Revenue ($)*	0	$2,459,000	$2,151,000
• *PNV (salvage and required PDFs and KV planting) ($)*	0	-$741,000	-$3,000
• *PNV (salvage, required PDFs and non-essential KV planting) ($)*	0	-$2,389,000	-$2,223,000
• *Annual Jobs/Income from logging and mill work*	0	154 jobs $5,219,000/yr	103 jobs $3,488,000/yr
• *Annual Jobs/Income from reforestation work on salvage acres*	0	13 jobs $456,000/yr	10 jobs $328,000/yr
• *New Jobs/Income from reforestation work on non-salvage acres*	0	12 jobs $405,000/yr	16 jobs $546,000/yr
• *Payments to States*	0	$19,963	$13,213
2. Removal of Danger Trees (miles)	0	43.4	43.2
3. Reforest burned stands (acres)	0	6,428	6,428
Salvage / Reforestation Management Activities			
Helicopter yarding (acres)	0	3,411	2,346
Tractor skidding (acres)	0	496	423
Salvage harvest (total acres)	0	3,907	2,769
Danger tree removal along roads (miles)	0	43.4	43.2
Reforestation planting (acres)	0	6,428	6,428
Transportation Activities			
Road Maintenance (miles)	55.5	55.5	54.4
Roads Closed in Project area (miles)	1.2	1.2	1.2
Roads CFR closed to use (miles)	10.7	10.7	10.7
Roads open to use (miles)	19.3	19.3	19.3

Table 27. Comparison of Alternatives: Issues

Issue	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3
1. Effects on Aldrich MA 10			
• Acres of salvage in MA 10	0	1,138	0
• Open Road density – miles/sq. mile	1.6	1.6	1.6
• Recreation Opportunity Spectrum (ROS) Standard 1. Remoteness indicator 2. Naturalness indicator	No Impacts	ROS Standard for Remoteness is met. ROS standard for Naturalness is not met for 3-5 years	ROS standards for both Remoteness and Naturalness met
• Visual Quality Objectives (VQO) for retention	No Impacts	Retention not met for 3-5 years	Retention would be met.
2. Effects on Soils • Detrimentally disturbed soils (%) standard (not to exceed 20% by harvest unit)	No Impacts	No units exceed 20% standard	No units exceed 20% standard
3. Effects on watersheds/ water quality, sedimentation, and erosion			
• Sediment Yield	No Impacts	No significant sediment yields over natural	No significant sediment yields over natural
• Impacts to RHCAs	No Impacts	No Impacts	No Impacts
4. Effects on Fish Habitat and Species			
• Effects determinations by species	No Impacts	See Table 30	See Table 30
• Sediment Yield	No Impacts	No significant sediment yields over natural	No significant sediment yields over natural
5. Effects on Snags and Snag dependent Wildlife			
• # snags/acre retained in harvest units	No Impacts	3 snags > 21” dbh	3 snags > 21” dbh
• Treated Acres (% of forested acres in Shake Table fire area)	0 (0%)	3,907 (31%)	2,769 (22%)
• Untreated Acres (% of forested acres in Shake Table fire area)	12,690 (100%)	8,783 (69%)	9,921 (78%)
• Comparison to Forest Plan Standards	Meets or exceeds FP Standards	Meets or exceeds FP Standards	Meets or exceeds FP Standards
• DecAID Advisory Tool Results	Snag levels exceed DecAID reference condition	Snag levels exceed DecAID reference condition	Snag levels exceed DecAID reference condition
• Level of Snag Gap	120+ years	70-120 years	70-120 years
6. Effects on Down Wood and CWD			
• Tons/Acre Down Wood and CWD remaining	No Impacts	10 tons/acre left if available	10 tons/acre left if available
7. Effects of Increased Activity Fuels			
• Tons/acre fuels (3” or less diameter). Desired is < 3-5 tons per acre.	1.3 to 1.9	Fuel levels within guidelines	Fuel levels within guidelines

Issue	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3
• Tons/acre fuels (3" or more in diameter) = CWD. Desired is 10-25 tons acre.	< 10 tons	10 tons/acre left if available	10 tons/acre left if available
8. Effects of reopening roads and on open road density			
• Open road density (pre and post project)	1.6 mi./sq	1.6 mi./sq	1.6 mi./sq
• Open road density during project implementation	1.6 mi./sq	2.0 mi./sq	1.9 mi./sq
• Wildlife species determinations	No Impacts	See Table 29	See Table 29
9. Impacts of Invasive Species / Noxious Weeds			
• Estimated acres of ground-based harvest	No Impacts	496	423
• Miles of road maintenance impacts	No Impacts	55.5	54.4
• Estimated helicopter landings constructed	0	24	23
10. Effects on T&E and FS Sensitive Species	No Impacts	Wildlife: Table 29 Fish: Table 30 Plants:Table 31	Wildlife: Table 29 Fish: Table 30 Plants: Table 31
11. Effects on Old Growth (DOGs/ROGs/PWFAs)	No Impacts	DOGs and ROGs and PWFAs replaced as needed	DOGs and ROGs and PWFAs replaced as needed
12. Effects on PW Schneider Wildlife Management Area • Impacts on big-game wintering habitat	No Impacts	Limited Short-term Impacts	Limited Short-term Impacts
13. Effects on Cultural Resources • # Cultural sites disturbed	No Impacts	All sites protected by PDFs	All sites protected by PDFs
14. Negative Economic Impacts • MMBF salvaged • PNV $$ (*salvage and required PDFs and KV planting*	0	41.4 -$741,000	26.8 -$3,000

Table 28. Comparison of Alternatives: Resource Areas

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3
• Silviculture / Timber (Section 3.1)	No Impacts	Meets Management goals	Meets Management goals
• Fuels (Section 3.2)	No Impacts	Meets fuels management goals	Meets fuels management goals
• Air Quality (Section 3.3)	No Impacts	Meets all Air Quality standards	Meets all Air Quality standards
• Watershed / Soils (Section 3.4)	No Impacts	Limited short-term Impacts	Limited short-term Impacts
• Wildlife (Section 3.5)	No Impacts	See Table 29	See Table 29
• Fisheries (Section 3.6)	No Impacts	See Table 30	See Table 30
• Sensitive Plants (Section 3.7)	No Impacts	See Table **31**	See Table **31**
• Range / Noxious Weeds (Section 3.8)	No Impacts	Limited short-term Impacts	Limited short-term Impacts
• Recreation (Section 3.9)	No Impacts	• Limited short-term Impacts 3-5 years • Does not met LRMP standards in MA 10, 20A and 21 for SPNM Recreation	• Limited short-term Impacts 3-5 years • Does not met LRMP standards in 20A and 21 for SPNM Recreation
• Visuals (Section 3.10)	No Impacts	Limited short-term Impacts 3-5 years Does not met LRMP standards in MA 10 for Retention VQO	Limited short-term Impacts 3-5 years Does meet LRMP standards for VQOs.
• Heritage (Section 3.11)	No Impacts	No Impacts	No Impacts
• Economics / Social (Section 3.12)	See Table 26 and Table 27	See Table 26 and Table 27	See Table 26 and Table 27
• Transportation (Section 3.13)	No Impacts	Limited short-term Impacts	Limited short-term Impacts

Table 29. Comparison of Alternatives: Wildlife Species

Species	Status	Alternative 1	Alternative 2	Alternative 3
Gray wolf	Endangered	No Effect	No Effect	No Effect
Bald eagle	Threatened	No Effect	No Effect	No Effect
Canada lynx	Threatened	No Effect	No Effect	No Effect
Wolverine	Sensitive	No Impact	MIIH[1]	MIIH
Western sage grouse	Sensitive	No Impact	No Impact	No Impact
Gray flycatcher	Sensitive	No Impact	No Impact	No Impact
Upland sandpiper	Sensitive	No Impact	No Impact	No Impact
Bobolink	Sensitive	No Impact	No Impact	No Impact
Elk and Mule Deer	MIS[2]	No Impact	Beneficial Long-term impacts	Beneficial Long-term impacts
Pine Marten	MIS	No Impact	No Impact	No Impact
Pileated Woodpecker	MIS	No Impact	No Impact	No Impact

Species	Status	Alternative 1	Alternative 2	Alternative 3
Northern Three-toed Woodpecker	MIS	No Impact	Limited Impacts	Limited Impacts
Primary Cavity Excavators	MIS	No Impact	Limited Impacts	Limited Impacts
California Bighorn Sheep	Featured Species	No Impact	No Impact	No Impact
Northern Goshawk	Featured Species	No Impact	Short-term Limited Impacts	Short-term Limited Impacts
Blue Grouse	Featured Species	No Impact	Short-term impacts	Short-term impacts
Pronghorn	Featured Species	No Impact	No Impact	No Impact
Various Species	Landbirds / NTMB[3]	No Impact	Limited Impacts	Limited Impacts

[1]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; [2]MIS = Management Indicator Species; [3] NTMB = Neotropical Migratory Birds

Table 30. Comparison of Alternatives: Listed and Sensitive Fisheries and Aquatic Species

Species	Status	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3
Columbia River Bull Trout Salvelinus confluentus	T	NE	NE	NE
Columbia River Bull Trout Designated Critical Habitat	N	NE	NE	NE
Mid-Columbia River Steelhead Oncorhynchus mykiss	T	NLAA	NLAA	NLAA
Mid-Columbia Steelhead Designated Critical Habitat	D	NLAA	NLAA	NLAA
Chinook Salmon EFH[1]	MS	NAE	NAE	NAE
Interior Redband Trout Oncorhynchus mykiss	S	MIIH	MIIH	MIIH
Westslope Cutthroat Trout Oncorhynchus clarki lewisi	S	MIIH	MIIH	MIIH
Mid-Columbia River Spring Chinook Oncorhynchus tshawytscha	S	NI	NI	NI
Columbia Spotted Frog Rana luteiventris	S	NI	NI	NI
Malheur Mottled Sculpin Cottus bairdi ssp.	S	NI	NI	NI

[1]Chinook salmon waters are designated Essential Fish Habitat by the Magnuson-Stevens Act.

Status
- T Federally Threatened
- S Sensitive species from Regional Forester's list
- D Designated Critical Habitat
- N Designated Critical Habitat Not within Analysis Area
- MS Magnuson-Stevens Act designated Essential Fish Habitat

Effects Determinations - Threatened and Endangered Species
- NE No Effect
- NLAA May Effect, Not Likely to Adversely Affect

Effects Determinations - Sensitive Species
- NI No Impact
- MIIH May Impact Individuals or Habitat, but Would Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species

Designated Critical Habitat
- NE No Effect
- NLAA May Effect, Not Likely to Adversely Affect

Chinook Salmon Essential Fish Habitat NAE No Adverse Effect

Table 31. Comparison of Alternatives: Sensitive Plant Species: Summary of Effects Determination Statements

SENSITIVE SPECIES	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3
Achnatherum hendersonii	NI	NI	NI
Achnatherum wallowaensis	NI	NI	NI
Botrychium ascendens	NI	NI	NI
Botrychium crenulatum	NI	MIIH	MIIH
Botrychium lanceolatum	NI	NI	NI
Botrychium minganense	NI	MIIH	MIIH
Botrychium montanum	NI	MIIH	MIIH
Botrychium pinnatum	NI	NI	NI
Carex backii	NI	NI	NI
Carex interior	NI	MIIH	MIIH
Cypripedium fasciculatum	NI	NI	NI
Listera borealis	NI	NI	NI
Lomatium ravenii	NI	NI	NI
Luina serpentina	NI	NI	NI
Phacelia minutissima	NI	NI	NI
Thelypodium eucosmum	NI	NI	NI

NI No Impact
MIIH May Impact Individuals or Habitat, but Would Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species

Table 32. Comparison of Alternatives: Proposed Forest Plan Amendments

FP Item #	Description of Proposed Forest Plan Amendment	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3
Recreation 1	MA-10 Standard #1, p. IV-97. Manage dispersed recreation for goals of semiprimitive nonmotorized recreation. Activities may change the character from a natural appearing to a modified setting.	No amendment would be developed.	This amendment would be needed for Alternative 2. MA-10 Standard #1 - Alternative 2 would not meet recreation standard direction for goals of semi-primitive non-motorized recreation.	This amendment would not be needed for Alternative 3 since salvage harvest activities are not occurring in MA 10 Under Alternative 3
Recreation 2	MA 20A Standard # 1, p. IV- 121. Manage dispersed recreation for goals of semiprimitive nonmotorized recreation in a natural appearing environment with emphasis on quality big game hunting. Activities may change the character from natural appearing	No amendment would be developed.	This amendment would be needed for both Alternatives 2 and 3. MA-20A Standard #1 – Proposed harvest activities in Alternatives 2 and 3 would not meet recreation standard direction for goals of semi-primitive non-motorized recreation.	This amendment would be needed for both Alternatives 2 and 3. Proposed harvest activities in Alternatives 2 and 3 would not meet recreation standard direction for goals of semi-primitive non-motorized recreation.

FP Item #	Description of Proposed Forest Plan Amendment	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3
	to a modified setting.			
Recreation 3	MA 21 Standard #1 p. IV-131. Manage for semiprimitive motorized recreation on designated roads and trails. Manage for semiprimitive nonmotorized recreation on the remainder of the area.	No amendment would be developed.	This amendment would be needed for both Alternatives 2 and 3. MA-21 Standard #1 – Proposed harvest activities in Alternatives 2 and 3 would not meet recreation standard direction for goals of semi-primitive non-motorized recreation	This amendment would be needed for both Alternatives 2 and 3. MA-21 Standard #1 – Proposed harvest activities in Alternatives 2 and 3 would not meet recreation standard direction for goals of semi-primitive non-motorized recreation
Visuals 1	MA-10 (Semiprimitive Nonmotorized Recreation Areas) – Meet visual quality objective of foreground retention – Standard #3, p. IV-97). Salvage activities would be evident to the average viewer, therefore the need for an amendment.	No amendment would be developed.	This amendment would be needed for Alternative 2. MA-10 Standard #3 – Proposed harvest activities in Alternative 2 would not meet visuals standard direction of retention VQO	This amendment would not be needed for Alternative 3. MA-10 Standard #3 – Alternative 3 would not require this amendment since salvage harvest activities are not occurring in MA 10.
Wildlife 1	MA-13 (Dedicated Old Growth) to relocate old growth areas that burned in the fire. Dedicated Old Growth Areas within the project area would be relocated to suitable habitat outside the fire area.	No amendment would be developed.	This amendment would be needed for both Alternatives 2 and 3. Dedicated Old Growth Areas within the project area would be relocated to suitable habitat outside the fire area.	This amendment would be needed for both Alternatives 2 and 3. Dedicated Old Growth Areas within the project area would be relocated to suitable habitat outside the fire area.
Wildlife 2	MA-21 (Wildlife Emphasis with Non-Scheduled Timber Harvest) Forest Plan IV-133, Standard #10 - Exclude scheduled timber harvest.	No amendment would be developed.	This amendment would be needed for both Alternatives 2 and 3. The project objective is to capture the economic value of timber and would not necessarily accomplish wildlife habitat or fish habitat objectives.	This amendment would be needed for both Alternatives 2 and 3. The project objective is to capture the economic value of timber and would not necessarily accomplish wildlife habitat or fish habitat objectives.
Wildlife 3	Forest Plan Standard #5, p. IV-132, requires a long range plan for achievement of wildlife objectives through use of non-scheduled timber harvest.	No amendment would be developed.	This amendment would be needed for both Alternatives 2 and 3. Since the analysis occurs in a burned landscape, a wildlife plan would not be completed.	This amendment would be needed for both Alternatives 2 and 3. Since the analysis occurs in a burned landscape, a wildlife plan would not be completed.
Wildlife 4	MA-4A (Big Game	No amendment would	This amendment would	This amendment would

FP Item #	Description of Proposed Forest Plan Amendment	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3
	Winter Range) – Restrict activities that disturb wintering big game in a significant and prolonged manner from December 1 to April 1. Standard #7, p. IV-70.	be developed.	be needed for both Alternatives 2 and 3. To rapidly remove burned timber, activities may occur during the winter range period.	be needed for both Alternatives 2 and 3. To rapidly remove burned timber, activities may occur during the winter range period.
Wildlife 5	Eastside Screen wildlife standard at 6d(2)(a). Propose a non-significant Forest Plan amendment to Regional Forester's Amendment 2 to the Malheur LRMP (``Eastside Screens'') to include a definition of ``live'' trees as used in the wildlife standard No. 6d(2)(a).	No amendment would be developed.	This amendment would be needed for both Alternatives 2 and 3. This amendment would apply only to the TFSR Project on the Blue Mt. Ranger District.	This amendment would be needed for both Alternatives 2 and 3. This amendment would apply only to the TFSR Project on the Blue Mt. Ranger District
Wildlife 6	The Malheur Forest Plan was amended in 1995 by Regional Forester's Forest Plan Amendment #2 (commonly referred to as the "Eastside Screens"). The Interim wildlife standard in this amendment includes protection measures for goshawk.	No amendment would be developed.	This amendment would be needed for both Alternatives 2 and 3. If a goshawk nest is found along a critical haul route for salvage haul operation, the project economic viability would be adversely affected.	This amendment would be needed for both Alternatives 2 and 3. If a goshawk nest is found along a critical haul route for salvage haul operation, the project economic viability would be adversely affected

2.5 IDENTIFICATION OF THE PREFERRED ALTERNATIVE

The Proposed Action (Alternative #2) with associated project design features (PDFs), Forest Plan Amendments, and monitoring tasks, is the Agency Preferred Alternative.

This page left intentionally blank

+

3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter summarizes the physical, biological, social, and human environments of the project area and the direct, indirect and cumulative effects of implementing each alternative on that environment. The physical environment includes sections for Air Quality, Fuels, Soils and Watershed. The biological environment includes sections for Silviculture, Wildlife, Fisheries, Rare Plants, and Range (including threatened/endangered species, management indicator species and sensitive species). The human environment includes sections for, Recreation, Visuals, Economics, Heritage and Transportation. This chapter also presents the scientific and analytical basis for the comparison of alternatives presented at the end of Chapter 2. **DEIS Appendix A** contains project maps for the proposed action and alternatives.

SPECIALIST REPORTS, USE OF "BEST AVAILABLE SCIENCE" AND PROJECT RECORD

This Environmental Impact Statement hereby incorporates by reference the Timber/Silviculture, Fuels, Air Quality, Soils/Wateshed, Wildlife, Fisheries, Sensitive Plants, Range/Noxious Weeds, Recreation, Visual Resources, Heritage, Economics/Social, and Transportation Specialist Reports in the Thorn Fire Salvage Recovery Project Record (40 CFR 1502.21). These Specialist Reports are located in each specialist's section of the Project Record and contain the detailed data, methodologies, analyses, conclusions, maps, references, and technical documentation that the resource specialists relied upon to reach the conclusions in this environmental analysis.

The best available science is considered in preparation of this EIS. However, what constitutes best available science might vary over time and across scientific disciplines. As a general matter, we show consideration of the best available science when we insure the scientific integrity of the discussions and analyses in the project NEPA document. Specifically, this EIS and the accompanying Project Record identifies methods used, references reliable scientific sources, discusses responsible opposing views, and discloses incomplete or unavailable information, scientific uncertainty, and risk (See 40 CFR, 1502.9 (b), 1502.22, 1502.24). In addition, **DEIS Appendix B-10** has a detailed discussion on "Best Available Science" in regards to post-burn timber harvest and impacts associated with projects to harvest timber after a wildfire.

The Project Record for the Thorn Fire Salvage Recovery Project includes all project-specific information, including resource reports, the watershed analysis, and other results of field investigations. The record also contains information resulting from public involvement efforts. The project record is located at the Malheur National Forest in John Day, Oregon, and is available for review during regular business hours.

DIRECT, INDIRECT AND CUMULATIVE EFFECTS

Under NEPA, "direct effects" are caused by the action and occur at the same time and place. "Indirect effects" are caused by the action and are later in time or farther removed in distance, but still reasonably foreseeable.

Under NEPA, cumulative effects are the incremental effects of the proposed action or alternatives when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time. In the descriptions of cumulative effects of the proposed action, relevant related actions that are known are identified and discussed. The default temporal scale (time limits for past activities) selected for this project is from twenty years ago to the present. The default spatial scale to be considered for this project is within the 6th Code HUC watersheds that may be affected by the proposed action and all alternatives. However, each resource area cumulative effect area can be different and possibly larger or even smaller depending on the resource area. A full listing of relevant related actions is provided in **DEIS Appendix N**. Each cumulative effects analysis, for each environmental component or resource area, is guided by and consistent with the Council on Environmental Quality letter, "Guidance on the Consideration of Past Actions in Cumulative Effects Analysis" of June 24, 2005.

OVERVIEW OF THE PROJECT AREA

Location

The project area is located in about 20 miles southwest of John Day, Grant County, Oregon (**See DEIS Appendix A-1**) The project is on National Forest System Lands administered by the Blue Mountain Ranger District, Malheur National Forest. The legal location is T14S, R28E, Sections 22, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22 , 23, 24, 28, 32, 33; T15S, R28E, Sections 4, 5, 8; Willamette Meridian. Local area landmarks are the Aldrich Mountains and Chrome Ridge. The Shake Table Fire Complex occurred within the Upper John Day Subbasin. Subwatersheds (6^{th} field level) include Dry Creek, Fields Creek, Todd Creek, and Murderers Creek-Duncan Creek. These subwatersheds are delineated into 7^{th} level subwatersheds including Widows Creek, West Dry Creek, Dry Creek, Wickiup Creek, Buck Cabin Creek and Upper Todd Creek.

Climate

Precipitation is distributed throughout the year, though unevenly, with the months of November through April receiving the bulk. Snow is prevalent in winter, and average low temperatures are below freezing mid-October through mid-April. Total annual precipitation is about 21 inches per year. The highest yielding storms, with durations of a day or less are May through September at Dayville and city of John Day records. Daily totals up to 2.23 inches have been recorded at John Day. Frequency and duration of high intensity storms of 2-year, 6-hour are 0.8 to 0.9 inches for the area of Aldrich Mountain.

Topography, Geology and Streams

The project area is located in the Blue Mountains Ecological Section M332G, which is characterized in the eastern half by moderately dissected mountains (McNab and Avers 1994). Aldrich Ridge, located in the east-west running Aldrich Mountains, is the most prominent landform in the project area. The TFSR project area is predominantly located on the steep, north facing slope of Aldrich Mountain. The primary NE-SW trending ridge is the dominant topographic feature of the project area. Water sources in and adjacent to the project area include several springs and steeply incised tributaries of the John Day River. The topography of the project area is composed of moderate to steep slopes, generally ranging from 25 to over 70 percent. Elevation ranges from approximately 3320 feet in the northeast part of the project at Fields Creek and 6680 feet at the top of the 2150 road, near the watershed divide between Fields Creek, Murderers Creek and Todd Creek.

The geology of the lower slopes of Buck Cabin, Wickiup (both tributaries of Field's Creek) and Dry creeks are within the Fields Creek formation, which is composed of graywacke, shales and mudstones from shelf and subduction trench deposit. The lower portion of Widow's Creek and the upper slopes area of Wickiup and Buck Cabin creeks are serpentinite (hydrated seafloor) with inclusions of earlier Paleozoic metavolcanics. The upper portion of Widow's and Dry creeks are Eocene volcanics, including the andesite and basalt flows, ash, breccia and conglomerates of the Clarno Formation. Aldrich Mountain ridge, Todd and Duncan Creek watersheds are almost wholly contained within the

Columbia River group flood basalts, also Eocene in age. The project treatment unit soils are either derived from basement rock—volcanics, meta-sedimentary and serpentinite, or from landslide material primarily originated from the Clarno volcanics, but may be a mixture of types.

Vegetation

The warm-dry plant association group dominates the forested vegetation in the project area (See Silviculture Section 3.1 for more details on plant association groups). These areas usually are dominated by climax ponderosa pine, Douglas-fir, or grand fir. Ponderosa pine is a major seral species present in the Douglas-fir and grand fir plant associations that are included in this PAG. The Douglas-fir with ponderosa pine associations contained a mix of the two species, as well as occasional grand fir. Western juniper may appear on drier sites and groups of quaking aspen may appear on moister sites. Western larch is also present in varying amounts, but is only a minor species in this area.

The cool-moist plant association group has forested areas that contain grand fir and subalpine fir plant associations. The moist forest types are somewhat limited in this part of the Forest. This plant association can support a range of tree species, but most common in this area are grand fir, Douglas-fir, and ponderosa pine. Occasional western larch, lodgepole pine, and subalpine fir are found.

Open meadows, grasslands and rocky areas tend to be located along ridge tops and some south and west facing slopes

Wilderness Areas and Inventoried Roadless Areas

The Shake Table Fire Complex did impact approximately 8,000 acres of the Dry Cabin IRA; however, the TFSR project area does not include treatments in the Dry Cabin IRA or any other Inventoried Roadless Areas or wilderness areas. Black Canyon Wilderness is about 10 air miles west on the Ochoco NF and Strawberry Mountain Wilderness is located on both Prairie City and Blue Mountain Ranger Districts, but not adjacent to the project area.

Human Uses

Historic uses of the project area are reflected in the form of sites related to chrome mining, livestock grazing, and Forest Service timber management programs. John Day/Canyon City and Prairie City are home to several wood products industry facilities and a significant portion of the economic base is concentrated in forest products industries, livestock operations and agriculture.

Parts of three grazing allotments are within the project area; Aldrich Allotment, Fields Peak Allotment, and Murderers Creek Allotment. Livestock grazing is an important activity for the local economy in Eastern Oregon and is a significant management program on the Malheur National Forest.

The project area provides a range of recreation opportunities for the public. The area is accessed by Fields Creek Road #21 on the east side of the project area and Aldrich Ridge Road #2150 through the center and southern portions of the project area. Aldrich Ridge provides access to various recreation activities and opportunities including views of roadless and semiprimitive areas and road #2150 are also the primary access route to Aldrich Lookout and Aldrich Ponds, which is located on state owned lands. The primary recreation activities occurring in the project area include hunting, hiking, horn gathering, dispersed camping, personal-use firewood cutting, and driving for pleasure on roads. Dispersed campsites are used heavily during hunting seasons and are mostly located on Aldrich Ridge, near Road 2150 and along Chrome Ridge. The Cedar Grove Trailhead and most of the Cedar

Grove National Scenic Trail are located outside of the project area, but are connected recreation resources. There are no developed recreation facilities within the project area.

The primary access into the project area is Forest Service Road (FSR) #21. The road surface is asphalt and starts from U.S. Highway 26 and ends at a point southeast at milepost 25.2 at its junction with County Road 63. The other main access roads in the project area include FSR #2140 and #2170. The project area has some areas with virtually no roads, and other areas with moderately high total road densities. The total road density within the project area averages 2.6 miles/square mile, and the open road density within the project area averages 1.6 miles/square mile.

Shake Table Fire Complex of 2006

The landscape and the resources in the project area have been affected by a recent wildfire. In August 2006, the Shake Table Fire Complex burned much of the project area with high severity resulting in high levels of tree mortality. The landscape has undergone a fire that burned with higher severity than would historically have occurred in these vegetation types. Many of the places that had a continuous conifer canopy experienced stand replacing fire leaving nothing but large areas of visible black tree stems and burned ground surfaces. Patches of trees that did not burn entirely are seen as small patches of red-needled trees. Some other areas did not burn as intensely leaving patches of green trees interspersed with the dead and severely scorched trees.

CHAPTER 3 GUIDE TO RESOURCE SECTION DISCUSSIONS

A detailed discussion of the existing condition and the effects of the alternatives on each resource area are presented in Chapter 3. A table of contents is provided below to guide the reader to those resource specific discussions in this chapter.

3.1 TIMBER / SILVICULTURE

3.1.1 INTRODUCTON

This section focuses on the effects of tree planting versus natural conifer forest regeneration. It looks at how each contributes to meeting management objectives and desired forest conditions for rapid establishment of appropriate forest cover, and how that, in turn, produces stands that progress toward a mix of structural stage classes that provide benefits for many resources.

REGULATORY FRAMEWORK

NFMA

The National Forest Management Act (NFMA) of 1976, including its amendments to the Forest and Rangeland Renewable Resources Planning Act of 1974 state 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. Both acts also state "insure that timber will be harvested from national Forest System land only where – (ii) there is assurance that such lands can be adequately restocked within five years of harvest." The Forest Service has established a policy that this requirement is applied to salvage as well as to "green" timber sales. In addition, where no salvage is done, deforested lands should be reforested as quickly as practicable (Goodman, 2002)

Forest Plan

The Malheur NF Land and Resource Management Plan provide Forest-wide standards. The applicable standards for the forest vegetation analysis, and why this project is consistent with those standards are discusses at the conclusion of this section:

Forest Plan amendment 2 "Screens"

The Regional Foresters Forest Plan Amendment #2 gives additional direction for timber sales. Eastside Screen standard 6d (2) (a) is the subject of a Forest Plan Amendment associated with the action alternatives. This standard states "maintain all remnant late and old seral and/or live trees greater than or equal to 21" DBH that currently exist within stands proposed for harvest activities. The proposed amendment provides a practical definition of "live" and "dead" trees for purposes of implementing this salvage project.

Alternatives 2 and 3 do not propose harvest of live trees but still must apply riparian and wildlife standards. The applicable wildlife standards for the forest vegetation portion of this analysis are:

If late and old structure is below HRV, there should be no net loss of late and old structure. Manipulate vegetation that is not late and old structure so that it moves towards late and old structure. Where open, park-like stands occurred historically, encourage the development of large diameter trees with an open canopy structure. Amendment 2 does not require ecosystem screens in salvage situations, but for other analysis purposes, a brief assessment of the historic range of variability (HRV) is provided later in this section.

The Interior Columbia Basin Ecosystem Management Project terminology used in this document is old forest single story, or old forest multi-story rather than "late and old structure".

Affected Environment Acreage

The analysis area for forest vegetation includes all National Forest System (NFS) lands contained within the project area; non-NFS lands were excluded. This analysis area includes approximately 7783 acres of NFS lands. Table 33 displays acreages of several categories of lands that, due to physical, biological or management constraints were not considered for salvage, and those that are available. Many of these acres, though, are available for reforestation, as discussed in the Alternatives section.

Table 33. Area Considered for Salvage in the Project Area

Lands for Salvage Opportunity	Acres
Total NFS lands within the project area	7783
Non-forested, or non-vegetated lands	85
Riparian habitat conservation areas (RHCAs)	1169
Moist forest habitats (limited forest type in project area)	914
Suitable habitat TES Plants	519
Alaska yellow cedar stands inside project boundary (but not within Cedar Grove Botanical Area / IRA	11
Unburned forest	200
Widows Creek burn area (sub-merchantable, low volume)	578
Area considered for salvage harvest	4307
(source: /fsfiles/office/gis/thorn_salvage_eis/gis_spec_wksp_deis/silviculture/identity6_widow.shp)	

ANALYSIS INDICATORS

Analysis indicators are elements of the analysis that are quantified in order to compare and evaluate the effects of each Alternative. Rapid reforestation to appropriate forest cover is one of the purposes for this project. The following indicators are used to evaluate how well each Alternative addresses the purpose and need for the project, and how well each contributes toward meeting reforestation requirements and the desired condition of forest vegetation in the project area. Bark beetle hazard can increase following fire. While specific, quantifiable analysis is difficult, a discussion and relative comparison of how each Alternative effects bark beetle hazard is provided. The acres of affected bark beetle habitat are given for each Alternative.

Years to Full Stocking with Appropriate Forest Cover

Acres in the project area that are fully stocked within 5 years are displayed for each Alternative. It will show time differences between natural and artificial reforestation, and the acreage amount at several points.

Structural Stages

Structural stages are displayed. The distribution of structure stages over time is shown for each Alternative in the project area, and over the four sub watersheds that encompass the project area.

ANALYSIS METHODS

In order to compare the effects of Alternatives on forest development over time, the establishment and growth of naturally occurring seedlings and planted seedlings, are tracked into the future. As seedlings are established under the various burn severities and plant association groups, and because they add to over-all stand composition and structure when combined with remaining live trees, stand development over time will be modeled into the future to describe structural stage changes.

Tree Survivability

Tree survival probability is determined using “Factors Affecting Survival of Fire Injured Trees; a Rating System for Determining Relative Probability of Survival of Conifers in the Blue and Wallowa Mountains” by Scott, et al, 2002 as amended. These are commonly referred to as the “Scott Guidelines”. The proposed Forest Plan amendment for this project seeks to define a “dead” tree using these guidelines. Trees determined through use of the rating system that have a low probability of survival are considered to be dead trees for this project, where the guidelines are applied. Trees rated as moderate or high probability of survival are considered to be “live” trees.

Natural regeneration assumptions

Accurate predictions of natural regeneration are difficult to make and must be based on a number of assumptions. Factors that effect natural regeneration are variable and unpredictable. The availability and abundance of seed in the canopy of fire killed or injured trees would effect the resulting natural regeneration. Moisture conditions in the seedbed at the time of seed germination effects seedling establishment. Germination percent of the available seed is variable, and effects seedling density. The distance of surviving, seed-producing trees to unstocked areas effects seedling density. Cone and seed crops themselves are variable. The timing and abundance of seed from future come crops is variable. Seedbed receptiveness and micro-site availability effects seedling establishment and growth.

However, reasonable assumptions can be made and are necessary in order to describe stand development over time, and to then compare the effects of each Alternative. Effective seed dispersal distances, for establishing fully stocked stands in rapid fashion, are assumed to average 200 feet from the edges of unburned stands and from low-severity burned stands. Douglas-fir effectively seeds in up to 300 feet from fully stocked edges. Ponderosa pines effective seeding distance is 100 to 120 feet. Given that in the natural regeneration situation, we would rely on either species, and both are present in varying degrees along unburned and low-severity burned sites, it seems that a 200-foot distance is reasonable. In low-severity burned stands, and along the effectively seeded edges, it is assumed that full stocking will be achieved in 10 years. The areas farther from seed sources, especially those areas burned at high and very high severity will regenerate, but it will take a longer period. Estimates are that burned sites from 200 to 800 feet from a seed source might be fully stocked within 20 years. Areas farther than 800 feet from a seed source (unburned and low severity burned sites) would take 40 to 60 years or more to become stocked with well established conifer seedlings. Continued natural regeneration is included in model simulations. Where salvage harvest is planned, natural regeneration is reduced by two-thirds to simulate the effect of fewer natural seedlings after salvage.

Planting assumptions

All salvage harvest units with very high, high or moderate burn severity are planned for hand planting within five years after harvest, regardless of proximity to potential natural seed source. Funding availability, planting stock availability, nursery failures, poor initial seedling survival, unexpected natural regeneration success, unexpected animal damage, poor soil moisture and salvage harvest delays could extend the time required to meet the reforestation objective, but the objective is clear; to reforest these sites as quickly as practical. This is to promote prompt, vigorous recovery of appropriate forest cover in those areas affected by the salvage. The lower elevations (warm-dry PAGS) will receive about 300 seedlings per acre, all of which will be ponderosa pine. We assume a 60 percent mortality rate in these planted seedlings over the first five growing seasons. Higher elevation units (cool-moist PAGs) will receive a mix of about 65 percent ponderosa pine, 30 percent Douglas-fir and 5 percent western larch. Those sites will receive about 350 seedlings per acre, and we expect a 40 percent mortality rate in the first five growing seasons. Salvage units burned at low severity but with inadequate stocking will be planted. Field examinations will be conducted after salvage operations to determine the required number of seedlings needs, and the appropriate mix of species, for the final planting prescription. Until then, it is assumed that half of the salvage acreage burned at low severity will require planting at a density of 150 seedlings per acre, and we assume a 30 percent mortality rate in these areas. It is assumed that the remaining half of the low-severity units will not require planting, and that they will in-fill with naturally occurring seedlings. High and very high severity burned units at lower elevations will be scheduled for planting before units with low and moderate burn severity rates. This assumes salvage harvest operations have been completed. Simulations will include natural seedling establishment in addition to planted trees, but at a lower rate, to account for potential loss of seedlings to yarding operations. Planting in salvage units is considered essential reforestation and collections may be made under the Knutsen-Vandenberg Act to provide the funds needed to reforest these sites. Areas up to ¼ mile outside salvage units are planned for planting, but are considered non-essential and are a lower priority for KV financing. Areas beyond ¼ mile would be planted using available appropriated financing, if it becomes available.

Outside of harvest units, virtually all areas that supported forest vegetation types prior to the fire are planned for planting. The intent is to reforest these sites within five years. However, allowance may be necessary to address unforeseen situations such as planting stock availability (nursery crops occasionally fail), poorer than expected survival rates requiring re-planting, unanticipated animal damage, poor soil moisture, or others. Those areas that area expected to regenerate naturally, and quickly, will not be planted (about half of the low severity burned stands). The Alaska yellow cedar stands inside the project area (but not within the Cedar Grove Botanical Area / IRA), and the visual corridor along Road 2150 will be planted. Riparian habitat conservation areas are planned for planting where warranted. Riparian area planting to conifer would be considered and could include the mid and low-elevation habitats. It could include hardwood plantings of willows, dogwoods, cottonwood and others specific to the sites if planting stock becomes available and if funding is available. Again, specific tree densities to plant will be determined prior to planting, but for analysis purposes, it is reasonable to assume a planting density in the cedar area of 300 seedlings per acre. This is higher than we might normally plant, but there is no local experience with seedling survival rates with planted Alaska yellow cedar. If seedlings fail, rooted cutting could be planted in the cedar grove area, or the area could be replanted more than once. The planting along road 2150 will, by design, be variable. However, it is reasonable to assume an average rate of 150 tree seedlings per acre would adequately meet regeneration needs. RHCA planting will include appropriate species, including hardwoods, if planting stock can be acquired, and funding secured. Planting rates will vary by Alternative, but on average, about 1700 acres would be planted each year. All planting (inside and outside harvest units) will be accomplished in approximately four seasons, beginning spring 2008, ending spring 2011.

Planted stands are assumed to be certified as fully stocked and free to grow at the end of the fifth growing season.

Projecting tree and stand growth into the future is modeled using the Forest Vegetation Simulator (FVS). FVS is a firmly established tree and stand growth model that is fully supported and maintained by the Forest Service. A specifically calibrated variant of FVS is available for the Blue Mountains of Eastern Oregon. Stand development over time is modeled using existing stand conditions, as provided by INFORMS (**DEIS Appendix B-1**), and with the natural regeneration and planting assumptions discussed above. The INFORMS program is described in detail in **DEIS Appendix B-1.** Salvage functions are included as well, so that estimates if future fuels, snags, and structural stages are based on realistic conditions. **DEIS Appendix B-2** describes the modeling process. Growth projections do not necessarily predict the actual growth that will occur, because the models cannot predict all factors that effect stand and tree growth. Model results are used to highlight relative differences, not absolute conditions. No future activities or fires are included in growth simulations, but periodic establishment of natural regeneration is modeled. In the interest of time and modeling complexity, representative stands in each PAG and burn severity category were chosen to run in FVS. Results were averaged, and applied to each specific situation to calculate the proportions in each class.

Note that throughout this section, acreage figures are approximate. Where percents are displayed, some may not sum to 100 percent due to rounding.

Analysis Area for Direct and Indirect Effects

Direct and indirect effects discussions are limited to the project area. They will focus on the acreage established in appropriate forest cover.

Cumulative Effects Analysis Area

Discussions involving "HRV" include summary information at the sub-watershed level (four encompassing sub watersheds) because it is at that scale that we can realistically describe the range of variation. The temporal scale of analysis will include about 15 decades into the future; enough to draw conclusions about structural stage development and distribution. Structural stage distribution over time is displayed and compared by Alternative. INFORMS uses existing stand and site data where they exist in the database, and imputes stand data where none exists, using the most similar neighbor routine (**See DEIS Appendix B-1**) Past actions are included in the database INFORMS uses, so those effects of past harvest and fire activities are inherent in the programs outputs of pre- and post-fire conditions. Future tree planting in other parts of the Shake Table Fire Complex (outside the Thorn Salvage Recovery Project Area) were not included in the calculations of percent coverage of structural stages, because yearly production rates are uncertain. The effects of tree planting in other parts of the Shake Table Fire Complex are assumed to follow the same developmental trajectory as the planted stands inside the project area, and would then result in a much greater difference between Alternative 1 and Alternatives 2 and 3 in recovery time.

With reference to the project list of potential cumulative activities (**DEIS Appendix N**), a review of past, present and future activities concluded that: a) past timber sale activities are included in the forests data that was used in this analysis and therefore included in summaries of effects; b) wild horses, and management of their territories has no connection to the effects on vegetation; c) given management constraints and forest plan direction, grazing allotments and their management have no effect directly or indirectly on forest regeneration or structural stage development, and therefore has no cumulative effect) the condition of past wildfire sites is included in the stand database, and was considered in analyzing direct, indirect and cumulative effects) outfitter and guide operations have no effect on forest development and are not considered in cumulative effects f) fire suppression activities have no effect on the regenerating forest, and are not considered in cumulative effects. g) burned area emergency rehabilitation included aerial seeding of grasses for erosion control, tree felling in riparian areas for erosion control and straw mulching for erosion control these activities have no effect on forest regeneration or structural stage development, and were not considered in cumulative effects. h) noxious weed control has no effect on the overall conditions relating to forest vegetation and is not considered, i) other past activities, present and ongoing activities, foreseeable future activities, as listed, are not considered to have direct or indirect effects on forest vegetation, and are not considered in cumulative effects, j) other foreseeable activities, as listed, except the Shake Table Fire Complex reforestation activities, have no direct or indirect effect on forest vegetation and are not considered.

The Shake Table Fire Complex reforestation activities would not have a direct effect on the project area, but within the cumulative effects areas, the expected effects of planting in the vicinity could have an overall beneficial effect by rapidly establishing appropriate forest cover in some of the subwatersheds included in this cumulative effects area. The Shake Table planting project is listed as not yet approved, and is listed for 2007 only. Planned acreage, species, and density to plant are uncertain and therefore it is not possible to include the effects other than to acknowledge that, in addition to direct effects from any of the alternatives, similar beneficial effects are anticipated as a result of planting the Shake Table Fire Complex.

Burned area emergency rehabilitation work included aerial seeding ponderosa pine seed on about 536 acres of high severity burned areas outside the project area, and 614 acres inside the project area. Seedling establishment success is uncertain until monitoring in the 2007 growing season (and after) yields results. Aerial seeding success is highly variable and not entirely reliable. Estimates of regeneration success in this analysis do not include seedlings that may become established as a result of aerial seeding, because to do so would be speculative.

Incomplete Information

As discussed in **DEIS Appendix B-1,** many of the stands in the project area did not have pre-fire stand examination inventories. In order to proceed with analysis, the INFORMS most similar neighbor routine was used to fill information gaps. INFORMS, using most similar neighbor information, produces acceptable results for use in describing overall conditions. It cannot be used to determine specific features on an individual stand basis. Structural stage development over time (after the fire, but including reforestation) was simulated using the FVS stand growth model, using representative stands for each of several situations[16], to arrive at an average "per acre" value for structural stages each decade for 150 years. Those per-acre values were expanded by the acres in each situation, to arrive at overall proportion of the area in each structural stage. This approach was taken in the interest of time and modeling simplicity. However, it did result in inconsistent results when comparing those result against INFORMS results. INFORMS did not include regeneration establishment over time, so could not simulate future structural stages. While not incomplete, this method is not as rigorous as possible.

Predicting bark beetle response to fires is difficult at best. No specific stand information is available regarding any beetle activity last fall after the fires. The fire occurred after most beetle flights for the season had already taken place, so they would not have responded yet to the fire. Monitoring this early summer for beetle activity is the soonest that any meaningful information could be gathered.

3.1.2 AFFECTED ENVIRONMENT

This section discusses several elements of the effected environment to provide a context for the assessment. Topography is discussed. The influences of fire are introduced. Plant Association Groups – PAGs are explained. Pre-fire (Shake Table Fire Complex) conditions are provided and conditions immediately after the fire are provided, to show the effect of the fire itself, and to establish the baseline conditions for estimating effects into the future. One important element of the post-burn conditions is the burn severity, or amount of mortality, experienced throughout the project area. Different burn severities can produce different responses. Structural stages are discussed as a way of describing the current and future landscape, and of comparing those conditions against the historic range of conditions. Bark beetles are discussed, vegetation response to fire is discussed, and forest regeneration factors are discussed.

FIRE

Fire has been a principle agent of change that created, shaped and maintained several forest types and structures throughout the Blue Mountain region. Each fire event was unique in terms of ignition,

---

[16] Situations are arrived at by combining burn severity, plant association group, planting/natrual regeneration prescription, and whether a site is in or out of a salvage unit (or none at all for Alternative 1). For example, one situation is: a site with high burn severity, in warmd-dry PAG, that is in a salvage unit, and planned for hand planting.

timing, location, extent, duration and severity. In the warm-dry biophysical environment (most of the project area; “warm dry “ will be discussed later in this section) fire scar studies indicate a high frequency, low intensity fire regime, meaning that fires typically burned across a portion of the landscape approximately every 12 years. Fire continued to be an important agent of change on the landscape until the late 1800s. As settlers moved in, the influence and frequency of fires started by native peoples began to diminish, and settlers probably extinguished a small percent of lightening-caused fires. Fires became less frequent as a result. In the Warm-Dry biophysical environments, ponderosa pine dominated the landscape because frequent, low intensity surface fires favors ponderosa pine over other species.

PLANT ASSOCIATION GROUPS

Forest vegetation can be described in terms of plant associations or assemblages of plant species including conifers, hardwoods, shrubs, grasses, and forbs adapted to utilize available site resources. These assemblages or plant associations form patterns across the landscape in response to available site resources, or environmental gradients of light, moisture, temperature, and soil nutrients (Johnson, 1992). Potential vegetation types (PV), are fine-scaled, and almost 300 have been identified for the Blue Mountains. These fine-scaled PV types are often aggregated into mid- and broad-scale groups for planning purposes. These aggregations are called Plant Association Groups (PAG), and are referred to as “biophysical environments”. Plant Association Groups are useful because they are similar to those used by the Interior Columbia Basin Ecosystem Management Project and they are compatible with aggregations used for historic range of variability assessments. In addition to responding to environmental gradients, these associations are shaped by disturbance processes including fire, insects, and disease, wind, snow and drought conditions. Plant dominance is expressed by those species best adapted to utilize available growing space or site resources in response to inherent disturbance regimes. The types of disturbance, frequency, intensity and extent define those plant resources. These factors shape the vegetation composition and structure supported over time (Everett, 2000).

The Warm-Dry and Cool-Moist Plant Association Groups dominate the project area, and the surrounding watersheds. Other PAGs in the project, represented by considerably fewer acres, are the Cold Dry upland forest, Hot Dry upland forest, Hot Moist upland shrubland, Hot Moist upland woodland, Warm Moist upland forest, and Hot Dry upland hardwoods,

Table 34 shows the acreages in each PAG, for the four subwatersheds that encompass the project areas. Table 35 shows the acreages in each PAG for the project area only.

Table 34. Acres and Proportion Plant Association Groups by Subwatersheds

Subwatersheds	PAGs	Acres
Dry Creek	Cold Dry UF	4
	Cool Moist UF	262
	Hot Dry UF	44
	NF	90
	NV	8
	Warm Dry UF	4555
Dry Creek Total		4965
Fields Creek	Cold Dry UF	27
	Cool Moist UF	1375
	Hot Dry UF	290
	Hot Moist US	102
	Hot Moist UW	78

Subwatersheds	PAGs	Acres
	NF	985
	NV	57
	Warm Dry UF	7907
	Warm Moist US	0
Fields Creek Total		10820
Murderers Creek-Duncan Creek	Cold Dry UF	57
	Cool Moist UF	21
	Hot Dry UF	759
	Hot Dry UH	509
	Hot Moist UW	216
	NF	1738
	NV	7
	Warm Dry UF	6772
Murderers Creek-Duncan Creek Total		10080
Todd Creek	Cold Dry UF	20
	Cool Moist UF	0
	Hot Dry UF	244
	Hot Dry UH	93
	Hot Moist UW	107
	NF	606
	Warm Dry UF	7033
Todd Creek Total		8103
Grand Total		33967
Source geodata: huc6_less_nonnfs_postveg07merge.shp Note: "UF" is Upland Forest, " NF " is Non-Forested, "UW" is Upland Woodland (Juniper), "UH" is upland hardwoods, "US" is Upland Shrublands)		

Table 35. Acres by PAG in the Project Area.

Plant Association Group	Acres
Cold Dry UF	47
Cool Moist UF	970
Hot Dry UF	156
Hot Dry UH	5
Hot Moist UW	55
NF	72
NV	8
Warm Dry UF	6470
Grand Total	7783
source geodata: /fsfiles/office/gis/thorn_salvage_eis/gis_spec_wksp_deis/silviculture/postveg07_merge.shp *(Note the dominance of Warm-dry and Cool-moist PAGs)*	

The Warm-Dry Plant Association Group

The warm-dry plant association group dominates the project area. All elevations and aspects are included in this PAG. These areas usually are dominated by climax ponderosa pine, Douglas-fir, or grand fir. Ponderosa pine is a major seral species present in the Douglas-fir and grand fir plant associations that are included in this PAG. The Douglas-fir with ponderosa pine associations contained a mix of the two species, as well as occasional grand fir. Western juniper may appear on drier sites and groups of quaking aspen may appear on moister sites. Western larch is also present in varying amounts, but is only a minor species in this area. This PAG covers a full 83 percent of the project area. The natural fire regime here is one of frequent, low-intensity, low severity fires. Trees typically grow in small even aged clumps in stands dominated by larger ponderosa pine. Relatively few understory trees and shrubs are present, although localized patches missed by earlier fires can be dense. Generally, tree density is light, with open stands, adequate growing space, and little inter-tree competition. Typical fire mortality in the overstory is light, and patchy. Stand replacing fire events are infrequent. Heavy seed and poor dispersal limit natural regeneration of ponderosa pine. In general, fire exclusion and harvest of mature seral species trees leads to an increase in Douglas-fir and grand fir, an increase in fuel levels, and greater stand densities. These conditions may have contributed higher fire intensity and greater tree mortality than might have occurred under conditions that are more typical for these sites.

The Cool-Moist Plant Association Group

These areas contain grand fir and subalpine fir plant associations, and cover about 970 acres in the project acre. The moist forest types are somewhat limited in this part of the Forest. This collection of plant associations in the TFSR project area occupies a continuous band beginning just below the main east-west ridge at the top of the fire, about 6600 ft elevation, down to about 4900 feet at the lowest. Most of the cool moist PAG in the project area lies between 5400 and 6300 feet elevation and faces northeast. These plant associations can support a range of tree species, but most common in this area are grand fir, Douglas-fir, and ponderosa pine. Occasional western larch, lodgepole pine, and subalpine fir are found.

The cool-moist PAGs typically burned under a mixed-severity fire regime. In the mixed severity regime, there is more variation in the outcomes of fire. The mixed regime can experience less frequent, but still low-severity fires some of the time, while under hotter and dryer conditions, stand replacement fires can also be typical in the mixed regime, and not considered out of the historic range for that type. (Brown, J 2000) In the mixed severity fire regime, the influence of fire exclusion over the years is apparent, but it is not as striking as in the high-frequency, low-severity fire regimes.

Minor Plant Association Groups

Table 34 and Table 35 display the acres of every PAG in the four encompassing sub watersheds and the project area. These clearly show that the area is dominated by the warm-dry and cool-moist PAGs. The others, while important, are excluded from future analysis because changes to those types over time either follow other PAG responses closely and would have no meaningful effect to the analysis, or they simply are not affected by any elements in the alternatives and are not likely to change under any circumstances. Limiting the assessment of effects to only the Warm-Dry and Cool-Moist habitats in the analysis will yield a more focused analysis.

Vegetation Burn Severity and Tree Mortality

Vegetation burned by the Shake Table Fire Complex forms an interesting pattern created mainly by: 1) soil types, 2) aspect, 3) elevation, 4) moisture and temperature regimes, 5) past management practices, and 6) the specific fuel moisture, relative humidity, wind, and temperature at the time the flame front passed. The central portion of the project area is one large patch of completely blackened stands. Most of the project area burned very hot; with very high fire intensity, and much of that burned over a short period. Surrounding the large central patch are areas that burned with less intensity creating a mix of new stand conditions, and some patches inside the main fire perimeter did not burn.

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 tissue killed by heat.

For the project analysis area, about 4425 acres (57%) experienced first-order fire effects severe enough to kill 75% or more of the trees. This includes the high and very high burn severity categories.

Second-order fire effects refer to the indirect or delayed consequences of fire-caused heat injury. Insects, disease or drought may subsequently kill trees with injured cambium, crown or roots. Fire-caused injuries predispose trees to attack by insects or disease and many of those attacks will cause mortality because the trees were weakened by first-order effects.

For the project area, about 3051 acres (39%) sustained low or moderate direct fire effects. These are the low and moderate burn severity categories. It is in these areas that second-order fire effects, and delayed first-order effects, and a combination of both will be prevalent. This ongoing mortality may continue for several years. This delayed mortality is considered in the modeling processes used in the analysis. Four percent of the area (306 acres) was not burned.

It is useful to categorize varying degrees of tree mortality because each will respond differently to the new conditions created by the fire, and provide different structures now, and will provide different structures in the future. Stands that experienced a low severity burn, and have considerable overstory and even some understory vegetation remaining will regenerate differently than stands burned with very high severity that will probably take decades to become fully restocked. Approximately 57 percent of the project area (4425 acres) was killed or heavily damaged and are classed in the high and very high mortality categories. Those stands were converted to a much earlier seral stage of stand development. The most extensive area of severely damaged stands is west of Chrome Ridge. The Widows Creek burn that occurred in the 1960s had been reforested, using hand-planting techniques. Even though these stands were relatively young and healthy, and variably stocked, most burned with high and very high severity.

Forested areas that burned with low (25%) to moderate (14%) severity range greatly in vegetation mortality levels. Stands with a substantial number of live trees are around the fire perimeter where the fire slowed and burned with less intensity. These groupings of surviving trees usually occur in areas of low fuels, flat topography, lower stand density; or they burned during periods of higher relative humidity, higher fuel moisture, or cooler temperatures. These factors contributed to reducing local fire intensity. In moderate fire severity areas, stand structures range widely. Stands with lighter burn severity range from low density to high density stocking.

Live fire-injured trees may die within the next few years as a result of delayed direct effects, or secondary effects, or a combination of both. (Scott, et al 2002) The delayed tree mortality is considered in the modeling process used in this analysis, and those trees expected to die are included in estimates of mortality as if they were already dead.

Burn severity to vegetation was mapped into five categories: Low, Moderate, High, Very High and Unburned (**See DEIS Appendix B-3**). While it is useful to categorize these burned conditions, and those categories help us in discussing and quantifying certain characteristics, and in applying appropriate project design elements and prescriptions, it is important to understand that there can be wide variation in conditions even within each category, and even within individual stands.

Low: In the low severity category, leaves and twigs on smaller trees were partially or completely scorched. Mature trees were mostly unburned. Patches of the forest floor were unburned, or only lightly burned, with little effect. This category includes estimated tree mortality ranging from one to 30 percent. Table 36 displays the amount of burn severity by Plant Association Groups for the project area

Moderate: In the moderate category, leaves and small twigs on some tree branches were completely scorched; stems and tree trunks were charred and partially burned. Individual trees were completely scorched, but many others remained unburned. Remaining needles on scorched trees are mainly brown and persist on the trees. Other trees were only scorched in the lower canopy, and retain green needles higher in the tree. This category includes estimated tree mortality ranging from 30 to 75 percent.

High: In the high category almost all leaves, stems, and twigs on tree branches scorched (brown) or consumed; trees and tree trunks charred with branches mostly blackened. Most trees are black, but some retain brown needles, some trees survived the immediate effects of the fire, but they may succumb to secondary effects. This category includes estimated tree mortality of 75 to 95 percent.

Very High: This category describes the "black-black" condition. Essentially all trees are dead because of the fire. Needles and small branches were completely consumed in the fire. All parts of the standing trees are black. Existing snags and down wood were mostly consumed. Soils were blackened with most organic matter consumed in the fire. This category includes estimated tree mortality of over 95 percent.

Unburned: No visible burning took place in some patches within the main fire perimeter.

Table 36. Burn Severity by PAG within project area boundary

Burn Severity	PAG	Total
High	Cool Moist UF	17
	Hot Dry UF	4
	Hot Dry UH	1
	NF	2
	Warm Dry UF	635
Low	Cold Dry UF	2
	Cool Moist UF	169
	Hot Dry UF	101
	Hot Dry UH	5
	Hot Moist UW	8
	NF	14
	Warm Dry UF	1641
Moderate	Cold Dry UF	25
	Cool Moist UF	121
	Hot Dry UF	18
	Hot Moist UW	46
	NF	8
	Warm Dry UF	894
Unburned	Cool Moist UF	6
	Hot Moist UW	0
	NF	2

Burn Severity	PAG	Total
	Warm Dry UF	297
Very high	Cold Dry UF	20
	Cool Moist UF	657
	Hot Dry UF	34
	NF	46
	NV	8
	Warm Dry UF	3002
Grand Total		7783
source geodata: /fsfiles/office/gis/thorn_salvage_eis/gis_spec_wksp_deis/silviculture/postveg07_mortality_id.shp **Note: "UF" is Upland Forest, " NF " is Non-Forested, "UW" is Upland Woodland (Juniper), "UH" is upland hardwoods, "US" is Upland Shrublands, "NV" is Non-vegetated**		

Structural Stages

The structural stage classifications used here are consistent with the terms and methods used in the Interior Columbia Basin Ecosystem Management Project. Information on pre-fire stand structures and biophysical environments were derived from the INFORMS Most Similar Neighbor model process (**See DEIS Appendix B-1**). The structural stages used are summarized in Table 37

Table 37. Forest Stand Structure Stages used in analysis of the TFSR Project

Structural stage	Definition	Also known as:
Stand initiation (SI)	When land is reoccupied by trees following a stand replacement event	Early successional, early seral, regenerating
Stem exclusion – open canopy (SEOC)	Forested areas where the occurrence of new trees is predominantly limited by moisture	Mid-successional, mid-seral, young forest
Stem exclusion – closed canopy (SECC)	Forested areas where the occurrence of new trees is predominantly limited by light	Mid-successional, mid-seral, young forest
Understory reinitiation (UR)	When a second generation of trees is established under an older, typically seral overstory	Mid-successional, mid-seral, young forest
Young forest – multistory (YFMS)	Stand development resulting from frequent harvest or lethal disturbance to the overstory	Mid-successional, mid-seral, young forest
Old forest single story (OFSS)	Forested areas resulting from frequent non-lethal prescribed or natural burning, or other management	Late-successional, Late-seral single story, Old forest single story
Old forest multi-story (OFMS)	Forested areas lacking frequent disturbances to understory vegetation	Late successional late-seral multi story, Old forest multi-story

The proposed activities only salvage dead and dying trees and will not have any further impact on the existing post-fire structural stages. Therefore, Regional Forester's Forest Plan Amendment #2 does not require an analysis for structure stages. (This revised interim direction applies to all timber sales except salvage sales). The existing and historic ranges of structural stages are for information and to provide a context to the analysis of forest regeneration.

Future structural stages are in the Environmental Consequences section to show the effects of lag time between planting and natural reforestation. Structural stages shed light on forest development and how it might affect other resources, such as wildlife habitat and the gap between snag fall down and the time to grow new large diameter trees.

Table 38 shows the range of structural stages believed to have existed before settlement by Euro-Americans. Information is derived from Powell, 1998, Umatilla National Forest, who did an analysis in cooperation with the Blue Mountain Area Ecologist and Malheur, Umatilla, and Wallowa-Whitman National Forest Silviculturists.

An historic range of variability (HRV) assessment was used to evaluate forest structure stage composition before, immediately after, and several decades into the future. HRV is a concept used to characterize normal fluctuations or variations in ecosystem conditions over time. It recognizes that forest systems have a range of conditions in which they are generally self-sustaining. As systems move outside that range, they have a lower chance of maintaining their normal compliment of elements over time (Aplet and Keeton 1999).

At a landscape scale, a forest might be considered healthy if their expected patterns and proportions of structure are within the historic range. The HRV assessment is intended to serve as an indicator of change. It is not a specific target condition that management attempts to recreate.

Table 38. Historic Range of Structural Stages in Blue Mountains by major PAG

PAG	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
Warm-Dry	5-15%	5-20%	1-10%	1-10%	5-25%	15-55%	5-20%
Cool-Moist	1-10%	0-5%	5-25%	5-25%	40-60%	0-5%	10-30%

Comparing Table 38 and Table 39 and Table 40 shows that in general, the project area and at the larger scale including the four surrounding subwatersheds, there was a higher proportion of older forest conditions, and a lower proportion of young stand conditions prior to the fire than might be expected. Table 39 displays the structural stage proportions prior to the fire inside the project area. Table 40 shows the structural stage proportions prior to the fire for the total of the four subwatersheds that encompass the project area.

Table 39. Percent Structural Stages Pre-fire by PAG, by Project Area

PAG	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
Warm-Dry	0	3	29	3	11	4	49
Cool-Moist	0	0	25	0	0	13	62

Source: source geodata: vegbase07_clip.shp

Table 40. Percent Structural Stages Pre-fire by PAG, by Subwatersheds

PAG	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
Warm-Dry	0	3	27	3	8	5	54
Cool-Moist	0	0	15	0	0	24	62

Source: geodata: huc6_less_nonnfs_vegbase07_id.shp source table: /fsfiles/office/gis/thorn_salvge_eis/geodata_deis/vegetation/pre_fire_fvs_summary/2007 key: use1_gis_link/standid

A comparison of the historic range of conditions (Table 38) and the conditions immediately after the fire, shows that the fire created a larger proportion of young structure stage stands (SI, SEOC), and left the older classes with less than the historical proportional coverage in the project area (see Table 41). In a sense, the fire "overachieved" in converting old stands to younger ones. This is true for the larger-scale area as well, as shown by Table 38.

Table 41 displays the percent coverage of each structural stage immediately after the fire by PAG, for the project area.

Table 41. Percent of Structural Stages Post Fire by PAG, by Project Area

PAG	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
Warm-Dry	51	17	14	2	2	3	11
Cool-Moist	68	2	0	0	0	16	14

Source: source geodata: postveg07merge_clip.shp

Table 42 displays the percent coverage of each structural stage immediately after the fire by PAG, for the four subwatersheds that encompass the project area.

Table 42. Percent of Structural Stages Post Fire by PAG, Four Subwatersheds

PAG	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
Warm-Dry	20	7	22	2	5	3	40
Cool-Moist	40	1	0	0	0	28	30

Source: geodata: huc6_less_nonnfs_postveg07merge.shp source table: /fsfiles/office/gis/thorn_salvge_eis/geodata_deis/vegetation/post_fire_fvs_summary/2007 key: gis_link/standid, burned = y

The consequences section of this report will show how these proportions change over time, in the project area, and at the subwatershed scale.

Pre-fire Insect Conditions

Insect and disease activity is monitored and mapped each year by aerial observers. Results from the recent seven years of surveys are summarized in Table 43 for the four subwatersheds, and displayed in **DEIS Appendix B-4**; the fir engraver affected over 4400 acres from 2000 to 2006. It increased dramatically from 2002 to 2003 and again from 2003 to 2004. The 2005 detection survey noted a sharp decline (down to 730 acres in 2005). The 2006 surveys show another decline, down to only 359 acres inventoried. While not as aggressive as some insects, they will take advantage of the increased host material, and attack fire-weakened fir. Mountain pine beetle showed a similar rise and decline in acres affected, but the increase began a year earlier, increasing substantially from 2001 to 2002. For the period 2000 through 2006, about 1100 acres showed signs of mountain pine beetle attack in ponderosa pine. However, like the fir engraver, populations declined again in 2004, with only about 148 new acres affected. No new attacks by mountain pine beetle were recorded in 2005 or 2006. Fir engraver and mountain pine beetle affected more area than other insects detected in the area. Considered normal, background levels of several insects were recorded from 2000 to 2006. Douglas-fir beetle affected a total of 50 acres in 2000 and 2001, and none after that. Pine engraver, mountain pine beetle in lodgepole pine, western pine beetle, and wooly adelgid were all recorded in the area, but none were showing an increasing trend, and none affected large areas. Some of these can be expected to increase over the next few years.

Table 43. Acres affected per year by several forest insects in the four subwatershed cumulative effects area surrounding the project area.

Year/Insect	Douglas-fir beetle	Fir engraver	Mountain pine beetle in lodgepole pine	Mountain pine beetle in ponderosa pine	Pine engraver	Western pine beetle	Balsam wooly adelgid
2000	40	111	0	0	0	0	0
2001	10	0	0	38	0	0	0
2002	0	4	0	343	0	0	0
2003	0	977	13	588	48	0	303
2004	0	2247	0	148	32	74	0
2005	0	730	0	0	0	69	0
2006	0	359	0	0	0	0	178
Total	50	4427	13	1117	80	143	3181

Post-fire Insect Conditions

While direct fire damage to the crown, bole or roots of a tree may not immediately cause mortality, the damage may predispose the tree to bark beetle attack. Bark beetles are the number one biological agent of tree mortality due to wounding by fire. Badly scorched trees are more likely to host successful attacks by western pine beetles, mountain pine beetles, red turpentine beetles or pine engravers than unscorched or lightly scorched trees. Many of the remaining live trees are damaged and at risk to die within the next few years from drought, fire effects, and insects. Some localized mortality is likely, particularly from bark beetles in fire damaged Douglas-fir 15”dbh or larger, and low vigor ponderosa pine trees. Increases in bark beetles after fires are normal, and expected. Western pine beetle and Douglas-fir beetle populations may increase significantly and create the potential to spread through the burned area, and beyond. These beetles can cause outbreaks in or near the fire area. Normally for this to happen, large numbers of large diameter injured host trees are required for outbreaks to develop. Removing injured host trees, thereby removing suitable habitat for the beetles reduces the likelihood of outbreaks developing.

Often these beetles remain in the stands of fire-injured trees, killing the weaker surviving trees first, then moving into trees with less severe injuries and then into relatively healthy trees in the vicinity. These population increases tend to last two to three years, and then decline. Population declines are attributed to their having to attack trees that are more resistant once weaker ones have been killed. Natural predators of the beetles (other insects, birds, etc) increase in response to the increase in beetles, and become effective at reducing populations. Weather can be a factor in population declines. A very cold winter can dramatically reduce survival of over-wintering beetles. As suitable host trees have been utilized, beetles need to disperse farther in search of suitable hosts, and beetle mortality losses increase with increasing dispersal (Scott, e-mail. 2007).

If we assume that the low and moderate severity burned areas and the unburned stands (forested cover types) contain high quality bark beetle habitat (shade from some existing crowns, fire-weakened tree in proximity to live, relatively healthy trees), then Table 44 displays the acres of each category. A total of 3274 acres is available within the project area boundaries for beetles to attack trees, expand populations, and perhaps attack trees outside the area.

Table 44. Estimated acres forested cover types in the project area.

Habitat category	Acres
Low severity burned stands	1913
Moderate severity burned stands	1057
Unburned stands	304
Total	3274

Turpentine beetles were found in the bases of ponderosa pine trees soon after the Shake Table Fire Complex, but are not expected to kill remaining live trees.

Grand fir is host to many insect and disease pests. Spruce budworm attacks will likely be reduced due to the lack of host trees, a more open and warmer environment and the lack of a multi-story forest structure is not favorable to western spruce budworm. Fir engraver is not as aggressive as the Douglas-fir bark beetle, but can cause mortality to damaged firs. Outbreaks are not expected. Grand fir infected with heart rots or root rots are more likely to succumb if weakened by fire damage. Fire scars on trees not killed by the fire will be entry points for disease and insects, which can cause future damage and mortality.

Vegetative Response to Fire

Determining potential tree survivorship or mortality after a wildfire is often difficult because of the varied and complex factors governing the survival of fire-injured trees. Many factors interact to determine the fate of trees following wildfire including: 1) age, 2) size, 3) crown ratio, 4) bark thickness (and other fire-resistance characteristics like leaf arrangement and bud protection), 5) stand density, 6) fuel loading, 7) season of fire and growing site quality characteristics influencing intensity and duration, 8) degree of damage to trees and 9) insect population and disease status (Filip 2007), Scott (2002), Scott (1996).

Crown Damage

In order for the crown to survive fire, some buds and branch cambium must survive. Fire can affect foliage in the crown in several ways: complete foliage consumption; complete scorching; or partial scorching. Often, on conifers with short needles, crown scorch is equivalent to crown death because small buds and twigs do not survive. On ponderosa pine, larger buds are shielded by long needles and may survive fires that scorch adjacent foliage. While partially scorched foliage may appear green in color, superheated gases needles desiccate needles and they eventually turn brown and fall from the tree. Crown injury is more often the cause of mortality than bole damage for fire-adapted species such as ponderosa pine, and Douglas-fir. Bud survival is more critical for ponderosa pine and Douglas-fir than loss of crown because loss of buds limits photosynthesis.

Bole Damage

Fires of long duration and under conditions where moderate to high levels of fuels have accumulated around trees are likely to cause bole charring. In addition, these conditions are likely to kill most or all of the cambium some length up the bole, or around the entire circumference of the bole. Killing of the cambium effectively “girdles” the tree. Under these conditions, even fire-adapted species that develop thick bark to insulate their cambium (such as ponderosa pine, and Douglas-fir) are damaged. Even light ground fires readily kill species with thin bark, such as, subalpine fir, and young grand fir. In the absence of significant crown damage, preliminary work (Filip, 2007) indicates most conifer species can survive some cambial damage or girdling at the root collar if less than 25 percent of the circumference of the bole is affected. Trees with cambial damage exceeding 75 percent of bole circumference will not likely survive. Trees with cambial damage greater than 25 percent, but less than 75 percent bole circumference have a 50 percent chance of either living or dying. Trees with severely damaged cambium may still have functioning xylem taking water to the crown. However, the damaged phloem prevents the return of carbohydrates to the lower bole and root system. Effectively, the tree starves to death.

Root Damage

Because in many cases one or more fire cycles have been missed, and heavy accumulations of duff and litter have developed, fine roots and small diameter root systems are often in close proximity to the mineral soil surface. As a result, deep-rooted trees such as ponderosa pine and Douglas-fir have developed fine roots oriented closer to the surface in the mineral soil and are sometimes found in the duff layer. Under these circumstances, low-intensity surface fires pose an increased risk for elevated levels of tree mortality as fine roots are consumed along with duff and litter or because lethal levels of heat are concentrated into the rooting zone. Loss of these feeder roots may be a more significant cause of tree mortality than structural root damage. Damage to fine feeder roots has been associated with both growth reductions in young ponderosa pine stands and with tree mortality in low vigor, mature stands of ponderosa pine. Even light ground fires readily kill grand fir, subalpine fir, and lodgepole pine. These trees may sustain significant damage to shallow root systems while not exhibiting apparent damage around the root collar or in the aerial crown. While the loss of feeder roots may not kill the tree, it can place the tree under significant stress and predispose the tree to other damaging agents (such as insects and diseases).

Reforestation

Shade: Shade in unburned mature conifer stands ranges between 30 and 70 percent, and changes as the angle of the sun changes during daylight, and changes with day length. In high and very high severity burned stands, shade is probably reduced to five to 20 percent (authors estimate). This results in higher soil surface temperatures and changes growing conditions for plants. Fire-adapted plant species are generally more tolerant of full sunlight conditions, and many thrive in this new environment. Ponderosa pine and western larch are favored by these conditions; Douglas-fir is intermediate in its shade tolerance and can do well after fires. Grand-fir is a shade tolerant tree, and is not expected to become reestablished until sufficient shade is produced by ponderosa pine, western larch and Douglas-fir.

Competing vegetation: Some plants respond quickly after fires, and others respond more slowly. Some are aggressive competitors with conifer seedlings, and can cause delayed seedling establishment and slow seedling growth. Table 45 below lists some common plants with their response to fire, and their effects on conifer seedlings.

Table 45. List of Common Plants and Response to Fire

Common Plant	Response to Fire
Big huckleberry	Slow fire response, low seedling inhibition
Birchleaf spirea	Moderate response via sprouts, moderate inhibition
Braken fern	High response to fire, chemical seedling inhibition, and sever site cover
Snowberry	Moderate response, moderate inhibition, esp after low or mod fire
Elk sedge	High response to fire, aggressive competitor
Grouse whortleberry	Low response, low seedling inhibition, occupies high, cool sites
Heartleaf arnica	Low survival after fire, slow reseeder, moderate competitor
Pinegrass	High response to fire, aggressive, prolific seeder first years after fire
Redstem ceanothus	High response, moderate inhibition risk, stored seed released by fire
Scouler willow	Moderate response to fire, prolific sprouter, can be aggressive
Snowbrush ceanothus	High response, aggressive, stored seed released by fire
Trailplant	Low response, slow recovery, low inhibition risk

Common Plant	Response to Fire
Twinflower	low response, slow recovery, not aggressive

Source: Fire Effects Information System: http://www.fs.fed.us/database/feis/index.html, accessed April 17, 2007

Ceanothus is one plant that can cause lowered reforestation success. However, if seedlings are established before ceanothus becomes dominant, reforestation success is highly likely. The proposed planting plan establishes these areas within four years, and targets the more likely ceanothus sites first. These plans provided confidence in reforestation success, and avoid potential problems with competing vegetation. If planting is delayed, and ceanothus becomes dominant, then planting success will be lower than it would be otherwise.

Animal damage can reduce seedling survival also. Whether animal damage occurs, and whether it might occur to the degree that success is threatened is uncertain. Reforestation surveys will monitor for animal damage as well as other factors influencing survival. If indications are that animal damage could threaten seedling establishment, a technique called “netting” would be used. On open weave plastic net is placed around the seedling, which discourages browsing. This is a successful option if it becomes necessary.

The planting to be done is hand planting. Planting spots are prepared by “scalping” or cutting away grasses and forbs, and debris, to prepare a mineral soil planting site. Planters are directed to utilize “microsite” planting. Microsite planting favors proper site selection over inter-tree spacing. Planter will look for, and plant in spots with shade in the appropriate location, away from competing plants, in small depressions that may provide better soil moisture. These microsite selections improve seedling survival, and result in a random appearing stand, rather than evenly space rows.

It is uncertain how well planted Alaska yellow cedar will survive. There is no local experience with planting Alaska yellow cedar. Initial planting will be done using standard techniques and nursery grown bare-root or container stock. If survival is low, the area could be replanted or planted again using rooted cuttings, which may have a better survival rate.

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 project area will depend on many interacting factors:

- The availability and abundance of seed in the canopy of fire-killed or fire-injured trees in 2006,
- The occurrence of favorable moisture conditions for seed germination,
- Whether seed dispersed from killed or injured trees germinates in 2006 or 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 future 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 with moderate or high fire severity and where pre-fire composition was dominated by tree species with low fire resistance. This is not to say that forest regeneration is not likely at all. If fact forest regeneration is entirely likely (Shatford et al, 2007). However, the rate of natural recovery may not meet management goals and objectives for rapid reforestation to meet timber production, wildlife habitat replacement, riparian shade, visual quality and the reestablishment functioning of the important Alaska yellow cedar stands.

In the higher-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 40 years after the fire .

Estimating Natural and Artificial Regeneration

After considering the information contained in Table 46, along with empirical experience gained by following recovery after other local forest fires, as well as a review of it was possible to estimate natural regeneration potential for conifer species in the TFSR project 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.

Table 46. Reproduction characteristics for common conifers.

Life History Trait	PIPO	PSME	LAOC	ABGR	ABLA
Sprouts from root system or root collar	No	No	No	No	No
Long-term seed storage in duff or soil	No	No	No	No	No
Tolerance to frost	L	L	L	M	M
Tolerance to drought	H	M	M	M	L
Resistance to snow damage	L	L	M	M	H
Seed germination on ash/char seedbed	IN	IN	NE	IN	NR
Reproduction capacity1	H	H	H	M	M
Seed dissemination distance (feet)	100-120	300-330	120-150	200	50-100
Potential for regeneration in the open	H	H	H	L	L
Potential initial growth rate (≤ 5 years)	H	H	M	M	L

(USDA, 1965) Codes are: H, high; M, moderate; L, low; IN, increased; NE, no effect; RE, reduced; NR, not reported. PIPO, ponderosa pine; PSME, Douglas-fir; LAOC, western larch; ABGR, grand fir; ABLA, subalpine fir. 1 Reproduction capacity considers minimum cone-bearing age, seed crop frequency, crop size, seed soundness and other related factors.

The map in **DEIS Appendix B-5** shows areas where natural regeneration is expected to occur, and when. It was prepared using the assumption that a live seed source would be present in the low severity and unburned areas, and that this seed source would be sufficient to result in natural regeneration for 200 feet into the higher severity areas in 10 years. The **DEIS Appendix B-6** map also shows the expected area that will be naturally seeded in 20 years, using an 800 foot seeding distance, as explained in the assumptions section of this report. Areas beyond the 800 foot distance will take substantially longer, given the distance to seed sources, the severity of the burn, and the expected responses by competing vegetation.

DESIRED CONDITIONS

Based on the Forest Plan, NFMA, administrative policy letters issued by the Pacific Northwest Regional Forester, and other sources, the desired future condition for areas capable of supporting forest cover is that they will have appropriate forest cover established as soon as is practicable (Goodman, 2002). Plant association groups help determine appropriate forest cover; ponderosa pine dominated stands are normal, and expected on the lower two-thirds of the project area, on sites that support warm-dry plant associations. In the upper portion of the project area, a mix of conifers is indicated for the cool-moist plant associations. Ponderosa pine is major component in early seral cool moist types, but a significant portion of Douglas-fir and some western larch are expected as well, as these sites progress through successional development.

PROJECT DESIGN FEATURES

Project design features are noted in DEIS section 0.

3.1.3 ENVIRONMENTAL CONSEQUENCES

ALTERNATIVE 1 NO ACTION

Direct and Indirect Effects

Alternative 1 proposes no tree planting, but relies on natural regeneration and time to meet objectives for rapid reforestation. "Years to full stocking with appropriate forest cover" is the indicator selected to compare Alternatives. The acres in the project area that are fully stocked within five years are estimated using the assumptions given previously. It was assumed that natural regeneration could be relied upon in about half of the low severity burned stands. 1939 acres burned at low severity, so about 970 acres would be fully stocked within five years. There were about 306 acres in the project are that did not burn. The total acreage that can be relied on to be fully stocked with appropriate forest cover is 1276. Given that the project area is 7783 acres total, less than 17 percent of the areas will meet objectives for rapid reforestation – within five years.

Natural regeneration is expected to be fully established within 10 years on about 1118 acres (See **DEIS Appendix B-5 map**). Within 20 years, the area that is fully established with conifer seedlings totals about 3930 acres (See **DEIS Appendix B-6 map**). The project area is 7783, so about 50 percent of the area will have appropriate forest cover in 20 years. The remaining 50 percent of the area will gradually seed in, and may take 40 to 60 years to meet full stocking standards.

Ponderosa pine seed was aerially distributed on over about 614 acres in the fall, 2006. Establishment of new seedlings as a result is uncertain. Monitoring in the spring and fall 2007 will indicate whether or not this seeding might be successful. If it were to be successful, recovery of those 614 acres would occur more quickly than otherwise assumed.

Structural stage proportions are the indicator selected to compare Alternatives with regard to where the project area is in relation to the historic range of variability. In the existing condition discussion, the pre- and post-fire percents were displayed. A higher proportion of the project area is now in the stand initiation stage than might have occurred historically, while a lower proportion remains in the older forest classes (OFSS and OFMS, primarily). Under Alternative 1, where natural regeneration alone is relied upon to contribute to the future mix of structural stages, we see that for the most part, Alternative 1 retains a high proportion of stand initiation structural stages for about 7 decades before the structural stage proportions begin to diversify. Table 47 displays structural stages at the project scale for the warm dry PAG, which dominates the area. **DEIS Appendix B-7** lists information for each decade, by warm-dry and moist PAGs). Highlighted values in Table 47 indicate that the value is within the historic range of variability. Note that 46 percent of the area is still in Stand Initiation 70 years after the fire. This highlights the fact that much of the area, burned at high severity and burned in one relatively large patch, far from seed sources. Regeneration is expected to be slow for much of that area if natural regeneration alone is used.

Table 47. Percent Structural Stage Coverage in Warm-dry PAG for Alternative 1

Decade	OFMS	OFSS	SECC	SEOC	SI	UR	YFMS
2036	11	3	0	0	46	**10**	29[17]
2076	**44**[18]	**0**	**10**	0	46	0	0
2156	**25**	**5**	56	0	0	0	**14**

Indirectly, Alternative 1 promotes continued tree mortality, because it does not remove any of the ideal insect breeding habitats (fire-weakened Douglas-fir and ponderosa pine) that were created by the fire. While the effect of implementing Alternative 1 on beetle populations is not quantifiable, other than to say that about 3274 acres of high quality habitat would remain available to bark beetles under this Alternative. it is reasonable to conclude that bark beetle populations could increase more than they might under Alternatives 2 or 3, simply due to the fact that the action alternatives do remove a portion of the available and suitable beetle habitat.

Cumulative Effects of Alternative 1

Structural stage proportions is the indicator selected to compare Alternatives with regard to where the area is in relation to the historic range of variability in the vicinity, using the four subwatersheds as the cumulative effects area. In the existing condition discussion, the pre- and post-fire percents were displayed. Comparing those with the predicted future conditions, we find that higher proportions of the project area are now in the stand initiation and young forest stages than might have occurred historically, while the older forest classes (OFSS and OFMS, primarily) are within the range of variability. Under Alternative 1, where natural regeneration alone is relied upon to contribute to the future mix of structural stages, we see that at the larger scale the structural stage proportions begin to diversify fairly early, and the area develops a higher than expected proportion of older structural types, with a corresponding lower coverage of early stages. Table 48 displays structural stages at the subwatershed scale for the warm dry PAG,, which dominates the area. **DEIS Appendix B-7** lists information for each decade, by warm-dry and moist PAGs. Highlighted values in Table 48 indicate that the value is within the historic range of variability.

Planting is planned for the Shake Table Fire Complex area, outside the project area. Uncertain amounts, species, density, etc make including those effects in the cumulative effects speculative. It is reasonable to conclude, however, that beneficial effects similar to those inside the project area could result from planting outside the project area as well. Similarly, an uncertain number of seedlings

[17] Forty percent YFMS is higher than expected, and three percent, and 0 percent on the old forest stages is less than the value calculated by the INFORMS model for immediately post fire. Appendix B warns that comparing values from the two modeling processes may yield suspect results. In the case of 2036 in the project area, we know that OFMS and OFSS would not decline in that time. The INFORMS values are carried forward to that decade so a better overall view of the structural stage situation can be seen.

[18] Forty four % OFMS is higher than expected in the Warm-dry types, while 0 % in the OFSS is much lower than expected. The FVS modeling may have not "killed", through inter-tree competition, enough establishing regeneration to move at lease some of these acres from OFMS to OFSS. Also, no ground fire or thinnings were modeled, which also would have resulted in a better mix between OFMS and OFSS, especially in the warm-dry PAG. For comparison purposes, it is best to consider both of these old forest types together. At 44 %, it is well within the historic range when both OFMS and OFSS are considered. Subsequent tables summarizing structural stages should be considered in this light as well.

could result from aerial seeding of conifers done last fall. It is reasonable to conclude here as well, that if seedlings become established as a result, similar beneficial effects would result, and that could amount to as much as 614 acres that may not require planting.

Bark beetle habitat is not affected by this Alternative. No reduction of suitable host trees is accomplished. Bark beetles could increase in the project area, and move from there to adjacent healthy stands outside the project area.

Table 48. Percent Structural Stage Coverage in Warm-dry PAG for Alternative 1 in the four subwatershed cumulative effects area.

Decade	OFMS	OFSS	SECC	SEOC	SI	UR	YFMS
2036	**38**	**6**	**11**	**0**	18	4	22
2076	78	0	**3**	1	**18**	**1**	**11**
2156	73	1	22	0	0	0	4

ALTERNATIVES 2 AND 3

Alternatives 2 and 3 produce nearly identical effects and are discussed together in this section. The major difference between Alternatives 2 and 3 is the amount of salvage harvest that is proposed. Under both alternatives, planting is planned for virtually the same acreage. Since the indicators used to compare alternatives are based primarily on the timing of natural versus planted seedlings modeling results showed very little difference between the alternatives.

Direct and Indirect Effects

Alternative 2 and 3 proposes salvage harvest, tree planting and danger tree removal. Salvage harvest is not expected to have a measurable effect on forest regeneration. Logging is planned for only one year after the fire, so natural regeneration will not have been well established by then. Helicopter yarding causes the least amount of ground disturbance of any yarding method, reducing any potential for loss of seedlings, and it is planned for most of the salvage area. Danger tree removal will have no measurable effect on forest structure or function, as only individual trees are removed.

Rather than relying on natural regeneration alone to rapidly return these sites to appropriate forest cover, planting is planned for virtually the entire area, including harvest units and other areas that are understocked but could support forest cover. “Years to full stocking with appropriate forest cover” is the indicator selected to compare Alternatives. The number of acres in the project area that are expected to be fully stocked within five years is 6428. Planting is a reliable regeneration method, and success is virtually assured.

Ponderosa pine seed was aerially distributed on over about 614 acres in the fall, 2006. Establishment of new seedlings as a result is uncertain. Monitoring in the spring and fall 2007 will indicate whether or not this seeding might be successful. If it were to be successful, recovery of those 614 acres would occur more quickly than otherwise assumed, and would not require planting. The area that was seeded is planned for helicopter yarding, a low-impact method. If a significant stand of seedlings (one that will meet stocking certification standards) is established from the aerial seeding, it is unlikely that helicopter yarding would destroy enough seedlings to warrant planting.

Structural stage proportion is the indicator selected to compare Alternatives with regard to where the project area is in relation to the historic range of variability. In the existing condition discussion, the pre- and post-fire percentages were displayed. A higher proportion of the project area is now in the stand initiation stage than might have occurred historically, while a lower proportion remains in the older forest classes (OFSS and OFMS, primarily). Under Alternatives 2 and 3, where planting is certain to establish a new age class quickly, the mix of structural stages, begins to diversify at about year 2036. Virtually all stands have grown out of the stand initiation stage, and many have moved into the young forest multi-story and stem exclusion open canopy stages. While this does not align perfectly with the expected percent distribution of the historic range, it does show that the project area is more structurally diverse earlier under this Alternative than under the No Action alternative where the stand initiation phase dominates for a substantial period. Table 49 displays structural stages at the project scale for the warm dry PAG, which dominates the area. **DEIS Appendix B-7** lists information for each decade, by warm-dry and moist PAGs. Highlighted values in Table 49 indicate that the value is within the historic range of variability.

Table 49. Percent Structural Stage Coverage in Warm-dry PAG for Alternative 2 and 3 for the project area

Decade	OFMS	OFSS	SECC	SEOC	SI	UR	YFMS
2036	28	0	**6**	50	0	0	**15**
2076	**44**	**0**	6	31	0	**4**	**15**
2156	85	0	**10**	**7**	0	0	0

Alternatives 2 and 3 reduce the amount of insect breeding habitat (fire-weakened Douglas-fir and ponderosa pine) that was created by the fire. While the effect on future beetle populations is not quantifiable, the effect to available habitat is. Table 50 displays the available habitat had the amount remaining after salvage harvest remove a portion of the host material in these stands. It is reasonable to conclude that bark beetle populations are less likely to increase to outbreak populations than if none of that material were removed.

Table 50. Acres of suitable bark beetle habitat after salvage by Alternative inside the project area.

Habitat category	Alternative 1	Alternative 2	Alternative 3
Low severity burned stands	1913	894	1069
Moderate severity burned stands	1057	589	613
Unburned habitat	304	304	304
Total	3274	1787	1986

Cumulative Effects of Alternatives 2 and 3

Salvage harvest and danger tree removal are not expected to have cumulative effects on forest regeneration or structural stage development. No direct or indirect effects were identified for the forested vegetation section so cumulative effects cannot occur as a result of those actions.

Structural stage proportion is the indicator selected to compare Alternatives with regard to where the area is in relation to the historic range of variability in the vicinity, using the four subwatersheds as the cumulative effects area. In the existing condition discussion, the pre- and post-fire percentages were displayed. Comparing those with the predicted future conditions, we find that by 2036 several classes are within the historic range of variability. There is diversity in the structural stages earlier under Alternative 2 than under Alternative 1. This is attributed to the early establishment of seedlings by planting. Table 51 displays structural stages at the subwatershed scale for the warm dry PAG, which dominates the area. **DEIS Appendix B-7** lists information for each decade, by warm-dry and moist PAGs. Highlighted values in Table 51 indicate that the value is within the historic range of variability.

Table 51. Percent Structural Stage Coverage in Warm-dry PAG for Alternatives 2 and 3 for the four subwatersheds

Decade	OFMS	OFSS	SECC	SEOC	SI	UR	YFMS
2036	45	6	**13**	**13**	**7**	**1**	**16**
2076	78	0	**2**	1	**7**	**1**	**11**
2156	**25**	**60**	**10**	**3**	0	0	0

Planting is planned for the Shake Table Fire Complex area, outside the project area. Uncertain amounts, species, density, etc make including those effects in the cumulative effects speculative. It is reasonable to conclude, however, that beneficial effects similar to those inside the project area could result from planting outside the project area as well. Similarly, an uncertain number of seedlings could result from aerial seeding of conifers done last fall. It is reasonable to conclude here as well, that if seedlings become established as a result, similar beneficial effects would result, and that could amount to as much as 614 acres that may not require planting.

3.1.4 SUMMARY

This section looks at how each alternative contributes to meeting management objectives and desired forest conditions for rapid establishment of appropriate forest cover, and how that, in turn, produces stands that progress toward a mix of structural stage classes that provide benefits for many resources. Alternative 1, the No Action Alternative, relies entirely on natural regeneration to accomplish the reforestation need. Natural regeneration is certain to become established in time. However, by comparing Alternative 1 with Alternatives 2 and 3, which propose active reforestation through tree planting, it is clear that objectives for rapid establishment of forest cover are achieved more quickly, and with better assurance under Alternatives 2 and 3. The more rapid establishment of new stands under Alternatives 2 and 3 promote development and diversification of structural stages more quickly than does Alternative 1.

National Forest Management Act Consistency Finding; Alternative 1
The No Action Alternative does not meet direction to reforest areas as soon as possible.

National Forest Management Act Consistency Finding; Alternatives 2 and 3

The National Forest Management Act 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".

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 also 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.

Implementation specifications for the tree planting activity would ensure that Forest Plan minimum stocking level standards are met. Reforestation activities are needed to help meet desired future condition goals from the Forest Plan.

Forest Plan

The Malheur NF Land and Resource Management Plan provide Forest-wide standards. The applicable standards and a brief discussion of each are provided below. These short discussions are directed at Alternatives 2 and 3.

- While favoring high quality natural regeneration, consider the effectiveness of various regeneration methods and prescribe the best site-specific method. Satisfactory stocking of any regenerated stand is expected to occur within 5 years after harvest.
    - Both planted and natural regeneration are considered and prescribed, based on factors disclosed in the report.
- Use seed collected from phenotypically superior trees from the same seed zone and elevation band for growing planting stock.
    - This is standard practice on the Malheur National Forest, and it is consistent with handbook and manual direction. Seed collected from the proper seed zone and elevation is on hand.
- Manage to maintain or re-establish ponderosa pine on sites where ponderosa pine is subclimax.
    - The warm-dry plant association is prescribed to receive ponderosa pine. Higher elevations, with moist sites included, would receive a mix of conifers.
- Implement animal control when necessary to ensure adequate stocking and uninhibited growth of crop trees.
    - Monitoring for animal damage is planned.
- Coordinate livestock grazing on timber harvest units as necessary to protect tree regeneration.
    - Livestock grazing is deferred for a number of years to allow seedlings to become established.
- Accomplish site preparation using a combination of chemical, mechanical, silvicultural or physical methods.
    - Site preparation will be by hand scalping. The burned condition makes other methods unnecessary.
- Conduct silvicultural examination and prepare final prescriptions before implementing and silvicultural treatment. Final determination of the silvicultural method will be based on an approved site-specific silvicultural prescription.
    - Preliminary planning for final prescription development has already begun. Final prescriptions will be available along with the final environmental impact statement for this project.

- Stands managed for timber production will be managed to produce a sawlog product using best management practices.
    - Prescriptions will consider all reasonable alternatives to meet this objective. The first step is to establish new trees on these sites; one of the reasons for this project.
- Timber harvest on unsuitable lands is prohibited except that removal of volume lost through catastrophic mortality is allowed.
    - All volume removed is salvage material lost due to fire or insects.
- Avoid the creation of vegetation conditions which could promote insect and disease infestations.
    - All action alternatives include removal of insect host material that could promote infestations. The fire, however, did create conditions that could promote infestations.

Alternatives 2 and 3 are consistent with these Forest Plan Standards, as described above.

Regional Forester Forest Plan Amendment #2 (Eastside Screens)

All alternatives meet the direction to not decrease old forest structural stages, since live trees are not harvested (except for incidental green trees cut for landing construction and for safety). The Action alternatives better meet the objective to shorten the time to grow additional old forest structural stages, since planting will establish trees 10 to 60 years sooner, giving them a time advantage over the natural regeneration.

Forest Plan Amendment

Alternatives 2 and 3 include a proposed Forest Plan Amendment to Amendment #2: Eastside Screens. The amendment defines a "dead" tree for purposes of this project only. This is considered a short-term, one-time use amendment. The amendment would only apply to salvage harvest activities in this project area of 7783 acres on the Malheur National Forest (Screens do not apply to roadside hazard tree removal). This is an amendment to a standard that was established in Amendment #2, specifically wildlife standards, screen 3, scenario A, 2) outside late and old structure, item a). This item states: Maintain all remnant late and old seral (LOS) and/or structural live trees >21" DBH that currently exist within stands proposed for harvest activities. The amendment defines "dead" trees as those with a low probability of survival using the Scott Guidelines. The amendment would not preclude actions or require actions elsewhere on the Forest.

Irreversible Commitments

There are no anticipated long-term irreversible commitments of the forest vegetation.

Irretrievable Commitments

There are irretrievable commitments of the growth of forest vegetation for about 5 years because of the new landings that are built for the salvage operation. They are to be rehabilitated after use, but there will be a lag in reforestation and growth since the sites are impacted more heavily than the surrounding forestland

3.2 FUELS

3.2.1 INTRODUCTON

Fuels management is a process of managing the hazard in relation to the size and severity of a potential fire event. The objective of fuels management is to reduce the fire hazard to a level where cost effective resource protection is possible should a wildfire ignite. Of the three components affecting wildland fire behavior (fuels, weather and topography), only fuels can be manipulated. The intent of this report is to show the effects of dead tree removal on current and future fuel loadings and the implications of those fuel loadings from the standpoint of potential fire behavior.

MANAGEMENT DIRECTION

Malheur Forest Plan and the Fire Management Plan

The Malheur National Forest Plan includes Fire Management Direction to ensure that fire use programs are cost-effective, compatible with the role of fire in forest ecosystems, and responsive to resource management objectives and that fire presuppression and suppression programs are cost-effective and responsive to the Forest Plan.

The goals for fire management are to: 1) initiate initial management action that provides for the most reasonable probability of minimizing fire suppression costs and resource damage, consistent with probable fire behavior, resource impacts, safety, and smoke management and 2) identify, develop, and maintain fuel profiles that contribute to the most cost-efficient fire protection program consistent with management direction (Forest Plan IV-4).

The following applicable Forest wide direction is provided for fire management: manage residue profiles at a level that will minimize the potential of high intensity wildfire and provide for other resources (Forest Plan IV-44). Air quality standards require that air quality impacts be minimized, especially to Class I airsheds and smoke sensitive areas, mitigation measures be used when appropriate, and burning is conducted in accordance with the State Smoke Management Plan (Forest Plan IV-40).

The Malheur National Forest Fire Management Plan (FMP) provides operational guidance on how to carry out fire management policies that will help achieve resource management objectives. The Fire Management Plan is updated annually or as policy and Land and Resource Management Plans change. A fire management planning system that recognizes both fire use and fire protection as inherent parts of natural resource management will ensure adequate fire suppression capabilities as well as support fire reintroduction efforts (FMP).

The fuels management portion states that the appropriate type and amount of fuel treatment is tiered to the Forest Plan Management Area specific Standards and Guidelines. Levels and methods of fuel treatment will be guided by the protection and resource objectives of each management area. Emphasis will be on ecological restoration treatments. Where appropriate, fuels treatments will allow for the utilization of wood residues using a marketing strategy.

National Fire Plan

In August 2000, President Clinton asked Secretaries Babbitt and Glickman to prepare a report recommending how best to respond to the severe fires, reduce the impacts of those fires on rural communities, and ensure sufficient firefighting resources in the future. President Clinton accepted their report, *Managing Impacts of Wildfires on Communities and the Environment*, in September

2000. This report provides an overall framework for implementing fire management and forest health programs.

Operating principles directed by the Chief of the Forest Service in implementing this report include: firefighting readiness, prevention through education, rehabilitation, hazardous fuel reduction, restoration, collaborative stewardship, monitoring, jobs, and applied research and technology.

The TFSR Project addresses the hazardous fuel reduction element, which states: Assign highest priority for hazardous fuels reduction to communities at risk, readily accessible municipal watersheds, threatened and endangered species habitat, and other important local features, where conditions favor uncharacteristically intense fires (Laverty & Williams 2000).

The focus of the Cohesive Strategy, which was signed October 2000, is on hazardous fuel reduction to restore ecosystems that evolved with frequent, low intensity fire with a high priority for treatment of Wildland Urban Interface (WUI) areas. The Grant County Community Fire Protection Plan (2006) is the result of a countywide effort initiated to reduce forest fire risk to citezens, the environment, and quality of life within Grant County including the Granty County WUI area. A portion of the TFSR Project area falls within the Grant County WUI area..

The 10-Year Comprehensive Strategy, signed August 2001, reflects the views of a broad cross section of stakeholders with a desired end result of healthier watersheds, enhance community protection, and diminished risk of and consequences of severe fire. The strategy established 4 primary goals: 1) Improve Prevention and Suppression, 2) Reduce Hazardous Fuels, 3) Restore Fire Adapted Ecosystems, and 4) Promote Community Assistance. A set of actions to facilitate attaining each goal was also established.

The Implementation Outcome as described in the National Fire Plan 10-year Implementation Plan is reduced risks associated with wildland fires to communities and the environment due to hazardous fuel reduction. The TFSR Project addresses the potential of fires in decades to come, rather than fires in the immediate future. The project recognizes the values at risk in the structures in close proximity to the project area and values in the resources within the project area that will be developing.

Analysis Methods

The following topics were analyzed with this project:

Fuel loading and fire behavior

Future fuel loading (tons/acre) for the TFSR Project were predicted by modeling data obtained through stand exams. See Silviculture Section 3.1 for a detailed explanation of how the vegetation data base was compiled and the assumptions used. Estimates of surface fuels were made using FVS-FFE, Forest Vegetation Simulator with the Fire and Fuels Extension (Rheinhardt and Crookston 2003). 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 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 fall down rates and subsequent fuel loading are important to model and 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.

The fire and fuels direct and indirect effects can be measured by fuel loads. The greater the fuel loading is, the greater the effects on the environment if it were to burn. For fire and fuels management, direct and indirect effects are those that occur from the proposed activity. In this report, direct and indirect effects will be considered for each alternative from 1-10 years and 10-30 years after the fire event. Cumulative effects are those effects from other activities, past, present, and future, that adds to or subtract from the effects of this project.

3.2.2 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 historical 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 nonlethal 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 (historical) 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 natural (historical) regimes are classified based on average number of years between fire (fire frequency) combined with the severity (amount of replacement) of the fire on dominant overstory vegetation. These five natural fire regime groups are described in Table 52 below.

Table 52. Historical 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 percent of the overstory vegetation replaced)
II	0-35 years	High Severity (stand replacement with greater than 75 percent of the dominant overstory replaced)
III	35-100+ years	Mixed (less than 75 percent of the overstory replaced)
IV	35-100+ years	High Severity (stand replacement with greater than 75 percent of the dominant overstory replaced)
V	>200 years	High Severity (stand replacement with greater than 75 percent of the dominant overstory replaced)

The TFSR Project area is represented by Fire Regimes I, II, III and IV. It is composed of 85 percent Dry Upland Forest Potential Vegetation Group (PVG) which is classified as Fire Regime I, 13 percent of the Moist Upland Forest PVG which is classified as Fire Regime III and less than 1 percent of Cold Upland Forest PVG which is Fire Regime IV (USDA Forest Service 2002). The remaining 1 percent is mountain grasslands and is classified as Fire Regime II. Table 53 lists the historical fire regime groups for the TFSR Project area.

Table 53. Fire Regime Groups for the TFSR Project Area.

Fire Regime	Acres	Percent
I	6,633	85%
II	77	1%
III	1,018	13%
IV	47	<1%
V	0	0%
Non-vegetated	8	<1%

Summarized from the Thorn Recovery vegetation database. Fire regime classification based on Potential Vegetation Group.

Historic fire intensity and associated effects varied by fire regime. Table 54 numerically describes the ranges of burn severity that would have historically been experienced by Fire Regimes I and III which account for approximately 98% of the TFSR Project area.

Table 54. Historic Range of Fire Severity by Fire Regime I and III

HISTORICAL FIRE REGIME	PREDICTED BURN SEVERITY RATING	APPROXIMATE HISTORIC 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

Historical percentages were derived from Agee 1998

The landscape natural fire regime group of Fire Regime I and III corresponds well with the historical forest structures and species composition of TFSR Project area (Agee 1996). Prior to organized suppression in the early twentieth century, frequent fires of varying intensities characterized the TFSR Project area. These fires were usually low intensity surface fires, but when topography, fuels, and weather aligned, high intensity fire would develop. This resulted in a fire regime with a vegetative mosaic generally dominated by early seral, fire adapted, and fire resistant species. The TFSR project landscape experienced frequent fires of low severity that maintained open, late successional forest structures as well as mixed severity fires which created a variety of different age open, late successional forest, and early to mid-seral forest structural stages, and shrub/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 forest types, primarily those dominated by ponderosa pine, Douglas-fir or both (Graham 2004). The TFSR Project area is an 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 the severe fire weather condition of August 2006, 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, 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 TFSR project area was high. High severity burned through 57 percent of the Fire Regime I area and 66 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 14 percent of the fire regime I area, and 16 percent of the Fire Regime III area killing between 31 percent and 74 percent of the trees. Low severity fire occurred on 26 percent of the Fire Regime I area and 17 percent of the Fire Regime III area. Trees in these areas suffered less than 30 percent mortality. Table 55 characterizes burn severity experienced for Fire Regime I and Fire Regime III forested stands and compares it to the historical range for burn severity.

Table 55. Burn Severity Experienced in Fire Regimes I and III Forested Stands in TFSR Project Area as Compared to the Historical Range

HISTORICAL FIRE REGIME	BURN SEVERITY RATING	BURN SEVERITY HISTORICAL RANGE (%)	TFSR PROJECT AREA ACRES	TFSR % OF FIRE REGIME	INTERPRETATION
Low Severity (Fire Regime I)	Unburned	NA	297	4%	NA
	Low	60-90	1,744	26%	Well Below Historic
	Moderate	20-60	912	14%	Below Historic
	High	10-20	3,679	57%	Well Above Historic
Mixed Severity (Fire Regime III)	Unburned	NA	7	1%	NA
	Low	20-60	175	17%	Below Historic
	Moderate	50-70	167	16%	Well Below Historic
	High	20-60	670	66%	Above Historic

Summarized from the TFSR project vegetation database; acres include all NFS forested lands. Fire regime classification based on Potential Vegetation Group. Historical percents were derived from Agee 1998.

Overall, the burn severities experienced in TFSR Project area was outside of the historical range. The amount of high severity burn was well above the historical range for the Fire Regime I acres and above for the Fire Regime III acres in the TFSR Project area. Greater than historical density of trees, ladder fuel development, and ground fuel loadings were certainly large contributors to the above historic amount of high burn severity.

FIRE HAZARD

Fire hazard generally refers to the difficulty of controlling potential wildfire. It is commonly determined by fire behavior characteristics such as rate-of-spread, intensity, torching, crowning, spotting, fire persistence and by resistance-to-control. Fire severity is considered to be an element of fire hazard for this analysis. Fire 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 down woody fuels (fuel loading) contribute differently to the various elements of fire hazard (Brown et al. 2003).

For the remainder of this report the Warm Dry Upland Forest Plant Association Group (PAG) (6470 acres) – a subset of the Dry Upland Forest PVG - will be tracked to represent Fire Regime I and the Cool Moist Upland Forest PAG (970 acres) - a subset of the Moist Upland Forest PVG - will be tracked to represent Fire Regime III. These two PAGs account for approximately 96 percent of the project area.

FUEL LOADING AND FIRE BEHAVIOR

Frequent surface fires that characterized the mixed conifer stands in TFSR Project area had been effectively eliminated since the early 1900’s. Hence, the amount of down woody debris on the ground prior to the Shake Table Fire Complex was higher than would be expected to occur in historic fire regimes I and III due to frequent fire occurrence and associated fuel consumption. Although fire both creates and consume fuel (Brown 1995), fuel depletion would tend to be greater than fuel accretion in high frequency fire regime types such as warm, dry ponderosa pine and Douglas-fir types (Brown et al. 2003). Fuel loads likely varied throughout the landscape with many stands having little down woody material and few stands having excessive accumulations.

The following is a general assessment by burn severity of the fuels conditions that resulted from the Shake Table Fire Complex:

- **Low Burn Severity -** Areas with low burn severity experienced low to severe underburn, which resulted in low mortality of overstory trees. About 10 to 35 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 of size class, the smaller the fuels, the higher the consumption).
- **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 30 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 and Very High Burn Severity -** In the high and very high severity areas, surface fuels were generally consumed by the fire. These stand experienced over 75 percent mortality in the high and with over 95 percent in the very high. 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 loading 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.

Small Woody Fuels

The influence of small woody fuels (less than 3 inches 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 (Andrews 1986; Finney 1998; Rothermel 1983; Scott and Reinhardt 2001). Brown et al. (2003) suggest that once small woody fuel loadings exceed 8 to 10 tons per acre, fire hazard increases substantially especially when larger quantities of CWD are present. Table 56 below displays pre-fire, current and maximum desired small diameter (less than 3 inch diameter) fuel loading by fire regime.

Table 56. Estimated Average Pre-Fire, Current and Desired Maximum Small Woody Fuel Loadings for the Warm Dry and Cool Moist PAGs in the TFSR Project Area

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 – Warm Dry)	3	1.3	3
Mixed Severity (Fire Regime III – Cool Moist)	4.7	1.9	5

Fuel loadings were determined using FVS-FFE. The pre-fire fuel loading is based on all the acres in each PAG and the current fuel loading is based on an average of representative stands within each PAG and burn severity. Desired maximum small wood fuel loadings are based on predictions of ground fuel loadings that may have occurred under the natural fire regime (Brown et al. 2003). Small woody fuel is in addition to adequate levels of CWD.

Coarse Woody Debris (CWD) – Large Woody Fuels

Coarse woody debris (CWD) is typically defined as dead standing and down pieces larger than 3 inches in diameter (Harmon and others 1986), which corresponds to the size class that defines large woody fuel. Large woody fuels have little influence on spread and intensity of the initiating fire; however, they can contribute to development of large fires and high fire severity. Fire persistence, resistance-to-control, and burnout time (affects to fire fighter and public safety, soil heating and tree mortality) are significantly influenced by loading, size, and decay state of large woody fuel. Torching, crowning, and spotting contribute to large fire growth and are greater where large woody fuels have accumulated under a forest canopy. Large woody fuel, especially containing large decayed pieces, are a suitable fuelbed for firebrands and can hold smoldering fire for extended periods of time (Brown et al 2003). Spot fires can also be started in rot pockets of standing snags. The distance firebrands travel is dependent of size of the firebrand, wind speed, and height above ground of the source. A reburn results when falldown of the burned forest contributes significantly to the fire behavior and fire effects of the next fire.

Coarse woody debris is also an important component in the structure and functioning of ecosystems. A dead tree, from the time it dies until it is fully decomposed, and contributes to many ecological processes as a standing snag and fallen woody material lying on and incorporated into the soil. Considering these factors, a multi-resource desired condition would be quantities of accumulated down 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 et al. 2003).

Brown et al. 2003 integrated 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. 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 for acceptable fire hazard is appropriate if small woody fuel loadings are at or below desired levels (as defined above in Table 56). 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 (Brown et al. 2003).

Table 57. Estimated Historical and Acceptable Ranges of CWD for the Warm Dry and Cool Moist PAGs in the TFSR Project Area

HISTORICAL FIRE REGIME	HISTORICAL RANGE >3 INCH FUELS (TONS/ACRE)	ACCEPTABLE RANGE >3 INCH FUELS (TONS/ACRE)
Low Severity (Fire Regime I – Warm Dry)	5 – 10 Tons/Acre	5 – 20 Tons/Acre
Mixed Severity (Fire Regime III – Cool Moist)	10 – 27 Tons/Acre	10 – 30 Tons/Acre

Acceptable and historic CWD fuel loadings are based on predictions of ground fuel loadings that may have occurred under the natural fire regime (Brown et al. 2003).

Using the suggested acceptable and historical ranges of CWD quantities from Brown et al.2003, *((a) 5 to 10 tons per acre for the warm dry types and (b) 10 to 30 tons per acre for other types*), stands in the TFSR Project area were assigned pre and post-fire CWD classifications as follows: Below - below acceptable range; Historical - within acceptable range and historical range; High - within acceptable range but higher than historical range; Above - above acceptable range. Table 58 identifies the pre-fire and current CWD classifications for the Warm Dry and Cool Moist PAGs in the Thorn Fire Salvage Recovery Project area.

Table 58. Pre-Fire and Current CWD Classifications for the Warm Dry and Cool Moist PAGs in the TFSR Project Area

CWD Class	Pre-Fire Acres	% of Area	Current Acres	% of Area
Above	0	0%	0	0%
High	2,120	29%	0	0%
Historical	4,220	57%	1,940	26%
Below	1,100	15%	5,500	74%
Total:	7,440	100%	7,440	100%

Fuel loadings were determined using FVS-FFE. The pre-fire fuel loading is based on all the acres in each PAG and the current fuel loading is based on an average of representative stands within each PAG and burn severity.

RESISTANCE-TO-CONTROL

Resistance-to-control is generally viewed as an estimate of the suppression force required for controlling a unit of fire perimeter. The USDA Forest Service Pacific Southwest Region (1976) developed a resistance-to-control rating scheme based on difficulty of hand line construction and an inventory of downed woody fuel loadings by size classes. Fire hazard including resistance-to-control and fire behavior reach high ratings when large fuels exceed about 25 to 30 tons per acre in combination with small woody fuels of 5 tons per acre or less. Excessive soil heating is likely at approximately 40 tons per acre and higher. Table 59 illustrates the combination of small and large woody fuels it would take to reach high and extreme resistance-to-control ratings.

Table 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 FUELS (TONS/ACRE)	
	HIGH	EXTREME
5	25	40
10	15	25
15	5	15

Source: Brown et al. 2003.

Pre and post-fire fuel loads were used to assign the Warm Dry and Cool Moist PAGs within the Thorn Fire Salvage Recovery Project area and resistance-to-control rating for pre-fire and current stand conditions. The results are displayed in Table 60.

Table 60. Pre-Fire and Current Resistance-To-Control Ratings for the Warm Dry and Cool Moist PAGs in the TFSR Project Area.

RESISTANCE TO CONTROL RATING	PRE-FIRE		CURRENT	
	Acres	%	Acres	%
Extreme	0	0%	0	0%
High	90	1%	0	0%
Low to Moderate	7,350	99%	7,440	100%

Fuel loadings were determined using FVS-FFE. The pre-fire fuel loading is based on all the acres in each PAG and the current fuel loading is based on an average of representative stands within each PAG and burn severity.

FUEL TREATMENTS

Danger Tree Removal – Danger trees will be felled along all haul routes used for timber sale activity (regardless of maintenance level) and all maintenance level 3, 4 and 5 forest roads. Danger trees felled within RHCAs and DOGS will be left on site. All other merchantable logs from danger trees will be removed as part of the salvage operation where economically feasible. All slash will be left on site. Concentrations of slash in key visual areas will be chipped or hand piled and burned.

Salvage Harvest - Merchantable logs from dead and dying trees 9 inches diameter at breast height (DBH) and greater will be cut and removed. All slash generated from the salvage operations within all the helicopter units and within the tractor units in areas of high or very high burn severity will be lopped and scattered. Within the tractor units in areas of low or moderate burn severity, tree tops will be removed to the landings with the merchantable logs and the limbs will be lopped and scattered on site.

3.2.3 ENVIRONMENTAL CONSEQUENCES

FUTURE FIRE BEHAVIOR AND SEVERITY

Future fire behavior and severity in the Shake Table Fire Complex area including potential of re-burn will depend on a number of interacting factors including fire severity experienced during the Shake Table Fire Complex, pre-fire vegetation, species adaptations to fire, environmental conditions, and elapsed time since the Shake Table Fire Complex. 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 et al. 2003).

- **0 to 10 Years After Shake Table Fire Complex** – 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 needle to accumulate as surface fuel. Surviving onsite herbs and shrubs should dominate the recovering vegetation. Newly established trees that regenerate by producing seeds could be lost. Even seedling of species having sprouting capability could die if their root systems are not well established.

- **10 to 30 Years After Shake Table Fire Complex** – 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 fall down 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 Shake Table Fire Complex** – 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 confers. 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 optimum range.

FUEL MASS AFTER POST-FIRE LOGGING

In a study conducted 2 years after the 1996 Summit Wildfire on the northern end of the Malheur NF in a ponderosa pine-dominated forest, McIver and Ottmar (2007) found that logged units experienced higher amounts of slash fuel (<3") compared to the un-logged control. Model projections of the fuel bed indicate that the disparity in slash fuel mass between fuel reduction and un-logged units would be sustained until about 15 years post logging. They also report that a re-burn of moderate intensity occurring during this time would likely kill all young trees, even in un-logged units, because of the influence of other components of the fuel bed, such as grasses and shrubs. Model projections of large woody fuels (>3") in this study indicate that standing structure in all stands would collapse quickly, with the result that un-logged stands would contain two- or three-fold greater masses at 25 and 50 years post-logging, leading to much higher consumption rates of fuel in the event of a re-burn in the same place.

DIRECT AND INDIRECT EFFECTS - ALTERNATIVE 1 NO ACTION

Under the No Action Alternative, no salvage of fire-killed timber would occur, no reforestation would occur and no danger tree removal would occur.

Fuel Loading

Small Woody Fuels

Current - Duff and downed woody fuels that support high severity fire are absent. Surviving onsite herbs and shrubs dominate the recovering vegetation. Where stand replacement fire did not consume foliage, a layer of scorched needles will accumulate as surface fuels. Small woody fuel loading is below the desired maximum of 3 tons per acre for Fire Regime I and 5 tons per acre for Fire Regime III.

10 Years Post Fire – The duff layer would not be well established. A limited amount of conifer regeneration is possible from existing seed source adjacent to and within the burn area. Onsite herbs and shrubs would dominate the recovery vegetation. Small woody fuel is above the desired maximum and has exceeded the 8 to 10 ton per acre threshold in the Cool Most PAG. Any fire during this time would likely kill conifer seedlings that have regenerated since the fire.

30 Years Post-Fire – A forest floor of litter and duff would be established to a variable extent depending on the density of overstory conifers. Small woody fuel is well above the desired maximum and above the 8 to 10 ton per acre threshold resulting in an increased fire hazard since 2017 for both PAGs. Modeling indicates that the accumulation of small woody fuels will have peaked during this time period and there will be a substantial reduction in tons per acre of less than 3 inch fuels over the next few years due to decay.

Table 61. Alternative 1 - Estimated Average Current, 10 & 30 Years Post-Fire Small Woody Fuel Loadings by Historical Fire Regime.

HISTORICAL FIRE REGIME	<3 INCH FUELS (TONS/ACRE)		
	CURRENT (2007)	10 YEARS POST FIRE (2017)	30 YEARS POST FIRE (2037)
Low Severity (Fire Regime I – Warm Dry)	1.3	5.6	8.9
Mixed Severity (Fire Regime III – Cool Moist)	1.9	10.3	13.0

Fuel loadings were determined using FVS-FFE and are based on an average of representative stands within each PAG and burn severity.

Coarse Woody Debris

Current - Large woody fuels are just starting to accumulate through falldown and would not have decayed enough to support smoldering combustion. Coarse woody fuel loading is below or within the historical range throughout the project area. High severity fire is unlikely because downed woody fuels that support prolonged burning are absent.

10 Years Post-Fire – Accumulation of downed CWD is progressing and it is beginning to exhibit decay that would support a longer period of burning. Approximately 96 percent of the Cool Moist and Warm Dry PAGs in the TFSR Project area are within the historical range of CWD while the other 4 percent is in the high range. A burn within this range of CWD should not lead to unusually severe fire effects (Brown et al. 2003). High burn severity could occur where large woody material is lying on or near the soil surface.

30 Years Post-Fire – Accumulation of large woody pieces is beginning to peak and is probably exhibiting considerable decay. Higher severity burning is possible depending on extent of soil coverage by large woody pieces. Over 70 percent of the TFSR Project area is above the acceptable range of CWD buildup and could result in unusually severe fire effects. Many of the acres rated as above have over 25 tons per acre of CWD and would experience excessive soil heating during a wildfire fire event.

Table 62. Alternative 1 - Current, 10 & 30 Years Post-Fire CWD Classifications for the Warm Dry and Cool Moist PAGs in the TFSR Project Area

CWD Class	Current Acres (2007)	% of Area	10 Years Post-Fire Acres (2017)	% of Area	30 Years Post-Fire Acres (2037)	% of Area
Above	0	0%	0	0%	5,620	76%
High	0	0%	300	4%	1,650	22%
Historical	1,940	26%	7,140	96%	170	2%
Below	5,500	74%	0	0%	0	0%
Total:	7,440	100%	7,440	100%	7,440	100%

Fuel loadings were determined using FVS-FFE and are based on an average of representative stands within each PAG and burn severity.

Resistance-To-Control

Current – The combination of small woody fuels and CWD has not accumulated to the point beyond desired levels. Fire hazard is in the low to moderate range throughout the project area.

10 Years Post-Fire – The resistance to control rating remains in low to moderate but the average small woody fuel is above the desired maximum and has exceeded the 8 to 10 ton per acre threshold in the Cool Most PAG resulting in an increased fire hazard.

30 Years Post-Fire – As down woody fuels accumulate, the number of project area acres with high and extreme resistance-to-control ratings has increased substantially. Approximately 60 percent of the project area has fuels conditions that would make it very difficult to control a wildfire and would result in a high to extreme fire hazard with potential for a high severity fire over a majority of the project area. This trend will continue as the number of acres with CWD loadings above the acceptable range increases.

Table 63. Alternative 1 - Current, 10 & 30 Years Post-Fire Resistance-To-Control Ratings by percent for the Warm Dry and Cool Moist PAGs in the TFSR Project Area

RESISTANCE TO CONTROL RATING	CURRENT (2007)		10 YEARS POST-FIRE (2017)		30 YEARS POST-FIRE (2037)	
	Acres	%	Acres	%	Acres	%
Extreme	0	0%	0	0%	680	9%
High	0	0%	0	0%	3,670	51%
Low to Moderate	7,440	100%	7,440	100%	3,000	40%

Fuel loadings were determined using FVS-FFE and are based on an average of representative stands within each PAG and burn severity.

DIRECT/INDIRECT EFFECTS - ALTERNATIVE 2 PROPOSED ACTION

Fuel Loading

Small Woody Fuels

10 Years Post Fire – The duff layer would not be well established. Onsite herbs and shrubs would dominate the recovery vegetation with extensive conifer regeneration (seedling stage) throughout the project area due reforestation efforts. Small woody fuel is above the desired maximum and has

exceeded the 8 to 10 ton per acre threshold in the Cool Most PAG. A moderate intensity fire during this time would likely kill conifer seedlings that were planted.

30 Years Post-Fire – A forest floor of litter and duff would be established to a variable extent depending on the density of overstory conifers. Planted trees would be approaching 3 to 5 inch diameter range and are starting to exhibit fire resistant characteristics. Small woody fuel loading is above the desired maximum and above the 8 to 10 ton per acre threshold resulting in an increased fire hazard since 2017 for both PAGs. Modeling indicates that the accumulation of small woody fuels will have peaked during this time period and there will be a substantial reduction in tons per acre of less than 3 inch fuels over the next few years due to decay.

Table 64. Alternative 2 - Estimated Average Current, 10 & 30 Years Post-Fire Small Woody Fuel Loadings by Historical Fire Regime.

HISTORICAL FIRE REGIME	<3 INCH FUELS (TONS/ACRE)		
	CURRENT (2007)	10 YEARS POST FIRE (2017)	30 YEARS POST FIRE (2037)
Low Severity (Fire Regime I – Warm Dry)	1.3	5.5	8.9
Mixed Severity (Fire Regime III – Cool Moist)	1.9	10.3	13.4

Fuel loadings were determined using FVS-FFE and are based on an average of representative stands within each PAG and burn severity.

Coarse Woody Debris

10 Years Post Fire – Accumulation of downed CWD is progressing and it is beginning to exhibit decay that would support a longer period of burning. Approximately 96 percent of the Cool Moist and Warm Dry PAGs in the TFSR Project area are within or below the historical range of CWD while the other 4 percent is in the high range. A burn within this range of CWD should not lead to unusually severe fire effects (Brown et al. 2003). High burn severity could occur where large woody material is lying on or near the soil surface.

30 Years Post-Fire – Accumulation of large woody pieces is beginning to peak and is probably exhibiting considerable decay. Higher severity burning is possible depending on extent of soil coverage by large woody pieces. Over 35 percent of the TFSR Project area is above the acceptable range of CWD buildup and could result in unusually severe fire effects.

Table 65. Alternative 2 - Current, 10 & 30 Years Post-Fire CWD Classifications for the Warm Dry and Cool Moist PAGs in the TFSR Project Area

CWD Class	Current Acres (2007)	% of Area	10 Years Post-Fire Acres (2017)	% of Area	30 Years Post-Fire Acres (2037)	% of Area
Above	0	0%	0	0%	2,670	36%
High	0	0%	300	4%	3,240	44%
Historical	1,940	26%	4,300	58%	1,530	21%
Below	5,500	74%	2,840	38%	0	0%
Total:	7,440	100%	7,440	100%	7,440	100%

Fuel loadings were determined using FVS-FFE and are based on an average of representative stands within each PAG and burn severity.

Resistance-To-Control

10 Years Post Fire – The resistance to control rating remains in low to moderate but the average small woody fuel is above the desired maximum and has exceeded the 8 to 10 ton per acre threshold in the Cool Most PAG resulting in an increased fire hazard.

30 Years Post-Fire – As down woody fuels accumulate, the number of project area acres with high and extreme resistance-to-control ratings has increased. Over 25 percent of the project area has fuels conditions that would make it very difficult to control a wildfire and would result in a high to extreme fire hazard with potential for a high severity fire. This trend will continue as the number of acres with CWD loadings above the acceptable range increases.

Table 66. Alternative 2 - Current, 10 & 30 Years Post-Fire Resistance-To-Control Ratings for the Warm Dry and Cool Moist PAGs in the TFSR Project Area

RESISTANCE TO CONTROL RATING	CURRENT (2007)		10 YEARS POST-FIRE (2017)		30 YEARS POST-FIRE (2037)	
	Acres	%	Acres	%	Acres	%
Extreme	0	0%	0	0%	670	9%
High	0	0%	0	0%	1,350	18%
Low to Moderate	7,440	100%	7,440	100%	5,420	73%

Fuel loadings were determined using FVS-FFE and are based on an average of representative stands within each PAG and burn severity.

DIRECT AND INDIRECT EFFECTS - ALTERNATIVE 3

Fuel Loading

Small Woody Fuels

10 Years Post Fire – The duff layer would not be well established. Onsite herbs and shrubs would dominate the recovery vegetation with extensive conifer regeneration (seedling stage) throughout the project area due reforestation efforts. Small woody fuel is above the desired maximum and has exceeded the 8 to 10 ton per acre threshold in the Cool Most PAG. A moderate intensity fire during this time would likely kill conifer seedlings that were planted.

30 Years Post-Fire – A forest floor of litter and duff would be established to a variable extent depending on the density of overstory conifers. Planted trees would be approaching 3 to 5 inch diameter range and are starting to exhibit fire resistant characteristics. Small woody fuel loading is above the desired maximum and above the 8 to 10 ton per acre threshold resulting in an increased fire hazard since 2017 for both PAGs. Modeling indicates that the accumulation of small woody fuels will have peaked during this time period and there will be a substantial reduction in tons per acre of less than 3 inch fuels over the next few years due to decay.

Table 67. Alternative 3 - Estimated Average Current, 10 & 30 Years Post-Fire Small Woody Fuel Loadings by Historical Fire Regime.

HISTORICAL FIRE REGIME	<3 INCH FUELS (TONS/ACRE)		
	CURRENT (2007)	10 YEARS POST FIRE (2017)	30 YEARS POST FIRE (2037)
Low Severity (Fire Regime I – Warm Dry)	1.3	5.5	8.9
Mixed Severity (Fire Regime III – Cool Moist)	1.9	10.3	13.4

Fuel loadings were determined using FVS-FFE and are based on an average of representative stands within each PAG and burn severity.

Coarse Woody Debris

10 Years Post Fire – Accumulation of downed CWD is progressing and it is beginning to exhibit decay that would support a longer period of burning. Approximately 96 percent of the Cool Moist and Warm Dry PAGs in the TFSR Project area are within or below the historical range of CWD while the other 4 percent is in the high range. A burn within this range of CWD should not lead to unusually severe fire effects (Brown et al. 2003). High burn severity could occur where large woody material is lying on or near the soil surface.

30 Years Post-Fire – Accumulation of large woody pieces is beginning to peak and is probably exhibiting considerable decay. Higher severity burning is possible depending on extent of soil coverage by large woody pieces. Approximately 49 percent of the TFSR Project area is above the acceptable range of CWD buildup and could result in unusually severe fire effects.

Table 68. Alternative 3 - Current, 10 & 30 Years Post-Fire CWD Classifications for the Warm Dry and Cool Moist PAGs in the TFSR Project Area

CWD Class	Current Acres (2007)	% of Area	10 Years Post-Fire Acres (2017)	% of Area	30 Years Post-Fire Acres (2037)	% of Area
Above	0	0%	0	0%	3,630	49%
High	0	0%	300	4%	2,480	33%
Historical	1,940	26%	5,260	71%	1,330	18%
Below	5,500	74%	1,880	25%	0	0%
Total:	7,440	100%	7,440	100%	7,440	100%

Fuel loadings were determined using FVS-FFE and are based on an average of representative stands within each PAG and burn severity.

Resistance-To-Control

10 Years Post Fire – The resistance to control rating remains in low to moderate but the average small woody fuel is above the desired maximum and has exceeded the 8 to 10 ton per acre threshold in the Cool Most PAG resulting in an increased fire hazard.

30 Years Post-Fire – As down woody fuels accumulate, the number of project area acres with high and extreme resistance-to-control ratings has increased. Approximately 40 percent of the project area has fuels conditions that would make it very difficult to control a wildfire and would result in a high to extreme fire hazard with potential for a high severity fire. This trend will continue as the number of acres with CWD loadings above the acceptable range increases.

Table 69. Alternative 3 - Current, 10 & 30 Years Post-Fire Resistance-To-Control Ratings by percent for the Warm Dry and Cool Moist PAGs in the TFSR Project Area

RESISTANCE TO CONTROL RATING	CURRENT (2007)		10 YEARS POST-FIRE (2017)		30 YEARS POST-FIRE (2037)	
	Acres	%	Acres	%	Acres	%
Extreme	0	0%	0	0%	670	9%
High	0	0%	0	0%	2,290	31%
Low to Moderate	7,440	100%	7,440	100%	4,480	60%

Fuel loadings were determined using FVS-FFE and are based on an average of representative stands within each PAG and burn severity.

3.2.4 CUMULATIVE IMPACTS

The cumulative effects analysis area for this report is considered to be the Shake Table Fire Complex perimeter. Ongoing and reasonably foreseeable actions, as listed in **DEIS Appendix N**, that could affect fire and fuels include: salvage logging and fuel treatments on private land; livestock grazing, personal use firewood and danger tree removal.

Without some kind of treatment that results in a reduction of down woody fuels, future fires in the TFSR Project area as well as within the entire Shake Table Fire Complex perimeter would be high intensity with stand replacement levels of mortality. Implementation of salvage logging would remove substantial quantities of CWD, thereby reducing future fuel loading and potential fire effects.

Salvage harvest on private lands would have no effect on the fire hazard risk on National Forest land. However, they would reduce the resistance-to-control for future wildfires adjacent to the National Forest, thereby reducing the risk of fire moving onto National Forest land and the potential of newly developing stands succumbing to high intensity wildfire.

Danger tree removal would slightly reduce fuels within the areas that are being treated. This isolated reduction of down woody fuels would have a very limited affect fire behavior.

Domestic grazing would result in a net reduction of fine live fuels (forbs and grass) which along with dead branches and twigs affect fire intensity.

Personal use firewood would have an incidental increase in slash fuels associated with any bole wood removal which will not affect overall potential fire hazard.

All other ongoing and future projects listed in **DEIS Appendix N** would not affect fuels and future fire severity.

CONSISTENCY WITH DIRECTION AND REGULATIONS

MALHEUR NATIONAL FOREST PLAN AND FIRE MANAGEMENT PLAN

Alternative 1 is not responsive to the objectives and standards in the Forest Plan as it will not allow the utilization of prescribed fire in the future because fuel loadings will be high and outside of the historic range. These fuel loadings would create conditions allowing for another high severity fire.

Alternative 2 is responsive to the objectives and standards in the Forest Plan. Proposed salvage harvest activities will reduce the potential of high intensity fire that also results in a cost-efficient protection program, as fires would show a lower resistance to control. Reduced fuel levels would allow future use of prescribed fire to meet land management objectives. Fuel levels would be within the historic range on much of the landscape allowing compatibility with the role of fire.

Alternative 3 is responsive to Forest Plan direction as described above for Alternative 2 on the acres proposed for treatment.

NATIONAL FIRE PLAN

Alternative 1 is not responsive to the National Fire Plan.

Alternatives 2 and 3 are responsive to the National Fire Plan by reduction of hazardous fuels. Alternative 2 reduces more acres of hazardous fuels in the Wildland Urban Interface areas to historical levels than Alternative 3. The acres treated are however, sufficient to make both Alternatives equally responsive to the NFP.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS

There are no irreversible and irretrievable commitments of resources that may result from the alternatives with respect to fire and fuels.

3.3 AIR QUALITY

3.3.1 INTRODUCTON

This analysis discloses the potential air quality effects of the proposed action and alternatives considered for the TFSR project. Smoke produced from the prescribed burning of timber harvest residue and natural fuels can have an adverse effect on air quality. The amount of smoke produced is influenced by the same factors as smoke produced by wildland fires. Increasing the utilization of sub-merchantable material can reduce the amount of fuel remaining after timber harvest, thereby reducing the amount of smoke produced. The type and timing of burning, and weather conditions influence the amount of smoke produced.

CURRENT MANAGEMENT DIRECTION

Federal Clean Air Act. The framework for controlling air pollutants in the United States is mandated by the 1970 Clean Air Act (CAA), as amended in 1977 and 1990 (42 U.S.C. §7401 et seq.). The CAA was designed to "protect and enhance" the quality of the Nation's air resources, and encourages reasonable Federal, state, and local government actions for pollution prevention. State implementation plans (SIPs) are developed by each state to implement the provisions of the CAA. The SIPs describe the state's actions to achieve and maintain the National Ambient Air Quality Standards (NAAQS).

Section 160 of the CAA requires measures "to preserve, protect, and enhance the air quality in national parks, national wilderness areas, national monuments, national seashores, and other areas of special national or regional natural, recreational, scenic, or historic value." Stringent requirements are therefore established for areas designated as "Class I" attainment areas. Class I areas include Forest Service and Fish and Wildlife Service wilderness areas over 5,000 acres that were in existence before August 1977, and National Parks in excess of 6,000 acres as of August 1977. Designation as a Class I area allows only very small increments of new pollution above existing air pollution levels.

National and State Ambient Air Quality Standards. EPA developed the NAAQS for a specific set of "criteria" pollutants designed to protect public health. States can adopt standards even more stringent than the Federal standards. NAAQS are defined as the amount of a criteria pollutant above which detrimental effects to public health (or welfare) may result. NAAQS are set at a conservative level with the intent of protecting even the most sensitive members of the public including children, asthmatics, and people with cardiovascular disease. If an area consistently violates one of the NAAQS, that area becomes federally designated as a "non-attainment" area. States must demonstrate to the public and the EPA how a nonattainment area would meet the NAAQS, based upon the control of emission sources. Such demonstrations employ control plans that are part of each SIP, including emissions from prescribed fire.

Regional Haze Rule (1990 Clean Air Act Amendments), 40 CFR Part 51. In 1999, EPA promulgated the Regional Haze Rule (40 CFR 51.308-309), which calls for states to establish goals for improving visibility in mandatory class I areas and to develop long-term strategies for reducing the emissions of air pollutants that cause visibility impairment. Class I areas include wilderness or national parks greater than 5,000 acres which existed on August 7, 1977. The Regional Haze Rule requires states to demonstrate "reasonable progress" toward improving visibility in each Class I area over a 60-year period (to 2064), during which visibility should be returned to natural conditions.

The Regional Haze Rule also requires states to address visibility impairment in mandatory class I areas due to emissions from fire activities. The Preamble to the Rule emphasizes the "implementation of smoke management programs to minimize effects of all fire activities on visibility." The Rule requires states to address visibility effects from all fire sources contributing to visibility impairment in mandatory class I areas.

The Interim Air Quality Policy on Wildland and Prescribed Fires (U.S. EPA 1998). The Interim Policy suggests that air quality and visibility impact evaluations of fire activities on Federal lands should consider several different items during planning (EPA 1998). In a project level NEPA document, it is appropriate to consider and address to the extent practical, a description of applicable regulations, plans, or policies, identification of sensitive areas (receptors), and the potential for smoke intrusions in those sensitive areas. Other important disclosure items include applicable smoke management techniques, participation in a basic smoke management program, and potential for emission reductions. Typically ambient air quality, visibility monitoring, and cumulative impacts of fires on regional and subregional air quality are not explained to the same level of detail. Ambient air quality and visibility monitoring (for class I areas) are typically done collaboratively with the states. Impacts to regional and subregional air are addressed operationally through a coordinated smoke management program. The EPA urges states to develop, implement, and certify smoke management programs that meet the recommended requirements of the Interim Policy. If a "certified" program is in place and smoke exceeds the particulate standard, it may not be considered a violation by EPA (Dzomba 2005).

State Regulations. Prescribed burning in Oregon's forests is managed by the State Department of Forestry (ODF) under the Oregon Smoke Management Plan (OSMP). The OSMP is intended to minimize smoke impacts by conducting forest burning under weather conditions that disperse smoke and steer it away from populated areas. Burning on National Forest System Lands would not occur unless prior approval has been granted by the ODF.

Local Regulations. The Forest Plan provides the direction for management activities on the Malheur National Forest. Forest-wide management goals and specific management area direction embody the desired future condition that management actions are designed to achieve. The following goals and standards are applicable to the Forest as a whole, followed by Management Area direction specific to the project area relevant to air quality.

Forest Plan goals:

- Cooperate with other Federal, State and local regulatory agencies to meet the standards required in the Clean Air Act regulations and State of Oregon Implementation Plan.
- Relative to Wilderness – manage air quality to remain with in standards set by the State of Oregon

Forest Plan Standards:

- Plan management activities to maintain air quality at a level adequate for the protection and use of the National Forest resources
- Coordinate and cooperate with appropriate air quality regulatory agencies
- Plan and conduct all prescribed burning in accordance with the State Smoke Management Plan and State Implementation Plan of the Clean Air Act as amended in 1972
- Apply mitigation measures listed in the FEIS of the Pacific Northwest Regional Guide for reducing emissions from prescribed burning where appropriate.

- Use the best available technology to minimize the impact of prescribed burning in Class 1 Airsheds and smoke sensitive areas.
- Protect the forest air resource from pollution sources outside the forest boundaries through application of the Prevention of the Significant Deteriorations regulations contained in the Clean Air Act. Give special protection to air quality related values found in Class I wilderness.

3.3.2 AFFECTED ENVIRONMENT

SMOKE DISPERSION

Smoke dispersal is usually best during the spring and early summer because daytime heating and general windflows help smoke rise above ridge tops and into the free air winds where it is diluted and dispersed. Stable high pressure systems that often occur during late summer and fall hamper the vertical motion of air and reduce the smoke dispersion potential. Infrequent low-pressure systems also move through the area during the summer and early fall and improve smoke dispersal until high pressure re-establishes. As the heat of summer changes to milder daytime temperatures and night-time temperatures begin to drop, air quality begins to deteriorate as night-time inversions become more prevalent. Smoke is trapped in valley bottoms until adequate heating breaks the inversion later in the day. Weather patterns begin to change during the fall with periodic cold front passages being interspersed with periods of stable high pressure. These cold fronts are often dry, but can bring substantial moisture. Winds associated with these cold fronts provide good ventilation, but also increase the risk that a prescribed burn may escape control. The late fall often marks the return of wet, foggy, and cloudy weather to the analysis area. During this time, periods of good ventilation occur during fontal passages, but valley inversions often hamper the dispersion of smoke. Winter weather is very similar, with smoke dispersion being poor.

The mountainous topography of the analysis area also influences the dispersion of smoke. Smoke produced at higher elevations is nearer to the free air winds that occur at and above ridge tops, so dispersion is usually better than at lower elevation. Conversely, smoke produced at lower elevations is more likely to be effected by valley inversions and must rise farther to enter the free air wind. Burning on south exposures are more likely to be affected by local thermal winds than those on north slopes. Burns on slopes exposed to the prevailing wind would have better smoke dispersion than those located on the lee slope.

Smoke dispersal is best when the daytime heating is greatest. This usually coincides with the period of greatest atmospheric instability for the day. Free air winds penetrate into lower elevation at this time resulting in good vertical motion and smoke dilution. These conditions generally occur from 13:00 to 18:00. Smoke dispersal is usually poor for night-time burning due to the increase in atmospheric stability as cool air pools in valleys. This process also results in the development of valley inversions.

VISIBILITY AT CLASS I AREAS

Certain wilderness areas and national parks established before August of 1977 were designated as Class I areas. A Class I designation allows only very small increments of new pollution above already existing air pollution levels. The CAA amendments of 1977 included a program for prevention of significant deterioration of air quality, generally referred to as the PSD program. This program is to prevent areas currently having clean air from becoming more polluted. The Strawberry Mountain Wilderness is a Class I Airshed located approximately 25 miles east of the project area. No visibility protection periods have been set for Class 1 airsheds in Eastern Oregon; however, they have been set for central Oregon, burning is restricted from July 1st to September 15th annually.

Naturally occurring visual range in the East (United States) may be between 105 to 190 kilometers (65 to 118 miles), while natural visual range in the West is between 190 to 270 kilometers (118 to 167 miles) (Interim Air Quality Policy on Wildland and Prescribed Fires, EPA, 1998). The existing condition of the representative standard visual range for the Class I area of concern for this project area shown in Table 70.

Table 70. Standard visual range of Strawberry Wilderness area

80th percentile	90th percentile
Strawberry Mountain Wilderness	
256 kilometers (159 miles)	298 kilometers (185 miles)
Source: (http://www.fs.fed.us/r6/aq/svr.htm)	

The interpretation of these percentile figures is as follows. On 80 percent of the days monitored visibility was 159 miles or less, which also means that on 20 percent of days monitored visibility was greater than 159 miles. On 90 percent of days visibility was 185 miles or less, which also means that on 10 percent of the days monitored visibility was greater than 185 miles.

The degree of visual impairment and the amount of airborne pollutants resulting from the burning of wildland fuels is undoubtedly less than it was prior to the advent of effective fire suppression. Conversely, pollutants from other human related sources have increased during the same timeframe. There is no historic data for comparing the existing situation to the historic situation.

3.3.3 ENVIRONMENTAL CONSEQUENCES

ALTERNATIVE 1 – NO ACTION

Under this alternative no salvage or danger tree harvest would be implemented therefore there would be no piles created or ignited. Emissions created by pile burning would not be emitted into the air nor, would there be the possibility of associated diminished visibility. The project area would be subject to long-term deposition of surface fuels from snags due to the high tree mortality experienced by the Shake Table Fire Complex. These snags would contribute to the available fuel pools for future fires.

ALTERNATIVES 2 PROPOSED ACTION AND ALTERNATIVE 3

Pile burning associated with both of the action alternatives would produce smoke that would likely be transported to the northeast, as prevailing winds are from the southwest. The closest town to the project area is Mount Vernon approximately 15 miles to the north; John Day is located 20 miles to the northeast of the project area. Appreciable adverse affects to these communities from pile burning is not likely due to the limited amount of burning associated with both alternatives and the fact that burning would occur only under planned and approved conditions. If burning is conducted under north or northwest winds, air quality impacts on these communities would essentially be avoided.

Salvage activities for Alternative 2 are expected to create eighteen landing piles from helicopter salvage and eighteen landing piles from the ground-based salvage. A slight decrease in the number of piles is expected for Alternative 3 sixteen landing piles from helicopter salvage and fourteen from the ground based salvage.

No appreciable long-term increase in existing pollution levels or diminished visibility is expected to occur in the Strawberry Mountain Wilderness, 25 miles to the east under either action alternative. This is due to the fact that all burning would occur outside visibility-protection periods set for Central Oregon of July 1st to September 15th, and because the distance of the wilderness from the project area would allow for the smoke to be diluted.

As opposed to prescribed under burning or broadcast burning, pile burning allows for greater seasonal flexibility under which the burning can occur as well as the ability to burn small amounts at a time. It also produces fewer pounds of particulate matter, per ton of slash burned then broadcast or under burning.

Temporary and short term visibility impacts can be expected in the immediate project area during actual ignition and would be affected by wind speed and direction. Drainage inversions would affect nighttime dispersal of smoke, with possible smoke effects 5 to 10 miles downwind. Smoke from burning piles for either of the action alternatives can impact human health, most likely affecting the ground crews on site. The localized effects of burning would be short-term degradation of air quality, primarily during the actual burning stage and during night time canyon inversions. Piles would be constructed to burn easily and be free of dirt this would allow for quick consumption and decrease the likelihood of smoldering that would contribute to night time inversions.

Alternative 2 is expected to create six more landing piles then Alternative 3 thus producing slightly more smoke emissions. This minor increase in emissions under Alternative 2 is not expected to impact local air quality conditions since the timing of burning is granted by the Oregon Department of Forestry.

3.3.4 CUMULATIVE IMPACTS

The cumulative effects analysis area for air quality is the project area, expanded to include related actions in the same “airshed” – that is near enough to the project area that smoke generated by the action alternatives might combine with smoke generated concurrently by a related action, as though from a common source with potentially common effects. Related actions relevant to the analysis area can be found in **DEIS Appendix N**.

Past, present and reasonably foreseeable activities and their impacts on air quality are difficult to address in terms of cumulative effects. The Shake Table Fire Complex occurred in the project area but those effects on air quality are gone and cannot be viewed cumulatively. Cumulative foreseeable activities that produce pollutants include, but are not limited to, the burning on private lands and public lands, dust from unsurfaced roads and wildfires. Currently no planned prescribed burning scheduled to occur on public lands in the analysis area.

The effects of the proposed action from smoke are not likely to have cumulative effects with other activities in the airshed given the oversight by the Oregon Department of Forestry. The department’s burn-day determinations only allow burning when criteria allow for good smoke dispersion.

3.3.5 CONSISTENCY

In compliance with the Clean Air Act and the Oregon State Smoke Management Plan, burning of any kind will not occur unless prior approval is granted by Oregon Department of Forestry. The Clean Air Act sets air quality standards for particulate matter (PM) for particles less than 10 microns in diameter (PM10) and less than 2.5 microns in diameter (PM2.5—the main concern for human health). All amounts of PM10 and PM2.5 emissions will be calculated using the CONSUME software in the Fasttracks reporting system, which is also submitted with planned burn operations to the Oregon Department of Forestry to determine compliance with the Clean Air Act. • Even though no visibility-protection periods have been set for wilderness Class 1 airsheds in Eastern Oregon, all burning will occur outside visibility-protection periods set for Central Oregon of July 1 to September 15. Burning should be planned for times when transport winds are sufficient to displace much of the smoke from the area.

3.4 SOILS / WATERSHED

3.4.1 INTRODUCTON

This section will discuss the effects of the alternatives on the soils and watershed resource areas.

REGULATORY FRAMEWORK

Soils

Forest Service Manual R6 Supplement No. 2500.98-1 (USDA Forest Service, 1998), section 2520.2 states that the objectives of soil management are “To meet direction in National Forest Management Act of 1976 and other legal mandates”, and that “Soil quality is maintained when. . .(soil disturbances to structure, erosion loss and organic matter) are within defined standards and guidelines.” The Malheur National Forest Plan (Forest Plan) standards for soil conservation follow Region 6 guidelines and are re-iterated and adjusted as necessary for site conditions in project design features (PDFs) for this project (See Table 24 in DEIS Chapter 2) and Malheur LRMP, 1990: Standards 110, and 125-129, Chapter IV, Page 40).

Water Quality

The Forest Plan provides direction to protect and manage water resources through compliance with State requirements that are in accordance of the Clean Water Act and the selective use and enforcement of Best Management Practices (Standards 117 through 121, Chapter IV, Page 39 and 40). Those BMPs appropriate to the proposed action and conditions of the project area are incorporated within the PDFs. The Forest Plan directs that cumulative effects analysis would be conducted where combination of past and foreseeable actions, along with the proposed action, are regarded as an issue of concern.

The Forest plan was amended by the Regional Forester with the Interim Strategy for Managing Anadromous Fish-Producing Watersheds in eastern Oregon, Washington, Idaho and Portions of California (PACFISH) (USDA, 1995a). The amendments establish riparian Habitat Conservation Areas (RHCAs), Riparian Management Objectives (RMOs) and standards and guidelines for activities in RHCAs (See Table 24, PDF list, in Chapter 2). Harvest would not occur within RHCAs.

METHODOLOGY FOR ANALYSIS

Post-fire monitoring of a portion of the tractor ground in the proposed project area was conducted by Forest soils staff (USDA Forest Service, 2006a). This provided estimations of residual impacts from past harvest. Past monitoring of fire salvage sales by Forest staff (McNeil, 1996, 2002 and 2005; Gamble, 2002) provided additional insight on residual impacts of past harvest, effects of actions similar to the proposed action, and effects on burned and harvested areas from high intensity rainfall.

Channel conditions within the project area were drawn mainly from 1993 and 1995 stream surveys, done in preparation for Billy and Todd Timber sale (USDA Forest Service, 1993 and 1995b). Todd Creek Timber sale appears never to have been implemented.

Post fire condition of lower Widow’s Creek channel was outlined in a correspondence with National Resource Conservation Service (NRCS, 2007).

Burn Area Emergency Response (BAER) reports for soil and water resources were utilized for post fire runoff (Huffman, 2006; McNeil, 2006a)

Effects of harvest and wildfire on water quality and quantity (peak flow, timing and duration) were drawn from review of research, from previous experience of the author's (USDA Forest Service, 2004), and site specific examples on the Forest (McNeil, 2001; McIver and McNeil, 2006).

Cumulative effects on streamflow were assessed by considering the proportionate areas of treatment, past events (wildfire, harvest), road density and location, and existing condition of channels.

The Forest Geographical Information Systems (GIS) database was utilized to assessed project watersheds for fire and harvest history, current road status, vegetation cover, and topography.

Additional information came from soils inventories (USDA, 1974), geologic reports (USGS, 1966), stream flow data (USGS, 2006) and climate data (WRCC, 2006; NOAA, 1973).

3.4.2 AFFECTED ENVIRONMENT

CLIMATE

The town of Dayville, Oregon is the nearest weather station of record (COOP # 352168) (WRCC, 2006). It is situated in the John Day River valley at an elevation of about 2,900 feet, and about 7 miles from the project area. Station #354291 at John Day is at an elevation of 3,100 feet, about 20 miles from the project area (WRCC, 2006). Adjustments of Dayville records to reflect elevation range of the project is accomplished by the Rock Clime program within the Water Erosion Prediction Program (WEPP) (USDA Forest Service, 2002).

Precipitation is distributed throughout the year, though unevenly, with the months of November through April receiving the bulk. Snow is prevalent in winter, and average low temperatures are below freezing mid-October through mid-April. Total annual precipitation is about 21 inches per year. The highest yielding storms, with durations of a day or less are May through September at Dayville and city of John Day records. Daily totals up to 2.23 inches have been recorded at John Day. Frequency and duration of high intensity storms of 2-year, 6-hour are 0.8 to 0.9 inches for the area of Aldrich Mountain (NOAA, 1973).

GEOLOGY

The TFSR project area represents a slice of the geologic history of Oregon: with a portion of pushed up seafloor and continental shelf from mid-Triassic tectonic action between the Pacific and North American crustal plates; late Triassic deposits into a subduction trench formed at the edge of the plates, and finally, the Triassic sequences are capped by Eocene volcanics.

The geology of the lower slopes of Buck Cabin, Wickiup (both tributaries of Field's Creek) and Dry creeks are within the Fields Creek formation, which is composed of graywacke, shales and mudstones from shelf and subduction trench deposit. The lower portion of Widow's Creek and the upper slopes area of Wickiup and Buck Cabin creeks are serpentinite (hydrated seafloor) with inclusions of earlier Paleozoic metavolcanics. The upper portion of Widow's and Dry creeks are Eocene volcanics, including the andesite and basalt flows, ash, breccia and conglomerates of the Clarno Formation. Aldrich Mountain ridge, Todd and Duncan Creek watersheds are almost wholly contained within the Columbia River group flood basalts, also Eocene in age.

Serpentinite is a soft, smooth rock, typically massive with splintery fractures (Dietrich and Skinner, 1979). It has a platy structure which provides good cleavage in one direction and a tendency to swell between cleavage planes that is a cause of slumps and spring sources (Hurlebut and Klein, 1977).

Graywacke is term for an impure sandstone that is a poorly sorted mix of angular to subrounded grains of feldspar, mafic minerals and rock fragments, typically indurated with little cementation.

Grain size ranges from coarse sand (2mm) to clay matrix (Selley, 1976).

The mudflow breccias and conglomerates of the Clarno contain angular to rounded cobbles of country rock caught up in light ash of andesitic composition. This formation is poorly, or indistinctly bedded, and mostly of a massive appearance (Thayer and Brown, 1966).

Lying unconformably on top of the Clarno (the Clarno was weathered and eroded in the mean times) are massive basalt flows of the Columbia River Group. These flows are 50-100 feet thick with good, regular columnar jointing and uniform composition.

Large and recent landslides (Holocene age, approximately 8,000 years ago to present) are mapped in the project area mostly emanating from the Clarno. These features are quiescent and highly dissected by drainages in steep V-shape valleys

There are several springs mapped on the topographic quadrangles near the contact plane of the Clarno and Columbia River, or within the Columbia River. These appear within a zone between 5600 and 5800 feet elevation. A similar elevation source area was cited for headwaters in all project watersheds (USDA Forest Service, 1993, 1995). Water would readily percolate into basalt with regular joint sets, creating a typical "dry mountain" effect, where storage and transmission in the rock type is high and fast, respectively. Surface drainage on upper slopes is usually therefore ephemeral and sparse. Water often emerges from basalt ridges at "bedding planes" between flows, or formation contact planes, or artesian like though lenses of colluvium/alluvium deposits at the foot of the ridge.

SOILS

The project treatment unit soils are either derived from basement rock—volcanics, meta-sedimentary and serpentinite, or from landslide material primarily originated from the Clarno volcanics, but may be a mixture of types. Soil descriptions in this section and in Forest GIS layers are derived from Forest Soil Resource Inventory (USDA Forest Service, 1974), as modified by McNeil (2007a).

Loamy and Clayey Soils (Nonforested) (13 percent of Project Area)

The surface erosion potential hazard generally is high to very high in these soil types.

Soils in this group are loamy and clayey with very limited water available for plant uptake. They are generally less than 15 inches deep, and support only discontinuous vegetative ground cover, leaving part of soil surface vulnerable to erosional processes. Surface pavement develops where fine soils particles have eroded away, exposing coarser rock fragments.

One half of the unit area in these category soils (soil map units #98 and 99) are derived from serpentine and periodite which are low in fertility for vegetation due to an adverse calcium to magnesium ratio, which interferes with the uptake of calcium by plants. Soil units # 98 and 99 are excluded from timber harvest under the proposed action alternatives.

Loamy Forested Soils (2 percent of Project Area)

The surface erosion potential hazard is generally low to high dependant on vegetative cover for these soils.

These soils are shallow (12 to 24 inches deep) with high potential for accelerated sheet and rill erosion on slopes greater than 30 percent, particularly during high intensity rainfall. If water is allowed to concentrate or is discharged onto bare ground, this condition becomes severe. It is important that erosion control practices be used following harvest, and maintained for each ongoing activity until sufficient vegetation is in place.

Forest Clayey Soils (8 percent of Project Area)

The surface erosion potential hazard is generally low to high, with high ratings on slopes greater than 30 percent.

Clayey soils are easily compacted over a wide range of soil moisture. Puddling occurs during excessively wet periods that can result in damaged or destroyed structure.

These soils are generally quite resistant to surface erosion, however erosion potential increases when litter and vegetation is removed. Excessive erosion can occur when water is concentrated and allowed to channel.

All of the unit area in these category soils (soil map units #96 and 97) are derived from serpentine and periodite which are low in fertility for vegetation due to adverse calcium to magnesium ratio, which interferes with the uptake of calcium by plants.

Volcanic Ash Soils (77 percent of Project Area)

Surface erosion potential hazard for ash soils is low to medium.

These soils have low bulk density, which allow for easy movement (displacement) from mechanical treatment. Soil particles are easily detached, which readily leads to erosion by water and wind. These soils also have a high infiltration and water holding capacity, which can make them very resistant to compaction, depending on moisture content. The ideal moisture content range for equipment traffic is between 10 and 35 percent by weight. Moistures below 10 percent result in excessive mixing, displacement, and dust. Moistures exceeding 35 percent are too wet to support intensive activities.

SOILS - POST-FIRE CONDITIONS

Erosion Potential

The BAER soils report for the Shake Table Complex gave characteristics of high severity burn as a complete consumption of canopy and ground fuels (McNeil, 2006a). Those for moderate burn were partial consumption of canopy and ground fuels, because scorched needles would eventually fall to the ground and provide ground cover. In low burn severity incomplete canopy and ground fuel consumption left adequate effective ground cover to prevent accelerated soil erosion.

Estimated percent ground cover in high and moderate severity burn were 16 and 40 respectively. Field reconnaissance after the fire found 75 percent and 33 percent of the high and moderate burn area, respectively, with high water repellency characteristics (Huffman, 2006).

Aerial seeding and mulching was conducted in the fall of 2006 on virtually all very high and high severity burn areas in the project watersheds at levels that would be considered heavy (USDA Forest Service, 2006). Table 71 outlines soil erosion potential described in the Forest soil resources inventory adapted as criteria in the Forest Plan standards for minimum ground cover and Region 6 guidelines (USDA Forest Service, 1974).

Table 71. Minimum percent ground cover following activities.

Soil Erosion Potential	First Year; % Ground Cover	Second Year; % Ground Cover
Low	20-30	30-40
Moderate	30-45	40-60
High	45-60	60-75
Very High	60-90	75-90

Estimates of percent ground cover in the BAER soils report after heavy seeding of high severity burn and moderate severity burn areas are 30-50 percent and 50 to 59 percent, respectively, in the first growing season after treatment. Given that soil types in the project area have high and very high erosion potential on steeper slopes greater than 30 percent, many areas would not meet Forest Plan standards and are at risk for erosion. Recovery for vegetation is estimated at approximately 1 year for low severity burn areas, and 2 to 3 years in moderate and high severity burns (Huffman, 2006).

Detrimental Soil Conditions

Six units (# 2, 39, 40, 44, 48, 82 and 84) representing a total of 385 acres, including 157 acres of proposed ground base treatment (31 percent of total ground base) were surveyed for soil impacts from past logging, road building, wildfire, and fire suppression. Total detrimental disturbance measured on the units ranged from 0-8 percent, averaging about 2.5 percent, mostly from present skidding trails. Unit 82 and 84 with 5 percent disturbance had considerable off skid trail travel. Unit 44 and 48 however, are proposed for helicopter yarding. No current detrimental disturbance of soil was attributed to the fire.

A large portion of Widows Creek drainage (1124 acres) was part of the Widows Creek wildfire (1939). The fire areas were almost entirely planted in 1983 (See Table 72 below). The ground was tractor harvested then site prepped for planting, by machine terracing of the hill slopes. Surveys of soil conditions undertaken by the author on similarly prepared ground in the Bitterroot NF has consistently found about 15-20 percent detrimental disturbance is due to displacement or compaction even 20 years after implementation (Moser and Archer, 2006). Most of this plantation, about 880 acres within Widow's Creek watershed, is not treated in either action alternative. The remainder of the plantation is slated for helicopter yarding.

Harvest history depicted by the Forest Geographical Information System (GIS) layers show that between 1990 and 1992 575 acres in Buck Cabin and Wikiup Creeks were clear cut or final removal cut to release immature growth from past entries. In 1997 75 acres of commercial thinning was conducted in upper Wickiup Creek drainage. An additional 1,047 acres in upper Fields Creek watershed, outside the project area was harvested with similar methods between 1989 and 1992.

Portions of ground base harvest units #30, 32 and 39 are within 1990 and 1997 harvest units. It is evident that previous entries, for which there are no available records, probably involves most of the ground within the project area that is under 35 percent on ridges and slopes adjacent to the road system.

Between 1991 and 1993, 563 acres were harvested in the upper Duncan Creek watershed. Todd Creek drainage alone of the analysis watersheds has no record of a previous harvest, and neither does it have the road system that would be an indication of previous entry.

Table 72. Summary of past harvest and of burn severity of Shake Table Complex in analysis watersheds.

Watershed	% of Watershed in Past Harvest	Year of Past Harvest	% of Watershed High Burn Severity	% of Watershed Moderate Burn Severity
Dry	21.6	1983	10	5.3
Duncan	7.5	1991-1993	.02	4
Field	12.5	1987-1997	3	4
Todd	0	N/A	24	14
Widows	3.7	1983	16	6

Coarse Woody Material and Soil Productivity

Organic material in the form of coarse woody material (CWM) is needed for long-term soil productivity. Current research recommends retention of 5-10 tons per acre on dry ponderosa pine types, and between 10 and 24 tons per acre on cool forest types (i.e. predominate Douglas fir) (Brown et al., 2003). Decaying material needed to support organisms and return nutrients to the soil will be formed as standing dead trees in the project area fall and come into contact with the ground.

Modeling for CWM accumulation (Fuels Section in Chapter 3), shows peaks within 30 years of the fire and treatment. At that time, 100 percent of the project area would be at or above historical and sometimes acceptable levels of loading for fire control purposes, per Brown (2003).

Given the proportion of the burn within the project area that is very high and high severity, it is likely that current down CWM is below acceptable volumes.

Moisture retention in CWM is important for maintaining the productivity of soil (Amaranthus, et al. 1989). Decaying material needed to support organisms and return nutrients to the soil will be formed as standing dead trees in the project area fall and come into contact with the ground. Woody plants depend on ectomycorrhizae for water and nutrient up take. Harvey et al. (1979) found ectomycorrhizae in decaying wood in higher numbers than in the soil alone. Moisture content in adjoining soils will also remain at elevated levels and provide areas of accelerated vegetative recovery.

Water retained in woody material is not available for augmenting late-season stream flows, but would provide moist micro-sites for conifers and other vegetation. Mycorrhizae form symbiotic communities with the roots of conifers and are important in aiding nutrient uptake, water uptake and in warding off pathogenic fungi. Mycorrhizal fungal communities and other soil microbes are important not only because of their role in nutrient production and transfer, but also because of their contribution to soil formation and structure. Stability of soil aggregates is important for maintenance of soil pores that transmit air and water to plant roots (Amaranthus et al., 1989). Mycorrhizae populations are expected to decrease within the Thorn salvage project area as result of the fire. Highest decreases in mycorrhizae populations would occur were burn severities were the highest.

Many other organisms are import for soil formation, fertility, and nutrient recycling. The soil horizons generally affected are the organic litter and duff layer and the "A" horizon where carbon and nitrogen are stored and recycled. Organisms that influence soils include viruses, archaea, bacteria and blue-green algae, protozoa, fungi, molds and lichens, mosses and liverworts, all types of vascular plants (shrubs, trees, herbs); and various animals such as nematodes, snails, earthworms, and burrowing animals.

Mass Wasting

No recent landslides were mapped during post-fire soil surveys. Potential landslide areas have been mapped where gradient is greater than 70 percent (McNeil, 2007a). Much of this area is within designated RHCAs, except for headwater areas of streams, which are not included in treatment. All potential landslide ground areas within proposed treatment units are designated helicopter yarding system.

The potential for debris torrents in headwater channels in high severity burn areas certainly exists, with occurrence of high intensity rainfall. Several just such events occurred after summer thunderstorms within the Summit Fire perimeter in July and September 1998 (McIver and McNeil, 2006). Estimating the size of storms producing such events is problematic because the local nature of thunderstorms precludes the likelihood of measurement from existing stations. For example, none of the four surrounding SNOTEL sites of the Summit Fire area debris slides recorded any precipitation on the days in question.

Small landslides or slumps may occur in presently mapped Holocene age landslides in response to the fire, since more water will be held in the soil due to reduced transpiration.

Roads

The natural evolution of channel morphology is concomitant with forest soil cover, infiltration and holding capacity. Overland flow on a forested, undisturbed slope is a rare occurrence where cover is mostly complete and capacity greater than potential rainfall intensity.

Roads may alter the hydrologic response of a watershed by intercepting ground water flow, particularly on steep hill slope cuts that expose the entire solum (Jones and Grant 1996; Beschta et. al, 2000; Jones, 2000). Converting groundwater flow, with a velocity on the order of feet per day to surface flow on road beds or drainage ditches, with velocity on the order of thousands of feet per day, accentuates and advances peak flow timing over natural condition. Secondary parameters that contribute to the hydrologic effect of roads are hill slope gradient, and proximity of a bed to channel, particularly if the road is parallel to a channel.

A road system that covers only a small fraction of a watershed may therefore have a significant effect on peaks because it essentially enlarges the stream network, or area that contributes to surface runoff as first describe by Hewlett and Nutter (1970). Shown in Table 73 is percent of road area that is within 50 feet of a mapped channel as an index of the hydrologic connection of the road system.

Table 73. Summary information on road system in analysis watersheds.

Watershed	Watershed Area (square miles)	Watershed Roads Miles	Road Density (miles/square miles)	Estimated Watershed Area in Roads (%)*	% of Road Area in Riparian
Dry	6.2	13.3	2.1	1.0	28
Duncan	11.6	24.5	2.1	0.9	56
Fields	21.2	61.8	2.9	1.4	49
Todd	6.4	4.3	0.7	0.3	19
Widows	11.7	17.4	1.5	0.7	45

*-based on 25 foot width for road prism.

Culverts on Forest Roads 2140, 2140038 and 2140074, at crossings of Wickiup and Buck Cabin Creeks are at risk from exacerbated storm runoff generated by burn area above (Huffman, 2006). These roads provide the access into most of the project area ground base units and helicopter landings. Crossings under question have been, or are scheduled to be replaced or maintained. Maintenance would consist of clean out and armoring on bed with approximately 1 foot diameter rock (Conlee, 2007).

HYDROLOGY

Surface Flow

Peak flows within the project area have been measured only on Fields Creek from 1967 to 1979 (USGS, 2006). The highest peaks, by an order of magnitude over the others of record are entirely from rain on snow events in winter and during spring snowmelt when temperatures rise very rapidly over a few days to 70 degrees Fahrenheit or greater at the Dayville and John Day station; indicating at least similar conditions in the watersheds. Similar patterns are noted from gages on Jackass and Canyon Creeks during approximately the same time frame.

The most intense rainfall comes during summer storms. These events, however, are very local, and do not appear as peak flows of the year or even noticeable from examinations of stream flow records in drainages in the general area of the project, including Little Malheur River, Upper John Day River, Upper Middle and North Fork of the John Day (USGS, 2006).

Raindrop impact is a severe source of initial erosion on bare soil. Shear stress imparted by raindrops on bare soil has been measured as much as four times the critical shear stress of cohesive soils and 100 times the shear stress created by thin sheet wash (Julien, 2002). Critical shear stress is the point of initiation of movement of a particle. Fine particles transported by raindrop impact or sheet wash can plug pores in the mineral soil surface and thereby reduce infiltration capacity (Biswell, 1989, Powers 2002). Overland flow can be initiated when surface infiltration capacity is drastically reduced. Where soil texture and structure allow ready detachment of particles and transport by sheet wash, as is the case for most of the project area soils in circumstances of little ground cover and slopes in excess of 25 percent rilling would likely result (McNeil, 2001). Rilling not only channelizes, and therefore quickens flow, but provides an efficient avenue for sediment transport.

Runoff response to harvest, and incidental road building is overwhelmingly only for small (<<1 year recurrence interval) fall storms in dry antecedent conditions and well within the range of annual variability of peak flows (Beschta, 1978; Ziemer, 1998; Jones, 2000). Revealing, incidents of significant effects of harvest to large peak flows can usually be correlated only with very high road density, or the placement of roads in close proximity to channels (Rice et. al, 1973; Jones and Grant, 1996; Jones, 2000). This effect of harvest and roads is also most significant in small watersheds of under 1,000 acres and tends to decrease to insignificance in much larger watersheds (Beschta et. al., 2000).

Sediment production from harvest is also mostly tied to access roads with several fold increases (multiplicative factors of 2 and 3) measured from 1 to 5 years after completion of harvesting, before a return to near baseline or pre-activity condition (Krammes and Burns, 1973; Rice et. al., 1973; Beschta, 1978; Keppeler and Ziemer, 1990; McNeil, 2001). Primary sources are running surfaces, cut banks, and fill slope failures, the latter which usually come some years after road management actions.

Burned watersheds with significant ground cover loss however, diverge from their pre-burned conditions of peak flow and sediment production in response to high intensity rainfall, particularly in small headwater drainage areas (Neary et. al, 2005). Most importantly, peakflow responses from wildfire are typically well out of range of responses produce by harvest and road building, with measurements from 1 to 3 orders of magnitude (multiplicative factors of 10 to 1,000) over pre-fire conditions (Tiedemann et. al., 1979; Beschta, 1990; Neary et.al., 2005). These runoff events are capable of initiating debris flow in headwater areas, drastically altering channel morphology of alluvial channels (USDA Forest Service, 2004). Sedimentation following a wildfire is also typically 1 and often 2 orders of magnitude greater than pre-fire conditions (Tiedemann et. al, 1979).

Estimates of peakflows for drainages in the project area were 1 to 3 orders of magnitude greater than pre fire conditions (Huffman, 2006). These calculations utilized area estimates of post-fire hydrologic function, and a storm with a 10 year 30 minute recurrence interval and duration, for a total of 0.6 inches (Hershfield, 1961). More local information suggests the actual values of total rainfall may be much higher, over 1 inch for a 10 year, 30 minute storm (State of Oregon, 1974).

As an example, the amount of mineral soil exposed after the Summit Fire on the Forest, from a survey by McIver and McNeil (2006), was highly variable, but averaged 28 percent in moderate to high severity burn areas. After the fire salvage only very low levels of soil disturbance and sediment transport were observed. The authors concluded the likely reason was a lack of extreme weather events, particularly summer thunderstorms during the course of their study. Debris torrents produced by summer storms within the perimeter of the Summit fire occurred before the study commenced.

The magnitude of sediment from the debris torrents that initiated in high sub-alpine headwaters produced dwarfed that produced by the later combination of harvest and snowmelt runoff (McNeil, 2001; McIver and McNeil, 2006).

From Table 72 it is shown that Todd, widow’s and Dry creeks are most at risk from high intensity rainfall and accelerated erosion, even debris flows in steep head water channels. An approximate timeframe of such vulnerability is 2-3 years, judging from estimates of resumption of grazing as occurring within 3-5 years (Range section, DEIS chapter 3).

Channel/Valley Morphology

Stream channel condition surveys were conducted by the Forest staff in 1993 and 1995 in preparation of the Aldrich timber sale, which was not implemented, and the Billy timber sale (USDA Forest Service, 1993, 1995). The surveys were within the Upper Widow’s Creek, Wickiup and Buck Cabin Creeks, and the main stem of Field’s Creek along the boundary of the proposed TFSR project, and Todd Creek. The channel of lower Widow’s Creek was observed by NRCS staff during a site visit to determine post fire conditions (NRCS, 2007).

General observations of channel conditions in Huffman (2006) were a lack of large woody material in the channels, either because it was not an original component or was consumed in the fire.

Widow’s Creek

The tributary streams of Widow’s Creek originate as springs, frequently in dished out, slump pockets within the Clarno or Columbia River group rock types. Surface flow is very shallow and wide, discontinuous or subs out within 200 feet of the source. Gradients are 20 to 40 percent. Channel conditions observed by NRCS staff (NRCS, 2007) on lower Widows Creek were of a moderate to steep gradient stream with gravel/cobble substrate within a narrow steep sided valley, often with a developed floodplain/terrace. Forest cover predominated and there was a high degree of bank stability provided by vegetation and large colluvial/alluvial particles.

Fields Creek and Tributaries

Stream and riparian surveys for Billy Timber sale (USDA, 1993) were conducted on that portion of Fields Creek within the present proposed project area, and on Buck Cabin and Wikiup Creeks from their confluence with Fields Creek to the headwater source area.

Valley side slopes were between 35 and 70 percent gradient. Valleys were V-shape, with narrow bottoms. Stream channels were mostly less than 3 feet across on bottom width, and incised. Bank stability was over 80 percent. Water temperatures were between 48 and 50 degrees Fahrenheit throughout the summer time surveys, probably due to a predominately spring source and exceptional shading which ranged between 67 and 87 percent.

Channel gradient was between 4 and 15 percent, steeper on the tributaries Buck Cabin and Wikiup creeks (up to 12%), whereas Fields Creek was about 4 percent. Substrate was dominated by large clasts—small boulders and cobbles—and occasional bedrock. Embededness was less than 35 percent on the tributaries (percent of bed in fines, sand size or under), but over 35 percent on Fields Creek. This may be indicative of harvest activity and associated road use and maintenance in the upper watershed of Field’s Creek (and outside the project area), that occurred in the late 1980’s.

Todd Creek

Surveys were conducted on the south side of Aldrich Mountain ridge on first and second order tributaries of Todd Creek (Middle and East Forks) (October, 1995, USDA Forest Service). Valley forms generally begin as broad U shapes and deepen downstream into V shapes. Gradients were between 10 and 30 percent decreasing downstream. The headwater channels are typically ill defined or discontinuous with sand and cobble substrate. Flow was typically present only in channels originating near the ridge line, however some flow emanated from springs in slump pockets in valley side slopes. Side slopes had frequent outcropping, and were steep (greater than 40%).

Channel stability was rated at above 85 percent stable, with minor exceptions. Banks were anchored primarily by boulders and tree roots. Exceptions were channels that were incised deeply in alluvial material of sand and gravel mostly down slope from the Cabbage Patch area.

Further stream habitat surveys on the middle and lower portions of Todd Creek describe bank stability as between 85 and 95 percent, shading as greater than 60 percent (December, 1995, USDA Forest Service). Channel substrate was predominately gravel/cobble, but stabilized by colluvial boulders.

Hydrology analysis for Todd Planning Area noted a considerable amount of scab openings (non-forested) on the upper ridge slopes that had gullys probably as a result of early 20th century grazing. The gullys are generally unconnected hydrologically to the defined channels (USDA Forest Service, 1996). The channel is described as steep and down cutting through ancient slump and debris slide deposits; yet is overall an efficient sediment producing and transporting system.

Aldrich Allotment Plan also reported abundance of bare ground on gentle ridge top slopes, but that steeper slopes are well vegetated from light use since at least 1953 (USDA Forest Service, 1979;USDA Forest Service, 1953).

Water Quality

Presently, there are no domestic or municipal uses of surface water within the project area.

The segment of the John Day River (mile 182-265) which confluences with Fields Creek, Widows Creek and Dry Creek is listed in the Oregon Department of Environmental Quality as a priority II stream for development of Total Maximum Daily Loads (TMDL) (State of Oregon, 2003). To comply with Clean Water Act section 303(d) and 305(b), the state must identify and establish TMDL limits for known impaired and potentially impaired water bodies. One criteria of priority II status is that these waters contain candidate species for federal listing on the Threatened or Endangered Species list or listed as critical habitat for the Oregon Sensitive Species List. A second criterion is waters that have high recreational contact during chronic dry weather season. Parameters for listing and TMDL development, on the Upper John Day River are Bacteria, Biological Criteria, Temperature and Dissolved Oxygen. TMDL studies are targeted for conclusion in 2007.

Fields Creek is listed for temperature concerns all year for salmonid spawning and migration and rearing of anadromous and salmonids fish.

Project area stream temperatures during summer surveys, albeit one-time measurements, were well under thresholds set by the state of Oregon for cold water spawning and rearing (State of Oregon, 2007).

Todd, Widow’s and Dry Creek had large portions of their watershed in high and moderate severity burn (See Table 72 above) with most of the high severity in headwater areas. While these are high gradient channels with fast moving water and relatively brief residence time, the nearly total loss of canopy over the effected channel lengths of 0.5 to 1.5 miles, would nominally be expected to cause some water temperature increase. All the systems originating from Aldrich Mountain ridge, however, have predominately spring sources for flow in the summer dry season, which are unusually cool (48 to 50º F) in the reaches measured. More so than would be expected from storage in the soil mantle or weathered parent material in the aerated zone. It is reasonable to assume therefore water temperature is controlled at least partly by relatively large and deep source within basement rock, and would not be greatly affected by canopy loss over the channel, banks and valley slopes.

With mild exceptions (Field's Creek; see above) there is no observed indication of excessive fines entering the project area watersheds under the pre-fire conditions of recovering harvest areas, and existing road system. The amount of very high and high severity burn in Dry, Todd and Widow's creeks ranges from 10 to 24 percent, all in the upper portion of the watersheds. While the effect on water temperature may be attenuated by spring sources, the near total loss of canopy and ground cover within the riparian area as well as upland slopes creates a substantial risk to sedimentation of the streams during high intensity rainfall for at the least the first 2 growing seasons after the fire. The amount of fines potentially delivered to the channel cannot be adequately quantified due to variable topography, soils, storm magnitude, anymore than its occurrence can be stated other than as a probability. It is sufficient to understand that a short duration rainstorm (approximately 1 hour) with a recurrence interval of about 5 years or more is capable of accelerated erosion under the present post fire condition of ground and canopy cover (McNeil, 2005). As an example, in the general region of the project area 0.5 inches in 1 hour has a 5 year recurrence interval (State of Oregon, 1974), which is very close to modeled parameters for accelerated runoff and erosion in Huffman (2006). This means that in any given year in which ground cover is below standards there is a 20 percent chance of accelerated erosion from hill slopes and possible delivery of sediment to channels as a result, and a 40 percent chance such an even would occur in the first 2 growing seasons after the fire. Accelerated erosion means an amount above natural or baseline conditions.

The evolution of channel form is concomitant with soil condition, forest canopy and ground cover as the most important factors. Among indices of change in condition are water turbidity, bed particle size distribution (i.e. bimodal rather than normal), water temperature, and bank stability. Relatively good values of these parameters indicate that typical long-term, per-fire effects of grazing, road existence and use, and recreation have not adversely affected channel form, water quality and riparian condition. In spite of a high proportion of road length within riparian corridors (See Table 73), there is low to moderate road density for Duncan, Field's and Widow's creeks

DESIRED CONDITION

No desired future conditions for water and soil resources are directly identified in the Forest Plan. Forest wide goals applicable to the project area and proposed action reinforce requirements under the Clean Water Act to meet state water quality standards and ensure favorable conditions of flow for downstream beneficial uses.

PROJECT DESIGN FEATURES

Project design features for the soils and watershed resource areas are noted in DEIS section 0.

3.4.3 ENVIRONMENTAL CONSEQUENCES

ALTERNATIVE 1 - NO ACTION

An indirect effect under the No Action alternative is accumulation of fine and coarse woody material that would pose a greater hazard to soil condition, and resistance to control, in the event of a wild fire than would occur under Alternatives 2 and 3. This statement is based on projections of estimated fuel loading between 20 and 30 years after the fire (See Fuels section, Chapter 3).

High fire severity not only eliminates vegetative cover, but litter and soil organic matter. Under very extreme conditions soil structure can be altered to dense massive form that adversely affects hydrologic function by reducing infiltration and water holding capacity.

PROPOSED ACTION AND ALTERNATIVE 3

The only difference between the action alternatives is the inclusion of Management Area 10 (semiprimitive nonmotorized recreation area), within Alternative 2 and its absence in Alternative 3. There is no difference between the action alternatives for Duncan and Todd watersheds. Differences in other watersheds are shown in Table 74.

Table 74. Difference between Alternative 2 and Alternative 3

Watersheds	Alternative 2 Yarding System (acres)		Alternative 3 Yarding System (acres)	
	Helicopter	Ground-Base	Helicopter	Ground-Base
Dry	422	15	397	15
Duncan	334	141	334	141
Fields	1357	153	1082	108
Todd	37	133	37	133
Widows	1261	55	496	26

Soils—Erosion and Detrimental Disturbance

Detrimental disturbances within helicopter yarding treatment units are considered insignificant and incidental to hand falling of trees. Similarly, danger tree removal along travel and haul routes is a widely dispersed impact, particularly in areas of light severity or no burn.

Use of heavy equipment in ground base units for felling and yarding would compact and displace topsoil, particularly along principle trails and landings. The degree of soil compaction is dependant on number of passes by heavy equipment, and also the texture of soil (Powers, 2002). Coarser, sandy soils typically resist compaction better than finer grain soils, but most soil compaction occurs within the first three or four passes (Williamson and Neilson 2002).

Further effects of ground base yarding are decreased infiltration capacity, either because of the removal of the organic ground cover and exposure to high intensity rainfall, or reduced porosity through compaction. The former condition is the most probable cause of surface erosion by sheet wash and rilling because of the force of raindrop impact on bare mineral soil.

Skidding trails on slopes in excess of 25 percent, on the Summit and Flagtail Salvage sale, which had similar soil conditions and ground cover to the project, appeared to be vulnerable to rilling by storms with a recurrence interval of at least 3 years (McNeil, 2001 and 2005). Rutting by heavy equipment on moist soil, or where skidding trails and equipment cross or use as a through-fare a natural drainage caused shallow gullys.

On 35 acres of the Flagtail salvage, monitoring of the harvest results found an increase of 14 percent detrimental disturbance to soil overall. Skidtrails covered 19 percent of the measured activity area, with an average of 61 percent detrimental disturbance due to compaction (McNeil, 2005). These values are somewhat higher than found on other monitored sale sites.

Monitoring of 5 ground base units in the Silvies Canyon fire salvage sale done with skidder and feller buncher, found 7 to 15 percent of the ground harvest unit area in skidding trails, and 39 to 53 percent of the trail area detrimentally disturbed (McNeil, 2007b). Taking an average value of skid trail coverage, the detrimental disturbance from skidding would be approximately 4 to 6 percent of the total activity area. Counting disturbance from other sources—off-trail equipment use, landings, roads etc.—the total detrimental disturbance on the monitored ground was 6 to 9 percent. Slopes throughout were 5 to 25 percent.

Feller buncher tracking, separate from main skidding trial routes, covered 11 percent of a unit in the

Calamity Timber sale on the Forest, 15 percent of which ground was detrimentally disturbed, or 2 percent of the total activity area (McNeil, 1996). Within the same sale an additional 4 percent of the total activity area monitored was detrimentally disturbed from skidding trails. Minimum spacing of 120 feet is a PDF for the TFSR project (See Table 24, Chapter 2), which is a primary factor in reducing impact of harvest in ground base units. Other PDFs that address erosion control on trails, and seasonal equipment operating slope limits are designed to further reduce impacts to soil to below Forest plan and Region 6 standards.

Monitoring of ground-based harvest units for the Misty Timber sale found skidding trails covering 24 to 27 percent of units monitored and detrimental disturbance of the trails ranging between 50 and 70 percent (approximately 13 to 18 percent of the total activity area) (Gamble, 2002). Average skidding trail spacing, however, was 66 feet as feller bunchers mostly used skidding trails.

For a summary of soil disturbance per treatment unit and the project as a whole refer to the section below on Soils Cumulative Effects.

Soil Organic Matter and Coarse Woody Debris

Regional and Forest Plan standards are to maintain organic matter both of fine and large size in amounts sufficient to prevent significant short or long-term nutrient deficits (USDA Forest Service 1990). Fine surface organic matter includes plant litter, duff, and woody material less than three inches in diameter that occurs over at least 50 percent of the activity area. This condition is not likely to be met in very high and high burn severity areas for up to 3 years after the fire. CWM is defined as over 3 inches in diameter.

The proposed action would leave un-merchantable timber standing. Trees salvaged within units for helicopter yarding or within tractor yarded units that were delineated as high or very high severity would be limbed on-site. Tops of trees would be removed and left on site in tractor units delineated as low and moderate burn severity.

Wildlife criteria for coarse woody material (See project design features and LRMP Standards) ensure a minimum of 5-6 tons of down wood in mixed conifer cover. Additionally there are left limbs, tops, breakage and un-merchantable standing dead that would eventually fall. The total of these design features is considered sufficient to provide adequate down CWM for the long-term future.

All units with moderate or higher burn severity will be hand planted with conifer seedlings (See Timber-Sivilculture Section, Chapter 3). Preparation for planting is hand scalping of ground cover, of approximately 2 square feet. The density of planting will between 150 and 350 seedlings per acre, depending on burn severity and plant association groups of burn area, which constitutes between 0.7 and 1.6 percent of the planted area. This total is not considered significant to the eventual recovery of ground cover, nor is treatment plots large enough to be considered as detrimentally disturbed ground (USDA Forest Service, 1998).

In time, organic matter will gradually accumulate from litter, woody debris, forbs, and grasses. Nutrients will gradually accumulate due to inputs (in precipitation, dry deposition, weathering of parent material, and nitrogen fixation) and retention. These processes will take decades.

Retention of all dead and dying trees will create elevated fuel levels (See Fuels Section, Chapter 3) within 20-30 years. Soils may be detrimentally burned if another fire occurs as logs are consumed at ground level. Additional soil would be eroded and nutrients and organic matter lost. Productivity loss is difficult to predict at this time. Future wildfire has the potential for detrimental burning effects to the soil resource.

The No Action alternative would have no effect on ectomycorrhizae or other beneficial fungi or organisms in this area. Ectomycorrhizae are most abundant in the organic soil components, including the litter, humus; soil wood, charcoal and organic enriched mineral horizons. Since the Shake Table Fire Complex reduced the soil organic component, it follows that the total number of ectomycorrhizae would be reduced. This occurs for a number of reasons including the reduction of habitat sites, chemical changes in the remaining organic matter and the reduction of conifer needs for the added nutrient uptake capacity gained through ectomycorrhizal associations. Soil chemistry can change after fire, resulting in unfavorable conditions for some ectomycorrhizae species.

Surface Flow

Road prisms intercept overland and subsurface flow, conveying this water across the relatively impermeable running surfaces and ditches to concentrate at discrete discharge points. Skid trails and other temporary transport routes associated with treatment have a similar effect, though a lesser degree of compaction and total width, they are often on steeper gradients. Project design features for increased flow routing on trails is through erosion controls such as water bars, , and slash cover, which help dissipate the water energy and help water to infiltrate into the soil

The effect of greater overland flow and routing by roads and trails may be great enough to accentuate surface flow peaks for small fall storms in the natural channels of small watersheds. Exacerbated flows, occurring with a frequency or duration that exceeds existing long-term conditions of flow, could affect channel stability by degrading beds and in turn, undercutting banks and valley side slopes in the confined channels. However, the project area's channels and near-channel valley slopes are dominated by large alluvial/colluvial and bedrock outcropping. And the generally good stability conditions found in project surveys are an indication of the resiliency expected in well armored mountain streams.

No new roads would be constructed for the project. Road closures totaling 8.8 miles, more or less evenly divided between Dry and Field's creeks watersheds, were in place prior to fire suppression of the Shake Table complex, and would be so again after harvest and planting. Additionally, several roads have had crossings and surface repair and replacement scheduled prior to implementation of the sale. These roads are within the Field's Creek drainage and provide the main ingress and egress to landings and as haul routes off forest.

The overall effect of roads is expected to be similar to the long-term pre-fire condition. Maintenance of running surfaces and crossings may attenuate response to storms insofar as concentration of flow in rutted roads, plugged or damage culverts would be corrected. Erosion treatment on skidding trails, per PDFs, will reduce or eliminate the connectedness of the skid trial system to Forest roads and its drainage, hence to project streams.

Treated plots for the seedling plantings are not contiguous, or areas large enough to generate surface erosion in the event of high intensity rainfall while bare soil surface. Even at the highest density of 350 plantings per acre, approximately 10 feet of ground would exist between prepared plots.

Water Quality

There is general consent on the value of buffer strips of riparian vegetation along stream courses for control of water temperature, recruitment of CWM and as a sink for sediment and nutrients (Castelle et.al. 1994, Schnepf and Newton 2000). The most commonly prescribed minimum buffer widths for use in water quality and habitat maintenance are 20-30 meters (Welsch 1991, Sierra Nevada Ecosystem Project 1997).

The project area RHCAs follow PACFISH guidelines and are wider than minimum requirements indicted by research. Project RHCAs are exclusive of treatment and equipment entry except where pre-approved by appropriate Forest staff. In addition to PACFISH requirements ephemeral draws within ground-base system units that have evidence of water flow will also be exclusive of equipment entry and harvest within 25 feet to either side of the channel.

The project RHCAs, in conjunction with other PDFs (Table 23, chapter 2, FEIS) within ground-base units would reduce the risk of accelerated erosion, and delivery of fines to channels from project activity areas, and project activities alone. Particular efforts will be made to avoid gully erosion starts in ephemeral draws (See Table 24, WS-4), and conservative slope limitations will be implemented due to the project areas generally high elevation and moist soil conditions, particularly as compared to pervious salvage sales on the Forest (McIver and McNeil, 2006; McNeil, 2005).

Planned road closures, and repair and maintenance of access and haul roads for ground base units and helicopter landings would also eventually ameliorate the present condition of the road system.

Even with near complete loss of canopy due to the fire in most the project watershed’s headwater areas, because of spring source of flow, temperature effects are expected to be minimal. The complete loss of ground and canopy cover, however, in most of the headwater area of the project watersheds poses a significant risk of sedimentation in streams from either hill slope erosion or in channel debris torrents for at least two years after the fire. These discussions are detailed within Existing Conditions: Water Quality and Surface Runoff.

Harvest of danger trees on haul routes in RHCAs constitute very minimal amounts of total riparian area in moderate to very high burn severity areas where felling might be considerable (headwaters of Wickiup and Buck Cabin Creeks), but would not effect shading or temperature of stream water. Haul routes parallel and within the Field’s Creek riparian area (FR 2100) is either unburned or light burn severity where felling density would be light.

The short-term effect of road maintenance on running surfaces and channel crossings will be to increase sediment delivery to discrete points, primarily crossings, for one to two seasons after the maintenance. Schedule maintenance includes armoring of channel culvert outlets, which will reduce bed and bank instability and as a consequence, sediment production for the long-term.

3.4.4 CUMULATIVE IMPACTS

ALTERNATIVE 1 – NO ACTION

Future foreseeable actions in the project area (see Appendix N, FEIS) are: recreation (hunting, camping); grazing; firewood cutting; maintenance of roads, communication sites and fire look outs; and noxious weed spraying. None of these actions in themselves or in combination with effects of the No Action alternative discussed above are considered to have a significant effect to soil conditions or hydrologic response of the watersheds.

PROPOSED ACTION AND ALTERNATIVE 3

Soil

An activity area is any impacted site feasible for sampling. Sale contract units are typically considered as individual activity areas for the purpose of soils monitoring (USDA Forest Service, 1998). Given the project design features, the theoretical limit of skid trailing in any ground base harvested unit is 11.6 percent of an activity area. The proportion of a skid trial detrimentally compacted as measured in monitor sites of previous sales, and already discussed in this report, is between 39 and 70 percent. The variance appears to be most strongly correlated to volume harvest (McNeil, 2007c), though other factors such as slope, antecedent soil moisture and soil type are important. Table 75 below shows percent detrimental disturbance in ground-based units using equations developed by McNeil (2007c). The equations use harvest volume, soil type, slope, and re-use of existing skid trails. Other, additive factors are percent of a unit in road area, and existing detrimental disturbance. Landings are integrated in roads and not separately calculated. Several small units (#7, 32, 39, 40, 41, 42 and 88) have significant area in Forest roads (3.6 to 9.3%) that generally run through the length of the units. Residual impacts for the project in general was taken from the mean for measured units; 2.5 percent. This value was used in calculations for all units unmeasured, but potentially had residual impacts because of slope and existing access roads suggest previous tractor harvest. Residual harvest effects were about 5 percent in measured units #82 and #84.

Forest Plan standards, which follow Regional guidelines for soil quality, state that no more than 20 percent of an activity area should be detrimentally disturbed, including system transportation routes.

Other units with high values of disturbance (# 2, 82 and 84), have high proportion of area greater than 20 percent gradient.

Four units (#2, 39, 41 and 42) have project design features (See Table 24 in Chapter 2) that require harvest over snow, or frozen ground only. This is to prevent levels of detrimental soil disturbance that exceed Forest and Regional standards. Existing high soil impacts on these units are because of very high road density and/or projected high harvest volumes. The detrimental impacts shown in Table 75 for these four stands are what are expected with harvest over snow or frozen ground.

The rest of the project treatment units, (not shown in Table 75), employ helicopter yarding systems, and with few exceptions have no current road surface. The range of current impacts on those units is 0 to 5 percent with expected impacts not to exceed 6 to 7 percent.

Table 75. Summary of detrimental disturbance on ground base units.

Unit	Unit Acres	Volume (MBF) Per acre	Roads (% of area)	Total Detrimental Disturbance after Implementation (% of area)
1	46	15.0	2.0	13.8
2	103	15.0	1.7	14.3**
6	123	3.0	2.4	9.7
7	4.0	2.7	4.7	11.8
12	12	2.3	2.1	6.8
14	12	9.8	1.3	10.4
24	64	2.2	2.8	9.6
32	15	4.7	6.8	14.0
39	5.3	15.1	7.5	13.5**
40	6.0	15.2	4.8	12.7**
41	2.0	14.5	9.3	15.1
42	1.8	14.4	9.1	14.9
43	11	15	3.2	15.0
53	18	15.2	0.3	12.1
82*	38	15.0	1.7	15.1**
84*	4.6	15	1.5	18.6**
86*	13	14.7	0.0	11.7
88*	17	15	3.6	15.3

*--Removed in Alternative 3

**-Areas of units # 2, 39, 40, 82 and 84 have been surveyed in post-fire condition.

Other foreseeable future activities in the Thorn Salvage project area (**See DEIS Appendix N**) are: grazing (3 to 5 years after the fire); firewood cutting; recreation (camping, hunting); use and maintenance of Forest roads, communication sites and fire lookouts; noxious weed spraying; and finally, fire suppression. With the exception of fire suppression, which is a randomly occurring factor, the other actions are more or less on a yearly basis. All these actions, again with the exception of fire suppression, do not directly and significantly impact soils either in the detrimental removal of soil organic matter, and ground cover, or by adversely altering hydrologic function to cause accelerated erosion. Taken together these actions represent the bulk of past actions, other than timber harvest, that have constituted pre-fire conditions of soil productivity that are within standards stated by the Forest plan and Region 6 guidelines.

Hydrology

Adequate RHCAs and PDFs such as seeding or mulching of skidding trails steeper than 20 percent and other disturbance areas within units should effectively prevent rilling and channelized flow and fine sediment from entering channels above what would occur under the No Action alternative.

Roads would continue to be primary source of surface runoff that advances timing of small peak flows, and of fine sediment. Absence of new road construction, re-initiation of area road closure policy after project completion, and repair and maintenance of roads and channel crossing structures within the project area would continue present disturbance levels or eventually ameliorate them.

There would be no harvest within RHCAs and therefore what shading exists would not be disturbed, neither would there be a disruption of natural recruitment of large woody debris within the riparian zone and channel that act as sediment traps, and for fish habitat enhancement.

Present channel and riparian conditions as ascertained from fish and stream habitat surveys, hydrologic analysis and range allotment plans indicate a channel network, outside of high or moderate severity burn, which is stable, with a viable riparian vegetative community and ample canopy closure. The channels are steep, armored by bank vegetation and large colluvial/alluvial clasts with minimal sediment storage and competent energy gradient to transport fines.

The proposed action alternatives would develop no significance increase in contributing area for runoff or surface erosion as summarized below in Table 76. Residual harvest impacts in the table are based on assumptions of an average 5 percent of the area detrimentally disturbed. Detrimental disturbance for proposed action is based on 20 percent for ground base and 2 percent for helicopter yarded units. Both values are at the upper end of expected range. The resultant totals are given as an index of the degree of impacts to hydrologic function (infiltration and water holding capacity) in the project watersheds, as a proportion of total area. This is not to imply that all this area is hydrologically connected with area streams and could be considered extensions of runoff network.

Table 76. Summary of impacts to hydrologic function; values equal percent of total watershed area.

Watershed	Roads	Residual Impact	Current Total Impact	Proposed Action		Total Post-Action	
				Alt. 2	Alt. 3	Alt. 2	Alt. 3
Dry	1.0	1.08	2.08	0.12	0.11	2.2	2.2
Duncan	0.9	0.4	1.3	0.29	0.29	1.6	1.6
Field's	1.4	0.6	2.0	0.32	0.24	2.3	2.2
Todd	0.3	0	0.3	0.47	0.47	0.8	0.8
Widow's	0.7	0.2	0.9	0.32	0.14	1.2	1.0

What is currently a significant source for sedimentation and runoff into project area streams and runoff is exposed soil from fire in high and moderate burn areas as described in Existing Conditions section above. Table 72 amply illustrates this condition and shows Dry, Todd and Widow's Creek as most at risk. Additionally, large portions of Dry and Widow's Creeks, and a lesser amount of Field's Creek, is off forest, on low elevation grasslands that sustain unknown levels of grazing. Other foreseeable future activities within the project analysis watersheds are resumption of pre-fire activities including the continuation of grazing in area allotments within 3 to 5 growing seasons, firewood cutting, recreation, and maintenance of roads, communication sites and lookout towers. None of these activities apparently contribute significantly to conditions that alter the present or pre-fire hydrologic regime in the analysis watersheds, given the relatively good condition of riparian vegetation, channels and observed loadings of fine sediment.

3.4.5 SUMMARY

The primary effect of harvest and existing road system are to small, high frequency and early season storms that are well within natural range of annual peak flows. The proposed action alternatives would have little or no significant effects to runoff or channel stability.

Potential effects of wildfire to runoff and sedimentation of streams is orders of magnitude greater than effects of roads and harvest, and well outside the range of pre-burn conditions. The risk of a storm causing accelerated runoff and erosion is about 40 percent over the first 2 years following the fire for all alternatives including the No Action

The project design features for snag retention is adequate to ensure long-term levels of down CWM.

Existing condition of ground cover in very high and high severity burn areas is below Forest Plan standards, and expected to remain so for 1 to 2 years after the fire.

Harvest over snow and/or frozen ground is a project design feature for four tractor units (#39, 40, 41 and 42) to meet Forest and Regional standards for detrimental soil disturbance.

Accumulation of fuels 20 to 30 years after the fire would pose greater hazard to soil conditions and resistance to control, in the event of a wildfire, for the No Action alternative than either of the action alternatives.

CONSISTENCY WITH DIRECTION AND REGULATIONS

All alternatives would be consistent with Forest Plan soil protection standards. All Forest-Wide Standards would be met (see" Regulatory Framework" section).

3.5 WILDLIFE

3.5.1 INTRODUCTON

This section describes the terrestrial wildlife species found in the project area and the effects of the alternatives on these species. Rather than addressing all wildlife species, discussions focus on Forest Plan management indicator species (MIS), threatened, endangered and sensitive (TES) species, Forest Plan featured species, and landbirds (see individual species lists below). TES species effects are analyzed in more detail in the TFSR Project Biological Evaluation (BE) found in the project files. The existing condition is described for each species, group of species, or habitat. Direct, indirect, and cumulative effects of alternatives are identified and discussed.

REGULATORY FRAMEWORK

The three principle laws relevant to wildlife management are the National Forest Management Act of 1976 (NFMA), the Endangered Species Act of 1973 (ESA), and the Migratory Bird Treaty Act (MBTA) of 1918. Direction relative to wildlife is as follows:

- NFMA requires the Forest Service to manage fish and wildlife habitat to maintain viable populations of all native and desirable non-native wildlife species and conserve all listed threatened or endangered species populations (36CFR219.19).
- ESA requires the Forest Service to manage for the recovery of threatened and endangered species and the ecosystems upon which they depend. Forests are required to consult with the US Fish and Wildlife Service if a proposed activity may affect the population or habitat of a listed species.
- MBTA established an international framework for the protection and conservation of migratory birds. This Act makes it illegal, unless permitted by regulations, to “pursue, hunt, take, capture, purchase, 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 . . .”

Forest Service Manual Direction provides additional guidance: identify and prescribe measures to prevent adverse modifications or destruction of critical habitat and other habitats essential for the conservation of endangered, threatened, and proposed species (FSM2670.31 (6)). The Forest Service Manual directs the Regional Forester to identify sensitive species for each National Forest where species viability may be a concern.

The principle policy document relevant to wildlife management on the Forest is the 1990 Malheur National Forest Land and Resource Management Plan, referred to as the Forest Plan for the remainder of this section. The Forest Plan provides standards and guidelines for management of wildlife species and habitats. Standards and guidelines are presented at the Forest level (LRMP, pp. IV-24 to IV-45) or Management Area level (LRMP pp. IV-50 to IV-54, IV-69 to IV-73, IV-97 to IV-98, IV-105 to IV-107 and IV-108-112). Management Areas include General Forest (MA-1), Rangeland (MA-2), Big Game Winter Range Maintenance (MA-4A), Semi-Primitive Non-Motorized Recreation Area (MA-10), Old Growth (MA-13), Visual Corridors (MA-14), Wildlife Emphasis Area (with Scheduled Timber Harvest) (MA-20), Wildlife Emphasis Area (with Non-Scheduled Timber Harvest) (MA-21).

The 1995 Regional Forester’s Eastside Forest Plans Amendment #2 amended Forest Plans for the National Forests in Eastern Oregon and Eastern Washington, including the Malheur National Forest. Amendment # 2 established interim wildlife standards for old growth, old growth connectivity, snags, large down logs, and northern goshawks. The Regional Forester has periodically distributed letters clarifying direction in Amendment #2 (Regional Forester, October 2, 1997; October 23, 1997; June 11, 2003).

Additional management direction is provided for the conservation of migratory landbirds. This direction is consolidated in the Forest Service Landbird Strategic Plan and further developed through the Partners in Flight Program. The Oregon-Washington Partners in Flight Conservation Strategy for Landbirds in the Rocky Mountains of Eastern Oregon and Washington (Altman 2000) identifies priority bird species and habitats for the Blue Mountains of Oregon.

ANALYSIS METHODS

Four different scale of analysis are used in this document to analyze the effects of the treatment activities on wildlife (**See DEIS Appendix E-1**).

The four analysis areas are:

- An 88,042 acre area located around the perimeter of the Shake Table Fire Complex. This analysis area was used specifically in the Decayed Wood Advisor (DecAID) runs (See Primary Cavity Excavator Species section in this analysis).
- Shake Table Fire Complex perimeter at 14,527 acres (13,536 acres on National Forest System lands).
- TFSR Area located within the Shake Table Fire Complex perimeter at 7,783 acres. Referred to in this document as the “project area”.
- Four 6th field subwatersheds are partially located within the TFSR project area. The four subwatersheds include: Murderers-Duncan Creek (689 acres), Todd Creek (263 acres), Dry Creek (3,432 acres) and Fields Creek (3,399 acres).

The Shake Table Fire Complex has changed approximately 14,527 acres of wildlife habitat and the proposed activities will affect the trajectory of recovery of the burned area. The existing condition is described for each species, group of species, or habitat. Direct, indirect, and cumulative effects of alternatives are identified and discussed.

Management Indicator Species (MIS)

The Malheur Forest Plan, as amended, identifies 15 Management Indicator Species (MIS) and their associated habitat requirements. MIS habitat requirements are presumed to represent those of a larger group of wildlife species, and act as a barometer for the health of their various habitats. Pine marten, pileated woodpecker, and northern three-toed woodpecker represent old growth habitats, Rocky Mountain elk represent big game species, and primary cavity excavators (most woodpeckers) represent dead wood habitats. Effects to MIS species will be discussed in the Old Growth Forest, Big Game, and Primary Cavity Excavator sections respectively.

Threatened, Endangered and Sensitive (TES) 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 TFSR project Biological Evaluation for wildlife is located in the project files and provides a more detailed discussion.

Featured Species

The Malheur Forest Plan defines a featured species as a wildlife species of high public interest or demand. The featured species associated with the project area are California bighorn sheep, northern goshawk, blue grouse, and pronghorn. Effects to these species, except pronghorn, will be discussed in this section. Effects to pronghorn will be discussed as part of the Big Game Section.

Landbirds including Neotropical Migratory Birds (NTMB)

Landbirds, including neotropical migratory birds, are discussed because many species are experiencing downward population trends. Discussion can be found in the section Species of Concern – Landbirds including Neotropical Migratory Birds (NTMB).

Species presence/absence determinations were based on habitat presence, wildlife surveys, recorded wildlife sightings, observations made during fire reconnaissance, non-Forest Service databases, and status/trend and source habitat trend documented for the Interior Columbia Basin. 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. This strategy is based upon science that demonstrates connections between species populations and viability and the quantity and condition of habitat at appropriate scales of analysis (Baydack et al 1999). There is a high confidence level that species discussed in this document are either currently present in the area or were prior to the fire.

Stands within the fire area burned at varying severities which resulted in the current condition of the vegetation. Vegetation analysis and estimates of stand conditions were done using stand exam data, photo interpretation, satellite imagery, and Most-Similar-Neighbor Imputation program from within the INFORMS program (See Timber / Silviculture Section 3.1). The INFORMS, Most-Similar-Neighbor-Analysis program, extrapolated stand exam information across the 88,042 acre analysis area, to generate both pre- and post-fire vegetation information. Scripts were written to kill trees at different rates depending on burn severity. Scripts were then applied through FVS for different structural and growth stages and post-fire existing condition were generated. This data provided information for snag densities, big game cover, biophysical environment and structural stages. Field reconnaissance information, pre-fire aerial photos, post-fire satellite imagery, and Geographic Information System (GIS) databases provided additional information.

Effects on species will be determined by assessing how alternatives affect the structure and function of vegetation relative to current and historical distributions. Some wildlife habitats require a detailed analysis and discussion to determine potential effects on a particular species. Other habitats may either not be impacted or are impacted at a level which does not influence the species or their occurrence. The level of analysis depends on the existing habitat conditions, the magnitude and intensity of the proposed actions, and the risk to the resources.

Old growth habitat was analyzed through fire area reconnaissance, the District's old growth map layer, Dedicated and Replacement Old Growth surveys, and post-fire structural stage determinations made by the U.S. Forest Service Enterprise Unit T.E.A.M.S. (T.E.A.M.S.) silviculturist and wildlife biologist. Because the Shake Table Fire Complex damaged several Dedicated and Replacement Old

Growth areas, this analysis considered opportunities to relocate these management areas in unburned areas outside the fire area.

Elk habitat was evaluated using the Habitat Effectiveness Index (HEI) (Thomas et al. 1988), marginal and satisfactory cover percent, and open road densities. Cover acres were obtained from Forest GIS databases; cover percent were reduced to reflect losses due to the fire. Open road densities were calculated using the District access travel management database.

Specific analysis methods use to evaluate alternative effects on deadwood habitats will be discussed under the PCE section.

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). While the Forest has not conducted official NTMB surveys in the project area, the Oregon Breeding Bird Atlas (Adamus et al. 2001) includes observational data for this area. Much of the data for the Malheur National Forest was obtained from local biologists and ornithologists. Most NTMB species that are expected in the project area were recorded within the atlas' hexagons for the area. Based on a review of the District's wildlife database, there is a high confidence level that species discussed in this report are either currently present in the area or were prior to the fire.

Cumulative effects analyzed with respect to past, ongoing and foreseeable future activities are listed in **DEIS Appendix N**. These effects were first analyzed within the context of the project area. . If there were contributions to effects at that scale, then the analysis scale was broadened to a larger land base scale, usually the fire area or subwatershed level. Analysis area size varied by species; the specific area used is documented in each wildlife section.

Alternative 1, the No Action alternative, is required by NEPA. It is used as a benchmark to compare and describe the differences and effects between taking no action and implementing action alternatives. The No Action alternative is designed to represent the existing condition; resource conditions are then projected forward in time to estimate resource changes expected in the absence of the proposed management activities. However, if the No Action alternative is chosen, the Forest Service still maintains the discretion to adjust Dedicated and Replacement Old Growth areas, plant trees, and close roads by conducting separate environmental analyses.

The affected environment, environmental consequences of the proposed action and other alternatives, and any cumulative effects is disclosed by topic area or by each species considered.

3.5.2 OLD GROWTH FOREST

CURRENT CONDITION

Management Area 13 - Dedicated and Replacement Old Growth

Region 6 developed a network of designated habitat areas to provide blocks of old growth coniferous forest across the landscape designed to support old growth management indicator species populations and allow for dispersal of individuals. These are known as Dedicated Old Growth (DOG) areas and Replacement Old Growth (ROG) areas. Replacement areas may not have all the characteristics of old growth, but are managed to achieve those characteristics so that when a Dedicated Old Growth area no longer meets the needed habitat requirements, the replacement old growth area can take its place.

On the Malheur National Forest, these old growth blocks were designed to provide the necessary network of habitat areas for pileated woodpecker and pine marten. Although these old growth areas are managed specifically for these two species, the Forest Plan assumes the old growth network will provide habitat for many other old growth associated species as well. In addition, the three-toed woodpecker is identified as a MIS for old growth lodgepole; however, habitat on the Malheur is quite limited and few areas have been formally designated for this species and no formal surveys have been conducted. Pre-fire, the DOG and ROGs have periodically been visited to record habitat conditions and species sightings.

Pileated Woodpecker

Pileated woodpeckers prefer mature and old growth forests with at least 60 percent canopy cover (Bull and Holthausen 1993). This species relies heavily on snags and downed wood material for foraging. Nests are built in cavities excavated in large (> 21 inches DBH) dead or decadent ponderosa pine, western larch or grand fir trees. Pileated woodpeckers are not strongly associated with post-fire habitats; individuals may use a burned area for foraging, but are not expected to nest there (Bull and Holthausen 1993).

Habitat trend information derived from Interior Columbia Basin studies (Wisdom et al. 2000) indicated that about 60 percent of the watersheds in the Blue Mountains showed a decreasing trend in pileated woodpecker habitat and 30 percent showed an increasing trend. Declines in source habitat are primarily attributed to a reduction in late seral forest. Breeding Bird Survey (BBS) data indicated a 7.8 percent annual decline in populations in Oregon and Washington from 1966 through 1994 (Wisdom et al. 2000).

The Forest Plan directs that pileated woodpecker areas are to be 600 acres, composed of a 300 acre Dedicated Old Growth (DOG) area and a 300 acre feeding area (PWFA). Replacement Old Growth (ROG) areas are intended to be half the size of the DOG, i.e., about 150 acre. ROGS may overlap with the feeding areas. Pileated woodpecker DOGs were delineated Forest-wide to provide an even distribution of habitat areas, one DOG every 12,000 acres, or approximately 5 miles apart. Management requirements were derived from the US Forest Service 1986 Minimum Management Requirements.

Pine Marten

Pine martens prefer mature old growth forest with a well-developed canopy. Martens show a strong avoidance of open areas, probably as a response to predator avoidance (Hawley and Newbry 1957). Cover and prey species largely determine their distribution and abundance. Snags and downed woody material are important for winter and summer dens, resting sites, and cover for prey species. Strickland and Douglas (1987) found that marten did not use recent burns because habitat changes reduced prey populations and overhead cover. Avoidance persisted for as long as 23 years post-disturbance, generally until regenerated forests provided overhead cover.

Habitat trend information derived from Interior Columbia Basin studies (Wisdom et al. 2000) indicated that about 50 percent of the watersheds in the Blue Mountains showed a decreasing trend in marten habitat and 35 percent showed an increasing trend. The distribution of marten within the Interior Columbia Basin has been fairly stable, but population changes are not known (Wisdom et al. 2000).

The Forest Plan directs that pine marten DOGs are to be 160 acres and ROGs are to be 80 acres. Pine marten DOGs were delineated every 4,000 to 5,000 acres, or approximately 3 miles apart.

Management requirements were derived from the US Forest Service 1986 Minimum Management Requirements.

Northern Three-Toed Woodpecker

There are no designated habitat areas for northern three-toed woodpecker in the project area. This species is also a management indicator species for dead and defective habitat; Existing Condition for this species is discussed in the section below on Primary Cavity Excavator Species.

Habitat trend information derived from Interior Columbia Basin studies (Wisdom et al. 2000) indicated that about 70 percent of the watersheds in the Blue Mountains showed an increasing trend in three-toed woodpecker habitat and 30 percent showed a decreasing trend. Breeding Bird Survey (BBS) data is insufficient to determine population trends in the Interior Columbia Basin, but data summarized across the West indicates a 0.7 percent annual decline in populations from 1966 through 1994 (Wisdom et al. 2000).

Old Growth Forest within the TFSR project Area

Four DOG areas and two ROG areas as well as one pileated woodpecker feeding area, are located within the TFSR project area (**See DEIS Appendix E-2**).

Fire intensities within the old growth areas ranged from low to very high intensity. Table 77 below identifies the DOGs and ROGs within the project area, subwatersheds, total acres burned, acres burned by mortality class and post-fire structural stage.

Table 77. Dedicated and Replacement Old Growth Areas Burned within the Project Area

Old Growth Area	MIS Species	Subwatershed	Total Acres Burned within the Project area	Acres Burned by Mortality Class	Post-fire Structural Stages
DOG 12 ROG 12	Pileated Woodpecker	Dry Creek Fields Creek	196	High = 7 ac. Mod. = 54 ac. Low =115 ac Unburned = 20 ac	SI, UR
DOG 205	Pileated Woodpecker	Duncan Creek	33	High = 30 ac. Low = 3 ac.	SI, UR
DOG 207 ROG 207 PWFA	Pileated Woodpecker	Dry Creek	646	Very High = 609 ac Low = 37 ac	SI, UR
DOG 208	Pileated Woodpecker	Fields Creek	19	Mod. = 7 ac Low = 12 ac	UR

DOG = Dedicated Old Growth, ROG = Replacement Old Growth
MIS = Management Indicator Species
PWFA= Pileated Woodpecker Feeding Area
Tree Mortality Classes:
Very high Mortality = 96-100% tree mortality
High Mortality = 76-95% tree mortality
Moderate Mortality = 31-75% tree mortality
Low Mortality = 1- 30% tree mortality
SI = Stand Initiation; UR = Understory Re-initiation

T.E.A.M.S. specialists, with assistance from the Malheur NF Forest biologist, used GIS and orthophoto quads to identify potential replacement areas for DOG/ROG 012, 205, 207 and 208. Parameters used were canopy cover (>60%) within Douglas fir and grand fir stands, biophysical environment (cold moist, cool moist, warm moist and warm dry), structure stage of OFMS (Old Forest Multi-strata) and YFMS (Young Forest Multi-strata). These query selections were then overlaid with the historical harvest and pre-commercial thin layers to ensure there was no previous activity in the selected polygons.

Prairie City RD silviculturist then field verified the selected polygons. He reported that DOG 205 and 208 were still functioning and did not need replacement, but that DOG/ROG 012 and 207 were no longer functioning as old growth habitat. All reconnaissance notes and maps are located in the project file and available for review.

The selected replacement polygons for 207 and 208 were field checked and found suitable. The replacement polygon for 012 was at the time inaccessible and not field checked. However, given that the replacement polygons for 207 and 208 were found suitable, similar success was assumed for replacement polygon for 012. Verification will commence when field conditions are suitable.

Regional Forester's Eastside Forest Plans Amendment #2 (USDA 1995) amended the Forest Plan to manage late and old structure (LOS) stands within the Historic Range of Variability (HRV). Amendment #2 direction applies to LOS stands both inside and outside the DOG/ROG network. The Interior Columbia Basin Ecosystem Management Project (ICBMP) terminology used in this document is old forest single story (OFSS), or old forest multi-story (OFMS) rather than LOS.

Also according to the Regional Foresters Forest Plan Amendment #2: If late and old structure is below HRV, there should be no net loss of late and old structure. Manipulate vegetation that is not late and old structure so that it moves towards late and old structure. Where open, park-like stands occurred historically, encourage the development of large diameter trees with an open canopy structure.

Post-fire, many OFMS/OFSS stands have been converted to understory re-initiation (UR) and stand initiation (SI) structural stages. Canopy cover has been reduced below 20 percent and in many places eliminated all together. Snags resulting from the fire will provide nesting and foraging habitat for northern three-toed woodpeckers and foraging habitat for pileated woodpeckers. Pre-fire approximately 53% OFMS/OFSS of warm-dry PAG and 75% cool-moist PAG existed within the project area compared to 14% and 30%, respectively, post-fire.

Post-fire, under Alternative 2 there would be 426 acres of OFMS/OFSS treated and 367 acres treated under Alternative 3

Old Growth Connectivity

Connectivity refers to habitat between old growth areas that allows species to move between these areas. Regional Forester's Eastside Forest Plans Amendment 2 (1994) requires that connectivity corridors be established between late and old structure stands. Stands should commonly have medium diameter or larger trees (≥9 inches DBH), and canopy closure should be within the top 1/3 of site potential. Corridors should be at least 400 feet wide. If appropriate stands are not available, then the next best stands will have to provide connectivity, and should be managed to improve connectivity. Generally, connectivity corridors are maintained or managed at higher tree densities and canopy cover than adjacent areas to provide more security for dispersal or movement.

Post-fire connectivity habitat is best evaluated by viewing the fire severity map (**See DEIS Appendix A-4**). Light mortality or underburn areas and non-burn areas are currently providing the best connectivity in the area, and are likely the only stands that meet Forest Plan standards. Moderate tree mortality areas may provide some additional connectivity, but are highly fragmented in many places due to the mosaic nature of the burn. Severe tree mortality areas do not provide connectivity.

To meet connectivity requirements in RF Amendment #2, connectivity has been maintained between old growth stands immediately adjacent to the fire perimeter and the remaining OFMS/OFSS areas within the project area (including those stands that are being salvaged).

ENVIRONMENTAL CONSEQUENCES

No Action Alternative

There would be no direct effects to old growth habitats within the project area. Habitat effectiveness for old growth species would remain as described in the existing condition. The No Action alternative would have no immediate effects on pine marten, pileated woodpeckers, or their habitats. Research has shown that martens are unlikely to be present in burned areas for 20 or more years post-fire (Strickland and Douglas 1987). Pileated woodpeckers are not strongly associated with post-fire habitats; individuals may use a burned area for foraging, but are not expected to nest there (Bull and Holthausen 1993).

Under the No Action Alternative, moderately to severely burned areas would develop into old growth in about 150 to 200 years.

The No Action alternative would not designate any new DOG areas to replace those lost in the fire, creating gaps in the old growth network. The Forest Service would still maintain the discretion to adjust DOG/ROG areas outside of this DEIS in a separate environment analysis. Existing DOGs and ROGs would not meet Forest Plan standards for designated habitats, and there would be a net reduction in suitable habitat for pileated woodpecker and pine marten under the MA-13 designation.

Currently approximately 14 percent of warm-dry PAG and 30% of cool-moist PAG of the project area still remains in old growth conditions, still substantially lower than the 53 percent and 75%, respectively, that existed before the fire. Development of future old growth in the fire area is dependent on the number and size of trees that survived the fire. Future old growth would develop from stem exclusion open canopy stands (SEOC) and young forest multi-story stands (YFMS) that were lightly burned by the fire, and consequently retained many medium–sized live trees. Because old growth would develop from existing live trees, reforestation success is of little consequence in these stands. Contrarily, in the moderately to severely burned areas, old growth development *is* highly dependent on regeneration success. Under a natural regeneration scenario, it is expected that the two old growth structural stages (OFSS and OFMS) could comprise as much as 44 percent of the project area by year 2076. Although 44 % OFMS is higher than expected in the Warm-dry types, while 0 % in the OFSS is much lower than expected. The FVS modeling may have not “killed”, through inter-tree competition, enough establishing regeneration to move at lease some of these acres from OFMS to OFSS. Also, no ground fire or thinnings were modeled, which also would have resulted in a better mix between OFMS and OFSS, especially in the warm-dry PAG. For comparison purposes, it is best to consider both of these old forest types together. At 44 %, it is well within the historic range when both OFMS and OFSS are considered (See Silviculture section 3.1for more detailed analysis).

The No Action alternative would maintain existing connectivity. Although dead tree boles might provide a small amount of cover, the use of burn areas for connectivity is very limited. Light mortality or underburn areas and non-burn areas are currently providing the best connectivity in the area, and are likely the only stands that meet Forest Plan standards. In moderately and severely burned areas, connectivity habitat for species that rely on ground cover, such as pine marten, could be reestablished once snags have fallen and live trees have been reestablished. Because the No Action alternative relies on natural regeneration to reforest burned areas, recovery of this minimal level of cover could take approximately 30+ years for some animals and approximately 50 to 70 for pine marten. Although these stands may provide connectivity habitat as early as year 30 for some animals, it should be noted that conditions would still not meet connectivity definitions as defined by the Regional Forester's Eastside Forest Plans Amendment #2 (1994). Moderately and severely burned areas could take 60 to 120 years to develop into connectivity habitat as defined in Amendment #2.

The risk of an intense reburn is high with this alternative, although risks do not increase for 10 to 20 years, the time it is expected for snags to fall to the ground and elevate fuel loads beyond risk thresholds. Development of OFSS and OFMS would be further delayed if another stand replacement fire were to occur.

Alternatives #2 and #3

All action alternatives would designate new MA-13 old growth areas to replace those lost in the fire (**See DEIS Appendix E-2)** for original and new locations). The relocation of Dedicated Old Growth (DOGs) and Replacement Old Growth (ROGs) should maintain the integrity of the Forest's old growth network. The Shake Table Fire Complex has reduced the ability to maintain the old growth network at the recommended spacing, but action alternatives would maintain desired acres in MA-13. Some of the new DOGs and ROGs did increase in size based on the topology of natural features, stand boundaries or geographical features in the mapping process. A non-significant Forest Plan amendment would be required to relocate DOG/ROG 012, 207, create a new ROG 208 and change Management Area (MA) designations. The MA designations for the burned DOG and ROGs will default back to the surrounding MA designations.

Under all action alternatives, DOG/ROG/PWFA 207 would be designated outside the fire perimeter in the Dry Creek subwatershed, adjacent to the NW boundary of the project area (**See DEIS Appendix E-2)**. This old growth area burned with severe mortality of trees; few live trees remain. In the new DOG/ROG, stands are classified as old forest multiple strata (OFMS) and young forest multiple strata (YFMS). The new DOG has been increased from 367 to 377 acres and the new ROG has been increased from 162 to 190 acres to align the DOG boundary with logical stand and topographical boundaries. Although the number of large diameter trees in the YFMS stands are lower than that required for old growth classification, many of the other characteristics that define old growth (multiple canopies, snag and down wood habitat) are intact. A non-significant Forest Plan amendment would be required to relocate the new DOG/ROG/PWFA.

Under all action alternatives, DOG/ROG 012 will be relocated outside the fire perimeter to the south in the Murderers-Duncan Creek subwatershed (**See DEIS Appendix E-2).** The new DOG has been increased from 500 to 504 acres and the new ROG has been increased from 251 to 258 acres. This site provides late-seral habitat, a combination of old forest multiple strata (OFMS) and young forest multiple strata (YFMS) stands.

Under all action alternatives, a new ROG 208 (200 acres) will be created to the east of the current DOG 208 (**See DEIS Appendix E-2**). In the new ROG, stands are classified as old forest multiple strata (OFMS) and young forest multiple strata (YFMS). A non-significant Forest Plan amendment would be required to relocate the new ROG.

The new locations provide better opportunities to manage for old growth given the level of fire damage in the original location. The new DOG/ROGs are closer than Forest Plan requirements and will not meet the space requirements of 5 miles apart for pileated woodpecker designated DOG/ROGs and 3 miles apart for marten designated DOG/ROGs, although they will meet size requirements in the Forest Plan.

Table 78 summarizes changes to Dedicated and Replacement Old Growth Area Designations by Alternative.

Table 78. Dedicated and Replacement Old Growth Areas Changes by Alternative

Old Growth Area	MIS Species	Subwatershed	Alternative 1 Acres	Alternatives 2 and 3	
				Acres	Comments
DOG 012 (Existing)	Pileated Woodpecker	Dry Creek Fields Creek	500	0	DOG relocated to Dry Creek Subwatershed Currently in MA-13
ROG 012 (Existing)	Pileated Woodpecker	Dry Creek Fields Creek	251	0	ROG relocated to Dry Creek Subwatershed. Currently in MA-13
DOG 012 (New)	Pileated Woodpecker	Duncan Creek	0	504	Converted to MA-13 and overlaps with MA-20 and MA-21
ROG 012 (New)	Pileated Woodpecker	Duncan Creek	0	258	Converted to MA-13 and overlaps with MA-20 and MA-21; ROG acres also serve as PWFA to meet the minimum 300 acres requirements.
PWFA 012 (New)	Pileated Woodpecker	Duncan Creek	0	42	Located in MA-20 and MA-21
DOG 205 (Existing)	Pileated Woodpecker	Duncan Creek	400	400	DOG is still functioning; therefore, no adjustments or creation of ROG is needed under this analysis. The ROG will be designated under future analysis.
DOG 207 (Existing)	Pileated Woodpecker	Dry Creek	367	0	DOG relocated to Dry Creek Subwatershed Currently in MA-10
ROG 207 (Existing)	Pileated Woodpecker	Dry Creek	162	0	ROG relocated to Dry Creek Subwatershed Currently in MA-10
PWFA (Existing)	Pileated Woodpecker	Dry Creek	117	0	PWFA relocated to Dry Creek Subwatershed Currently in MA-10
DOG 207 (New)	Pileated Woodpecker	Dry Creek	0	377	Converted to MA-13 and overlaps with MA-4a
ROG 207 (New)	Pileated Woodpecker	Dry Creek	0	190	Converted to MA-13 and overlaps with MA-4a. ROG acres also serve as PWFA to meet the minimum 300 acres requirements.

Old Growth Area	MIS Species	Subwatershed	Alternative 1 Acres	Alternatives 2 and 3	
				Acres	Comments
PWFA 207 (New)	Pileated Woodpecker	Dry Creek	0	154	Converted to MA-1 and MA-4a
DOG 208 (Existing)	Pileated Woodpecker	Duncan Creek	350	350	DOG is still functioning
ROG 208 (New)	Pileated Woodpecker	Duncan Creek	0	100	Creation of new ROG, converts to MA-13
PWFA 208 (New)	Pileated Woodpecker	Duncan Creek	0	100	Converts to MA-1
***TOTAL**			DOG = 867 ac. ROG = 413 ac. PWFA= 117 ac	DOG = 881ac. ROG = 648 ac. PWFA = 154 ac	All DOG/ROG have MA-13 designation but may overlap with other MA's

DOG = Dedicated Old Growth, ROG = Replacement Old Growth
MIS = Management Indicator Species
MA-1 = Management Area for General Forest
MA-4a = Management Area for Big game winter range
MA-10 = Management Area for Semi-Primitive Non-motorized Recreation Area
MA-13 = Management Area for Old Growth
MA-20 = Management Area for Wildlife emphasis area (with scheduled timber harvest)
MA 21 = Management Area for Wildlife emphasis area (with non-scheduled timber harvest)
*Not including DOG 205 or 208
ROGs and PWFA may overlap

Salvage harvest and fuels reduction would not affect mature or old growth habitat in the short-term. Burned areas are no longer functioning as old growth habitat and are not likely to be used by pileated woodpecker for nesting or by pine marten for denning before forest cover is reestablished. These species may use dead wood habitats for foraging substrate, but neither has a strong association with post-burn habitats. In all alternatives, snag and woody debris guidelines would maintain habitat components for foraging (see the Primary Cavity Excavator section for addition information on foraging habitat).

Under Alternatives 2 and 3, 426 acres and 367 acres, respectively, of OFMS/OFSS are proposed for treatment within the low and moderately burned areas. See Table 79 and Table 80 for number of acres treated. Most of these areas are small and fragmented, only two of the areas, 156 acres and 89 acres, are considered large and contiguous. Both areas might be providing for both species both not at Forest Plan standards. Based on Forest Plan standards for pileated woodpecker and marten only one of the areas at 156 acres meets the habitat requirements for required territory size for marten. Due to the fragmented nature of the areas the habitat is not considered optimum.

Only dead and incidental live trees would be harvested. RF Amendment #2 permits harvesting within OFMS/OFSS as long as OFMS/OFSS is not reduced or degraded. Forest Plan standards would be maintained for snags and down logs. Within portions of units mapped as old forest structure (OFMS, OFSS) a minimum of 4 snags/acre > 21 inches in diameter at breast height (dbh), if available, would be retained after treatments.

Table 79. Alternative 2 – OFMS/OFSS acres treated

Units	INFORMS Acres (LOS) Treated	Field Verification (Non-LOS)	Total Acres of LOS (Treated)
6,7, 8, 9, 11	190	-34*	156
12	12		12
13	54		54
22, 23	165	-76*	89
25	0		0
26	0		0
27	3		3
37	4		4
47	31		31
50	19		19
80	3		3
91	0		0
93	42		42
94	13		13
Total	536	-110*	426

**Acres field verified (determined not to be LOS). Areas are either:*
- *non-forested/open areas*
- *Small inclusions of earlier successional stages (SEOC)*
- *Patches of high intensity burn (Stand Initiation)*

Table 80. Alternative 3 – OFMS/OFSS acres treated

Units	INFORMS Acres (LOS) Treated	Field Varification (Non-LOS)	Total Acres of LOS Treated
6,7, 8, 9, 11	190	-34*	156
12	12		12
13	54		54
22, 23	165	-76*	89
25	0		0
26	0		0
27	3		3
37	4		4
47	31		31
50	19		19
Total	477	-110*	367

*Acres field verified (determined not to be LOS). Areas are either:
- non-forested/open areas
- Small inclusions of earlier successional stages (SEOC)
- Patches of high intensity burn (Stand Initiation)

Planting proposed in both action alternatives would reforest moderately and severely burned areas more quickly than if no action was taken and natural regeneration was required to reforest the area. Old growth development would be accelerated. Under alternatives 2 and 3 moderately to severely burned areas would develop into old growth in about 150 years verses 150-200 years under the no action alternative. The disparity in planting trees versus natural regeneration does not become readily apparent until around 2156 when late and mature stands (YFMS, OFMS, OFSS) could comprise 85 percent of the area under the action alternatives. Eighty five percent OFMS is higher than expected in the Warm-dry types, while 0 % in the OFSS is much lower than expected (See Silviculture section 3.1). The FVS modeling may have not “killed”, through inter-tree competition, enough establishing regeneration to move at lease some of these acres from OFMS to OFSS. Also, no ground fire or thinnings were modeled, which also would have resulted in a better mix between OFMS and OFSS, especially in the warm-dry PAG. For comparison purposes, it is best to consider both of these old forest types together. At 85 %, it is actually over the historic range when both OFMS and OFSS are considered (See Silviculture section for more detailed analysis).

Stands would develop into either old forest single stratum (OFSS) or old forest multiple strata (OFMS) depending on site-specific conditions including biophysical environment, amount and rate of natural regeneration, natural disturbance, and future management activities. It is expected that the landscape would include a mosaic of both old growth types. OFSS would favor such species as the white-headed woodpecker OFMS would favor cover-dependent species such as pileated woodpecker, pine marten and northern goshawk.

All action alternatives would maintain existing connectivity by retaining all live trees except those felled to facilitate logging operations or reduce safety hazards (see existing condition section). Although standing dead trees might provide a small amount of cover, the use of burn areas for connectivity is very limited.

Future connectivity habitat would develop as described in Alternative 1 except that tree planting would accelerate habitat recovery. Marten would likely first return to sites where vegetation cover has recovered and an abundance of downed logs have accumulated; e.g., non-harvested riparian areas. In the moderately to severely burned areas, recovery of cover for dispersal of pine marten could take 30 to 50 years versus 50 to 70 years under the No Action scenario.

CUMULATIVE EFFECTS

The area considered for cumulative effects is the Todd Creek, Dry Creek, Murderers-Duncan Creek and Fields Creek subwatersheds. All of the activities in Appendix N have been considered for their cumulative effects on old growth species. Past activities such as timber harvest, road construction, fire suppression, Burned Area Emergency Response (BAER), and wildfire have combined to create the current old growth condition in the analysis area. HRV tables in the Forest Vegetation section reflect the effects of past activities on structural stage. As stated previously, OFMS in the warm and hot dry biophysical environments is generally within HRV; OFSS is below HRV. OFMS in the cool-moist biophysical environments is generally within or above HRV; and OFSS is above HRV.

The Forest's network of Dedicated Old Growth (DOGs) and Replacement Old Growth (ROGs) is being managed to maintain or develop habitat for pine marten and pileated woodpecker. Pine marten DOG 210 (352 acres) and pine marten DOG 204 (365 acres) were both destroyed within the Shake Table fire perimeter but outside of the TFSR area. Suitable habitat outside the fire area was surveyed and analyzed as future replacement areas for these two DOGs. Habitat adjacent to the southern half of the fire perimeter was analyzed and found to be suitable for future DOG and ROG replacement areas. Designating these areas will help maintain the old growth network on the forest.

The northern edge of DOG 012 burned and was not analyzed in this DEIS as it was located outside of the project area. These areas will be analyzed and relocated in a future analysis. As stated above, there are suitable areas to relocate these areas to outside the fire perimeter.

Snag and down logs habitat are important to old growth MIS. Cumulative effects to snags and down logs are discussed in the Primary Cavity Excavator section.

BAER activities (i.e. aerial seeding and mulching) were conducted soon after the fire. These activities were not conducted in old growth habitat and had no effect on old growth habitat.

Since 1993, the Forest Plan as amended, has directed the Malheur National Forest to conduct timber sales in a manner that moves stands towards OFMS and OFSS structural stages, and timber sales planned since that time should not have contributed to loss of mature and old growth forest. The Forest's firewood policy prohibits the cutting of firewood in Dedicated and Replacement Old Growth areas, so prescribed snag and downed wood levels should be maintained.

ODFW is planning on thinning 315 acres in the Bridge Creek area to enhance big game habitat and to improve forest health. This project is not in old growth so no effect is anticipated.

In the past, adjacent private lands have not been managed for old growth habitat and no change in this strategy is expected. These areas are not expected to provide OFMS or OFSS habitat.

In the short-term, the two action alternatives would not contribute to cumulative losses of mature and old growth habitat because stands treated no longer function as old growth. In the long-term, the action alternatives would contribute positively to cumulative effects by accelerating the development of old growth, and therefore, contribute positively toward the viability of species that use these habitats.

SUMMARY

Salvage harvest and fuels reduction would not affect mature or old growth habitat in the short-term. Burned areas are no longer functioning as old growth. Pileated woodpeckers and pine martens are not strongly associated with post-burn habitats. In all alternatives, snag and woody debris guidelines would maintain habitat components for foraging.

Planting proposed in both action alternatives would reforest moderately and severely burned areas more quickly than if no action was taken and natural regeneration was required to reforest the area. In the moderately to severely burned areas, old growth habitat could be recovered in 130 years versus 150+ years under the No Action alternative.

The No Action alternative would not designate any new Dedicated Old Growth stands to replace those lost in the fire, creating gaps in the old growth network. Conversely, both action alternatives would designate new old growth areas.

Alternatives 2 and 3 leave some burn areas untreated, but salvage logging and fuels reductions reduce overall fuel loads and break up the continuity of fuels remaining.

MA 13 has a net increase of 249 acres with the replacement of the new DOGs and ROGs. PWFAs do not classify as MA 13 unless they are the same acreage as a ROG.

There are no significant direct, indirect or cumulative effects to pileated woodpeckers or pine martens or their habitat from any of the alternatives.

3.5.3 BIG GAME

EXISTING CONDITION

Rocky Mountain elk, mule deer and pronghorn are the big game species of concern due to their high public value. The project area is comprised of both winter and summer range and wildlife emphasis areas. Species are considered wildly distributed across the District, Forest and the Blue Mountain Region.

This area benefits from the cooperative management of three state and Federal agencies. The Oregon Department of Fish and Wildlife (ODFW), Bureau of Land Management (BLM) and the U.S. Forest Service (USFS) have formed the Murderers Creek Coordinated Resource Area (MCCRA). The MCCRA is a total of 116,442 acres managed for the benefit of fish and wildlife. The Phillip W. Schneider Wildlife Area (PWSWA) comprises nearly 25 percent of the MCCRA, and is located on BLM and ODFW lands. ODFW manages the PWSWA primarily to provide winter habitat for mule deer and elk in the Murderers Creek big game management unit, and year-round habitat for herds of California bighorn sheep and pronghorn.

Rocky Mountain elk are identified in the Forest Plan as a management indicator species (MIS); habitat quality is evaluated in terms of forest cover, forage quality, and open road density. Pronghorn are identified in the Forest Plan as a featured species dependent on open landscapes. Pronghorn winter in the Paulina Valley, 15-25 miles southwest of the project area. The animals migrate eastwards in late March/early April with animals dispersing over large portions of the Blue Mountain and Emigrant Creek Ranger Districts. Pronghorn concentrate where large open landscapes exist, including Bear Valley, Silvies Valley and the Murderer's Creek and Fields Creek watersheds. Approximately 100-150 animals occupy the areas in and around the Shake Table fire area during the spring, summer and fall months, migrating back to the Paulina area in October/November. These animals tend toward larger, open landscapes on BLM and ODFW lands to the north and east of the project area and less soon the more forested habitats in the fire area. Pronghorn fawn locally in the spring. A small population of pronghorn resides year-round in the John Day Valley. Although the fire opened up landscapes, the high density of standing dead trees combined with an initial deficiency in forage may still preclude high use. ODFW 2004 spring surveys of pronghorn from Fall Creek to Upper McClellan Creek recorded a total of 83 pronghorn.

Two habitat components; thermal/hiding cover and forage, have been significantly reduced as a result of the fire. Many animals may have dispersed into the unburned portions of the Dry Creek, Fields Creek, Todd Creek and Murderers-Duncan Creek subwatersheds as well as other adjacent subwatersheds. Loss of habitat may concentrate more animals into adjacent areas, forcing increased competition for cover. Loss of habitat has likely affected big game distribution and use, rather than actual population numbers.

Thomas, et al. (1988), developed the Habitat Effectiveness Index (HEI) model for estimating elk habitat effectiveness on the landscape. Overall habitat effectiveness (HEcsr) incorporates three variables or indices for summer range; cover quality (HEc), size and spacing of cover (HEs) and open road density (HEr). A fourth indices, the quality and quantity of forage, is added when computing winter range (Management Area 4a) and wildlife emphasis area (Management Areas 20 and 21). The Forest Plan establishes minimum standards for these indices. In addition, the Forest Plan establishes minimum standards for retention of satisfactory cover (%S), marginal cover (%M), total cover (%S and %M), and open road density (see Table 81 to Table 83). The following tables display existing HEI values, cover and forage percent, and open road densities for each subwatershed affected by the fire.

Table 81. Existing HEI Values, Cover percent and Open Road Densities by subwatershed for summer range.

Subwatershed	HEc	HEs	HEr	HEcsr (HEI)	%S	%M	Total Cover %	Open Road Density (miles per square mile)
Forest Plan Standard	.30	.30	.40	.40	12%	5%	20%	3.2
Dry Creek	.85	.38	1	.68	21%	9%	30%	0
Fields Creek	.82	.64	.46	.62	34%	18%	52%	2.3
Todd Creek	.65	.43	1	.65	26%	59%	85%	0
Murderers-Duncan Creek	.76	.45	.25	.44	44%	40%	84%	4.4

HEI = Habitat Effectiveness Index
HEc = habitat effectiveness derived from the quality of cover
HEs = habitat effectiveness derived from the size and spacing of cover
HEr = habitat effectiveness derived from the density or roads open to vehicular traffic
%S = Satisfactory Cover
%M = Marginal Cover
% Total Cover = %S + %M

Table 82. Existing HEI Values, Cover percent and Open Road Densities by subwatershed for winter range.

Subwatershed	HEc	HEs	HEr	HEf	HEcsrf (HEI)	%S	%M	Total Cover %	Open Road Density (miles per square mile)
Forest Plan Standard	.40	.30	.50	.40	.50	10%	10%	25%	2.2
Dry Creek	.93	.31	1	.50	.61	24%	3.9%	28%	0
Fields Creek	.80	.63	.39	.50	.56	24%	15%	39%	2.9
Todd Creek	.82	.60	1	.50	.70	47%	26%	73%	0
Murderers-Duncan Creek	.80	.69	.82	.50	.69	26%	17%	40%	.34

HEI = Habitat Effectiveness Index
HEc = habitat effectiveness derived from the quality of cover
HEs = habitat effectiveness derived from the size and spacing of cover
HEr = habitat effectiveness derived from the density or roads open to vehicular traffic
HEf = habitat effectiveness derived from the quality and quantity of forage
%S = Satisfactory Cover
%M = Marginal Cover
% Total Cover = %S + %M

Table 83. Existing HEI Values, Cover percent and Open Road Densities by subwatershed for wildlife emphasis area, Management Areas 20 and 21.

Subwatershed	HEc	HEs	HEr	HEcsrf* (HEI)	%S	%M	Total Cover %	Open Road Density (miles per square mile)
Forest Plan Standard	.50	.60	.60	.70	20%	20%	40%	1.5
Dry Creek	NA	NA	NA	NA	NA	NA	NA	NA
Fields Creek	.50	.68	1	.64	0%	15%	15%	0
Todd Creek	.75	.54	.79	.63	28%	27%	55%	.40
Murderers-Duncan Creek	.79	.67	.73	.66	31%	23%	54%	.40

HEI = Habitat Effectiveness Index
HEc = habitat effectiveness derived from the quality of cover
HEs = habitat effectiveness derived from the size and spacing of cover
HEr = habitat effectiveness derived from the density or roads open to vehicular traffic
* HEf = habitat effectiveness derived from the quality and quantity of forage, use 50 for HEI calculations
%S = Satisfactory Cover
%M = Marginal Cover
% Total Cover = %S + %M

According to the indices recorded for summer range in Table 81 the quality, size and spacing of cover exceed Forest Plan standards. Despite the size of the Shake Table fire, large portions of each subwatershed remain unburned. The percentages of satisfactory and marginal cover in four watersheds exceed Forest Plan standards. Road densities in Murderer's Creek-Duncan Creek do not meet standards for HEr or open road densities. This may effect distribution of big game but will not have an overall effect on population viability, particularly, given the amount of cover remaining. The HEI is exceeded in all four watersheds.

According to the indices recorded for winter range in Table 82 the quality, size and spacing of cover exceed Forest Plan standards. The percentages of satisfactory cover in four watersheds exceed Forest Plan standards as well. The marginal cover exceeds standards in three of the four watersheds. Dry Creek falls below standards due to the high percentage of the watershed being burned under very high and high severity. Dry Creek meets HEI despite deficiency in marginal cover - compensated by the amount of satisfactory cover and low road densities. Road densities in Fields Creek do not meet standards for HEr or open road densities. This may effect distribution of big game but will not have an overall effect on population viability. The HEI is exceeded in all four watersheds.

According to the indices recorded for the wildlife emphasis area in Table 83 the quality, size and spacing of cover meet or exceed Forest Plan standards. The percentages of satisfactory and marginal cover exceed standards in two of the three subwatersheds. Fields Creek falls below Forest Plan standards, this may effect distribution of big game because of lost cover however low road densities within this subwatershed may compensate for lost of cover. Dry Creek is not reflected in this table as there were minimal amount of acres for this management area within the subwatershed.

Portions of the Todd Creek and Duncan Creek subwatersheds are in the Murderer’s Creek-Flagtail Cooperative Travel Management Area (also known as a green dot closure area). Restriction periods occur in the fall and correspond to general deer hunting season and elk hunting season. Open road densities in these tables do not reflect seasonal closures. These closures would further reduce open road density and increase HEr and HEI values. Very little of the green dot area is within this project area; although numbers would change to the benefit of big game, the change is relatively small.

Big Game Populations

Big game management on the Malheur National Forest is a cooperative effort between the Forest Service and the Oregon Department of Fish and Wildlife (ODFW) where the Forest Service manages habitat while ODFW manages populations. The agencies cooperate by managing big game according to pre-established Management Objectives (MOs) for each big game management unit (GMU). The project area is in the Murderer’s Creek Big GMU.

ODFW MOs for the Murderers Creek GMU are 1,700 elk and 9,000 deer. For 2006 population estimates for elk and deer respectively are 1,800 and 5,600 (ODFW 2006). Since 1999, elk populations for the Murderers Creek GMU have been consistently over 100% of the MO. Since 2002 deer populations within the Murderers Creek GMU have been consistently 63 percent of the MO, except in 2003 when it was 67 percent. Low percentages could possibly be attributed to increased predation, elk/deer interactions, and forage conditions.

Bull to cow ratios are influenced by a number of factors including numbers of hunters, length of hunting seasons, including the rutting period in the hunting season, lack of restrictions of antler class in harvest, lack of hiding cover, and high open road densities (Schommer and Johnson 2003). Bull to cow ratios are been variable, meeting or exceeding the MO 6 of the last 8 years. As bull/cow ratios decline below 10 bulls/100 cows, breeding dynamics within a herd also change, and there can be a corresponding reduction in cow/calf ratios (ODFW 2003).

Calf recruitment is the number of sub-adult animals added to the population each year. Recruitment levels are expressed as the number of calves per 100 cows. ODFW does not establish MOs for calf to cow ratios because the level of recruitment necessary for population maintenance varies annually depending on the rate of adult mortality. The average number of calves needed to sustain an elk population ranges between 20 to 40 calves per 100 cows, depending on the annual adult mortality. In the Murderer's Creek Management unit, calf to cow have ranged from 18 to 35.

Forage

Post-burn forage is limited, but the new sprouts are nutrient-rich and highly palatable. Forage is expected to recover rapidly. Past observations within the Summit Fire area, in the northern portion of the Blue Mountain District, deer and elk use increased as forage recovered rapidly following the 1996 fire. Improved forage increased big game reproductive rates and subsequently, has increased populations.

In the fire area, aerial seeding conducted under BAER activities, combined with natural recovery of ground vegetation will increase forage habitat.

Cover

The Malheur Forest Plan defines three levels of cover:

- *Satisfactory Cover*- For elk, a stand of coniferous trees 40 or more feet tall with an average canopy closure equal to or more than 50 percent for ponderosa pine, and 60 percent for mixed conifer. Satisfactory cover typically exists as a multi-storied stand and will meet elk hiding cover criteria.

- *Marginal Cover*- For elk, a stand of coniferous trees 10 or more feet tall, with an average canopy closure equal to or more than 40 percent.

- *Hiding Cover*- Vegetation capable of hiding 90 percent of a standing adult deer or elk from human view at 200 feet.

A moderate amount of marginal or satisfactory cover remains within the fire perimeter. Some patches exist where the fire burned at low severity, but doubtful that many interior stands meet the minimum 40 percent canopy closure due to the high and very high fire severity. Deer and elk are believed to use thermal cover (satisfactory and marginal cover) to reduce the effects of weather and temperature extremes and to hide from predators. Table 82, winter range, the marginal cover within the Dry Creek subwatershed, is the only one that doesn't meet Forest Plan standards. In wildlife emphasis management area, (Table 83) the indices show that nearly all of the cover within the Dry Creek subwatershed was eliminated by the fire, the subwatershed does not meet Forest Plan cover or HEI standards. Conversely, within the summer range (Table 81) all four subwatersheds exceed the satisfactory and marginal cover for Forest Plan standards and HEI standards. Table 81 shows that Fields Creek does not meet Forest Plan standards for satisfactory or marginal cover. This may effect distribution of big game because of lost cover however low road densities within this subwatershed may compensate for lost of cover.

It is important to note that recent research at the Starkey Experimental Station in La Grande, Oregon (Cook 1998) has raised the concern that resource managers may be overstating the importance of thermal cover, i.e., marginal and satisfactory cover, on elk condition. Studies suggest that the energetic benefits of thermal cover may be inconsequential to elk performance, and that it is forage or nutritional effects that may have the greater impact on individual animal performance. However, these studies do not dispute elk's preference for dense forest stands or the numerous studies that show elk using dense stands disproportionately to their availability. Dense conifer cover contributes to better distribution of elk across available habitat, and may be more of a disturbance/hiding cover issue than a thermal regulation issue.

Post-fire, very little hiding cover exists within the fire perimeter. Hiding cover provides a visual barrier between big game animals and disturbance sources. This is especially important during hunting season when big game animals alter their travel patterns to avoid humans. Dead tree boles might offer some security, but only where snag densities are high, and even then it is of limited value compared to a similar live, green tree situation.

Oregon Department of Fish and Wildlife Biologist (Miller, ODFW biologist, personal communication 2007) concluded that Shake Table Fire at 14,537 acres could affect big game use and distribution, but was unlikely large enough to affect population numbers. Due to project area closure, areas west of the project area will have reduced access to hunters during logging, also helping to mitigate effects. Although the fire greatly reduced security cover, the surrounding unburned areas provide sufficient cover to meet habitat needs. Elk and deer will likely forage in the burn area, primarily during the night, and retreat to security areas during the day. During the hunting season, elevated human use and hunting pressure in the cover-deficient burn area will likely force animals into adjacent unburned areas.

Roads

No new roads will be built under any alternative including the no action. All roads were temporarily closed within the fire perimeter both during and immediately following the fire to ensure public safety. Certain roads will be temporarily opened for harvest and reforestation activities, then immediately closed upon completion of the project.

The reopening of approximately 11.9 miles of closed maintenance level 1 system roads for salvage harvest would nominally cause about 432 acres of disturbance to big game (150 feet on each side of road). However, since virtually all the road length is within the burn area, re-opening is not expected to disrupt big game distribution since animals will move out during the day due to lack of hiding cover.

The greatest potential for impact is during the hunting seasons, when hunter traffic, and the associated "stimulus" associated with those activities is at the highest level. Portions of the Todd and Murderers-Duncan Creek subwatersheds are in the Murderer's Creek-Flagtail Cooperative Travel Management Area (also known as a green dot closure area). Restriction periods further reduce traffic in the fall and correspond to general deer and elk hunting seasons. Open road densities the above tables do not reflect seasonal closures. These closures would further reduce open road density and increase HEr and HEI values. Very little of the green dot area is within this project area; although numbers would change to the benefit of big game, the change is relatively small.

Perhaps more important than the impacts of road densities upon elk habit use and selection is the spatial relationships of those roads. Recent studies at the Starkey Experimental Station analyzed road distribution and its impacts on elk habitat use (Rowland et al. 2001 and Wisdom et al. 1998). Researchers found a strong correlation between road activity and habitat selection. Roads that averaged as little as one vehicle per 12-hour period were affecting habitat selection out to 1,000 meters or more. Elk were increasingly found in areas further away from open roads, while those areas with many roads and limited distances between roads received very limited use. Conversely, mule deer responded to the distribution of elk by avoiding areas of high elk density. This behavioral pattern put mule deer closer to roads. The mule deer showed strong preference for cover habitat, especially in the first few hundred feet of an open road.

ENVIRONMENTAL CONSEQUENCES

No Action Alternative

Forage is expected to recover rapidly. Plants tend to sprout vigorously from the roots if the above ground portions are killed by fire, although it may take 2 to 5 years for grasses, sedges and forbs to return to their pre-fire abundance and volume. Shrub recovery may take 2 to 15 years. Fire can also increase nutrient content and palatability of forage, although the increased quantity of forage after a fire may be more significant than the increased quality of that forage (USDA 2000). As stated in the existing condition section, elk and deer will likely forage in the burn area during the night and retreat to security areas during the day.

Most of the fire-killed trees are expected to be on the ground within 10 to 20 years. Large concentrations of down woody material could impede big game movements (Thomas et al., 1979, Thomas and Toweill 1982). Consequently, the highest use of the area may be in the first 10 years, after forage has redeveloped and before many of the trees have fallen.

Historically, most of the subwatershed was shaped by frequent, low intensity fires, which reduce fuel levels and encouraged the growth of more succulent forage, ultimately benefiting pronghorn, deer and elk.

The fire destroyed a moderate amount of the marginal, satisfactory and hiding cover. Alternative 1 would not further reduce cover. Development of new cover would depend on natural regeneration. In the severely burned areas, recovery of hiding cover (tree vegetation) may take 50 to 70 years. Marginal cover would take 70 to 90 years to develop; satisfactory cover would likely take 90 to 120 years. Dead tree boles might offer some hiding cover, but only where snag densities are high, and even then it is of limited value compared to a similar live, green tree situation. Most of the small diameter trees will be on the ground in 10 years, so what does exist is short-lived.

Optimum calving and fawning habitat includes a combination of thermal cover, hiding cover, and quality forage located in close proximity to water. Habitat is provided primarily within riparian areas where high quality, succulent vegetation and water are readily available. Down trees can provide some security for calving and fawning. Salvage logging is not planned in riparian areas, although hazard trees may be felled. As snags fall and vegetation recovers, riparian areas are likely to become ideal for calving and fawning.

Open road densities would remain in excess of Forest Plan standards in the Murderers-Duncan Creek subwatershed – summer range (Table 81); and Field Creek subwatershed – winter range (Table 82. High open road densities reduce security and increase the potential for disturbance, especially given the lack of hiding cover. During the hunting seasons, elevated human use and hunting pressure in the cover-deficient burn area will likely force animals into adjacent unburned areas.

Alternatives #2 and #3

As described under the No Action alternative, deer and elk use will increase as grasses, forbs and shrubs recover. Elk and deer will primarily forage in the burn area during the night and retreat to security areas during the day. In Alternatives 2, and 3, salvage activities may result in a delayed or slower rate of response for some forage species; however, forage production is still expected to be high. Prescribed reforestation is planned at spacing designed to allow the trees room to grow without needing precommercial thinning to maintain adequate growth rates. This spacing should provide foraging habitat. Much of the burn area would be available for high quality forage until tree canopy recovers and begins to limit the development of ground vegetation.

Although deer population numbers have been below management objectives it is not anticipated that project objectives will cause further decline in population viability.

Salvage of dead and dying trees would not directly impact remaining marginal and satisfactory cover, as only fire-killed trees would be salvaged. Only incidental removal of green trees would be needed to facilitate logging. Logging would not have a significant effect on hiding cover. Dead tree boles offer little security and what cover currently remains would be on the ground in 10 years. It is likely that many individual animals have already been displaced by the fire and are using surrounding areas for security habitat.

Planting would accelerate reforestation, allowing hiding cover and thermal cover to develop sooner than under a natural reforestation scenario. In the severe burn areas, recovery of hiding cover would take 20 to 40 years. Marginal cover would develop in about 50 years and satisfactory cover would likely take 80 years to develop.

Optimum calving and fawning habitat includes a combination of thermal cover, hiding cover, and quality forage located in close proximity to water. Habitat is provided primarily within riparian areas where high quality, succulent vegetation and water are readily available. Down trees can provide some security for calving and fawning. Salvage logging is not planned in riparian areas, although danger trees may be felled. As snags fall and vegetation recovers, riparian areas are likely to become ideal for calving and fawning.

Under Alternatives 2 and 3, salvage would reduce the potential for excessive build up of fuels in 10 to 20 years as snags fall. Salvage would permit the use of prescribed fire in the future to maintain low fuel loads and encourage the growth of more succulent forage, ultimately benefiting pronghorn, deer and elk.

In the Todd Creek and Duncan Creek Subwatersheds, the Murderer’s Creek-Flagtail Cooperative Travel Management Area (also known as a green dot closure area) requires additional closures during the general deer and elk hunting seasons. These seasonal closures will be waived during salvage logging to expedite harvest. Seasonal area closure is expected for one to two seasons. Disturbance during logging foregoing the seasonal restriction and opening up roads that would have been closured probably effect distribution but no populations is expected to be minimal as animals are already expected to move out of the fire area during the day due to the lack of hiding cover.

Forest Plan Standard #2, LRMP IV-69, prohibits management activities from December 1 to April 30 in winter range. This requirement is to restrict activities that disturb wintering big game in a significant and prolong manner. Due to the timing of proposed harvest operations this requirement would be amended to allow for project completion to be expedited. Seasonal area closure is expected for one to two seasons. Disturbance during logging is expected to be minimal as animals are already expected to move out of the fire area during the day due to the lack of hiding cover. In addition, the table displays habitat effectiveness for open road densities (HEr) and overall habitat effectiveness (HEI). All alternatives, maintain existing cover.

Re-closing roads after the project is complete would reduce the potential for human disturbance to big game, resulting in greater use of available habitat, less unnecessary energy expenditure, and greater escapement from hunters. This would positively affect big game habitat and other species that prefer low human disturbance, particularly given the high loss of hiding cover from the fire.

CUMULATIVE EFFECTS

The area considered for cumulative effects is the Todd Creek, Dry Creek, Murderers-Duncan Creek and Fields Creek subwatersheds. All of the activities in Appendix N have been considered for their cumulative effects on big game species and habitat. Past activities such as timber harvest, road construction, fire suppression and wildfire have combined to create the current big game condition in the analysis area.

Past activities are reflected in the HEI, cover and road density values described at the beginning of this section.

In Table 81 to Table 83, cover, road density, and habitat effectiveness values reflect the effects of the fire as well as past timber management and access management activities. Additional planned projects in **DEIS Appendix N** are not expected to change these values in the short-term.

The action alternatives would cause short term effects to big game by opening roads to complete the project and therefore further increasing big game disturbance. When area access is restricted following project implementation, to pre-fire closure levels, disturbance in the burn area would decrease.

Adjacent private lands have already been salvage logged. Reforestation is required where commercial timber harvest has occurred and the land is left under-stocked. Future timber and access management activities have yet to be proposed for the unburned areas of the affected subwatersheds. Since the Thorn Recovery Project is expected to have few negative effects on big game habitat in the short-term, and since future activities will be designed with recognition of habitat losses due to the fire, adverse cumulative effects to big game are expected to be incidental regardless of the alternative selected.

Aerial seeding from BAER activities combined with natural recovery of ground vegetation will increase forage habitat.

Murderers Creek Wild Horse Territory- Monitoring indicated very limited use of the Shake Table Fire area pre-fire. The fire area has damaged fences within the territory which may change horse access and movement. Forage conditions have changed within the Shake Table Fire area for wild horses. Approximately 436 horses were counted in 2006 with an estimated recruitment rate of 30% and a mild winter, there may be as many as 566 horses in 2007. It has been estimated that 500 horses could be removed over the next 3 to 4 years. It is also anticipated that the removal within the Shake Table Fire Area will be a priority.

Livestock grazing would be delayed until vegetation has recovered according to the range design features (see Table 23 under Range). When livestock grazing is re-initiated, grazing will be management to meet forest plan standards. Grazing standards have been established at levels to provide sufficient forage to support both wildlife and domestic ungulate use.

Elk population census data for the Murderer's Creek Management Unit indicates a stable, level, population trend (Table 77, 78 and 79). It appears that past forest management has not been detrimental to elk populations in this management unit. It is not anticipated that planned activities in this alternative would cause a decline in elk populations either. However, it will likely cause a redistribution of animals across the landscape. Although deer population numbers have been below management objectives it is not anticipated that project objectives will cause further decline in population viability.

The combined effects of the TFSR project with the effects of past, present, and reasonably foreseeable future activities would not be expected to adversely affect populations or viability of big game species within the analysis area.

SUMMARY

The primary differences in alternatives relate to cover recovery, road closures, and build-up of down logs and future fuel loads. Under both the No Action and Action alternatives, overall habitat effectiveness for deer and elk would be expected to improve over time as cover develops. Population numbers are expected to remain stable; distribution and use may change initially as a result of improved forage, reduced cover and logging disturbance.

Under the action alternatives, planting would accelerate reforestation, allowing hiding cover and thermal cover to develop sooner than under a natural reforestation scenario. In the severe burn areas, recovery of hiding cover would take 20 to 40 years versus 50 to 70 years under the No Action scenario. Marginal cover would develop in about 50 years versus 70 to 90 years under the No Action alternative. Satisfactory cover would likely take 80 years to develop versus 90 to 120 years under the No Action alternative.

Cooperative Travel Management Area (also known as a green dot closure area) requires additional closures during the general deer and elk hunting seasons. These seasonal closures will be waived during salvage logging to expedite harvest. Seasonal area closure is expected for one to two seasons. Disturbance during logging foregoing the seasonal restriction and opening up roads that would have been closured probably effect distribution but no populations is expected to be minimal as animals are already expected to move out of the fire area during the day due to the lack of hiding cover.

Forest Plan Standard #2, LRMP IV-69, prohibits management activities from December 1 to April 30 in winter range. This requirement is to restrict activities that disturb wintering big game in a significant and prolong manner. Due to the timing of proposed harvest operations this requirement would be amended to allow for project completion to be expedited. Seasonal area closure is expected for one to two seasons. Disturbance during logging is expected to be minimal as animals are already expected to move out of the fire area during the day due to the lack of hiding cover. In addition, the table displays habitat effectiveness for open road densities (HEr) and overall habitat effectiveness (HEI). All alternatives, maintain existing cover.

The action alternatives would cause short term effects to big game by opening roads to complete the project and therefore further increasing big game disturbance. When area access is restored following project implementation, hunting, firewood cutting, and other Forest uses are expected to increase in the burn area. In addition, off road vehicle (ORV) use could induce greater big game disturbance, particularly given the loss of hiding cover.

Salvage logging reduces the future build-up of down logs that could impede big game movements and elevate risk of a future re-burn. Under Alternative 1, big game use in the area would likely increase in the first 10 years in response to the flush in forage; after 10 years, use would decrease as high concentrations of downed trees limits big game. Alternative 1 does not remove any trees; future fuel loads would be in excess of risk thresholds. In Alternatives 2 and 3, salvage reduces the future build-up of down to the benefit of big game.

3.5.4 PRIMARY CAVITY EXCAVATOR SPECIES

EXISTING CONDITION

Dead wood includes standing dead trees or "snags" and down wood or logs. Bird and mammal species rely on dead wood for dens, nest, 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.

The Forest Plan identifies 11 primary cavity excavators as management indicator species (MIS) for the availability and quality of dead and defective wood habitat: black-backed woodpecker, three-toed woodpecker, Lewis' woodpecker, white-headed woodpecker, pileated woodpecker, downy woodpecker, hairy woodpecker, northern flicker, Williamson's sapsucker, red-breasted sapsucker and yellow-bellied sapsucker. The red-breasted and yellow-bellied sapsuckers were formerly classified with the red-naped sapsucker. Neither the red-breasted or yellow-bellied sapsucker are known to occur in eastern Oregon; the red-naped sapsucker does occur throughout the area and will be used as a substitute MIS in this discussion.

Habitat trend information derived from Interior Columbia Basin studies (Wisdom et al. 2000) was reviewed. Habitat trends vary across the Blue Mountains with some watersheds experiencing increased habitat and others decreased habitats, but overall, the trend is towards a loss of habitat. Population trends for these species do no reflect the loss of habitats, with only the pileated woodpecker showing large declines (Wisdom et al. 2000).

Primary cavity excavators use burned forest habitats and green forest habitats differently. Fire-hardened snags and non-fire hardened snags or soft snags provide different niches for various woodpecker species. Snag habitats in post-fire environments are unique for several reasons: 1) early post-fire forests and associated insect outbreaks result in a rapid increase in nest sites and food supplies, 2) initially, most of the new snags are "hard" snags consisting of sound sapwood that may delay use by species that prefer "soft" snags, 3) many woodpecker species appear to respond positively to burned habitats, with some species using them as source habitats, and 4) fires leave few or no green trees for future snag replacements.

Most cavity nesting birds benefit from high fire mortality and high post-fire snag density (Hutto 1995, Saab and Dudley 2005, Hutto 2006). Many cavity nesting birds exhibit marked increase in abundance after the occurrence of stand replacing fires (Raphael and White 1984, Hutto 1995, Saab and Dudley 2005, Hutto 2006). The most dramatic increases are for species that are timber drillers and aerial foragers. Bark beetles and wood-boring beetles are key prey species for many woodpeckers, and often colonize fire-killed or injured trees in high densities. Although temporary, stand-replacement fires create a rich and concentrated foraging resource in areas where nest site potential also increases. It is thought that many cavity-nesting species are dependent upon both the spatial and temporal occurrence of severe burns to maintain their populations (Hutto 1995, Hutto 2006).

Black-backed woodpecker, three-toed woodpecker, hairy woodpecker, Lewis' woodpecker, and northern flicker are strongly associated with post-fire habitats, particularly, stand-replacement events. White-headed woodpecker and Williamson's sapsucker prefer mixed fire mortality conditions associated with light intensity burns. Pileated woodpeckers, downy woodpeckers and red-naped sapsuckers have much lower associations with post-fire habitats (Saab and Dudley 1997, Hutto 1995, Sallabanks 1995). Many of the species that use dead wood habitat are secondary cavity users, such as the western bluebird and mountain bluebird, which depend on primary cavity nesters to excavate cavities for their use. By addressing available habitat and effects to primary cavity excavators, it is expected that habitat for secondary cavity users will be provided.

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 proposed salvage units, the Shake Table fire area (13,356 acres) and the Murderers Creek-Fields Creek analysis area (88,042 acres). See Table 84 below. The Shake Table Fire area is located within the larger Murderers Creek-Fields Creek analysis area. Direct/indirect effects of the proposed actions will be evaluated at the stand/unit level and the fire area level. Cumulative effects will be analyzed for the Thorn analysis area.

There are two broad forested habitat types found in the fire area: the Ponderosa Pine/Douglas-fir (PP/DF) habitat type and the Eastside Mixed Conifer Blue Mountains (EMC) habitat type.

- The Ponderosa Pine/Douglas-fir habitat is equivalent to the warm-dry PAG and consists of ponderosa pine with Douglas-fir and grand fir. Generally, dry upland forest habitat is at low elevations, flat dry ridges, and south facing slopes. The PP/DF habitat type comprises about 11,045 acres of the Shake Table fire area and 75,145 acres of the Murderers Creek-Fields Creek analysis area.
- The Eastside Mixed Conifer habitat includes cool-moist PAGs, 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. The EMC habitat type comprises about 1,134 acres of the Shake Table fire area and 5,166 acres of the Murderers Creek-Fields Creek analysis area.

Table 84. Acres by Habitat Type for Shake Table Fire Area and Murderers Creek-Fields Creek Analysis Area

Habitat Type	Shake Table Fire Area	Murderers Creek – Fields Creek Analysis Area
Ponderosa Pine/Douglas-fir (PP/DF) Habitat Type	11,045	75,145
Eastside Mixed Conifer (EMC) Habitat Type	1,134	5,166
Non-Forested Acres	1,357	7,731
Total Acres	13,536	88,042

Snag estimates were derived using photo interpretation, satellite imagery, stand exam data, and Most-Similar-Neighbor Imputation program from within the INFORMS program (see Silviculture Section 3.1). The INFORMS, Most-Similar-Neighbor-Analysis program was used to extrapolate stand exam information across the 88,042-acre analysis area to generate pre-fire vegetation information. To estimate post-fire snag levels, scripts were applied to the fire area to model tree mortality based on burn severity. The Forest Vegetation Simulator (FVS) used the modified stand exam data to estimate snag levels both inside and outside the fire area and to project snag levels into the future.

MANAGEMENT DIRECTION AND ANALYSIS METHODS FOR DEAD WOOD HABITATS

The Forest Plan, as amended by Regional Forester Eastside Forest Plans Amendment #2, provides standards for retention of snags and down logs. This Amendment directed Forests to manage snags at the 100 percent population potential and to use the best available science to determine actual numbers. The Forest Plan, as amended, requires that an average 2.39 snags per acre, 21 inches DBH and greater, be retained. Amended standards for down logs are as follows: 20-40 lineal feet per acre for ponderosa pine types, 100-140 lineal feet for mixed conifer types, and 120-160 linear feet for lodgepole pine types. It is assumed that these snag and down log levels will provide the minimum level required for 100 percent of potential population levels of primary cavity excavators (LRMP 1990, Thomas 1979).

Overall, the fire area has snags well in excess of Forest Plan standards; conversely, down logs, are likely well below standards because of the high proportion of high and very high severity burn within the project area, a situation that will quickly be rectified as snags begin to fall. There are currently no specific snag retention standards for burned forest. In general, higher levels of snags have been retained in fire areas than the minimums required by the Forest Plan.

Decayed Wood Advisor (DecAID)

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 and down wood. DecAID is a summary, synthesis, and integration of published scientific literature, research data, forest inventory databases, wildlife databases, and expert judgment and experience. The Forest Plan guidance refers to “the best available science.” For deadwood MIS, DecAID is considered the best source and synthesis of available science (Mellen et al. 2006).

DecAID contains two major data sets: *vegetation inventory data* or snags and down wood data and *wildlife use data*. Vegetation data collected across the region is used to characterize natural forest conditions, and wildlife data is used to characterize habitat use by species. The following sections will describe these data sets in more detail and use them to evaluate effects of management activities on dead wood habitats and their associated species.

Vegetation Inventory Data

The inventory data is composed of statistical summaries of forest inventory data on snags and down wood in unharvested forests and entire landscapes across Oregon and Washington. Unharvested inventory data in DecAID is used to represent a "natural" or "reference" condition for snag and down wood levels.

Caution should be used 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 historical dead wood densities, and therefore, are appropriate to use in this analysis. Until new information becomes accessible, DecAID vegetation data provides current empirical data for dead wood evaluations. The reference condition presented in DecAID will be used to compare alternatives and evaluate effects.

In Table 85, comparison of inventory data will focus on the ponderosa pine/Douglas-fir habitat type. The table compares snag distributions in DecAID to snag distributions in the Shake Table fire area (11,045 acres) and in the Murderers Creek-Fields Creek analysis area (75,545 acres). The Eastside Mixed Conifer habitat, i.e., moist forest type, is much rarer on the Blue Mountain Ranger District. The Shake Table fire area includes only 1,134 acres and the Thorn analysis area includes only 5,166 acres. In order to use the inventory data in the Eastside Mixed Conifer habitat type in DecAID, the analysis area would need to be expanded to a much larger area (likely over 250,000 acres). Due to the need for expediency, the Decision Maker decided to forgo analysis area expansion and instead drop salvage proposals in the moist forest types, except to fell danger trees along existing roads.

The first half of Table 85 displays snag distribution for snags greater than 10 inches dbh. The second half of the table displays snag distribution for snags greater than 20 inches dbh. Snag levels are displayed by density group (e.g., density group 1 has 0-4 snags per acre). Percentages reflect the proportion of the forested acres in the Ponderosa Pine/Douglas-fir habitat type (75,145 acres) that have the specified snag densities (e.g., 58% percent of the forested acres in the fire area have snag densities in excess of 36 snags per acre).

Table 85. Post-fire Snag Densities for the Shake Table Fire Area (11,045 acres) and Murderers Creek-Fields Creek (MC-FC) Analysis Area (75,145 acres) by Density Group (Snags/Acre). PP/DF Wildlife Habitat Type = Dry Forest Types. DecAID Distribution (Mellen et al. 2006) is provided as a reference condition.

Density Group Code	Snags/Acre	DecAID Snag Distribution - Percent of Landscape	Existing Condition - Percent of Shake Table Fire Area (11,045 acres)	Existing Condition Percent of MC-FC Analysis Area (75,545 acres)
Snags equal to or greater than 10" DBH				
1	0-4	78	0.6	24.8
2	4-8	7	1.7	21.6
3	8-12	10	5.9	15.8
4	12-16	3	5.9	10.7
5	16-20	0	3.0	5.0
6	20-24	1	7.9	4.0
7	24-28	0	9.6	3.7
8	28-32	0	2.9	2.1
9	32-36	1	4.5	2.7
10	> 36	0	58.0	9.8
		100%	100%	100%

Density Group Code	Snags/Acre	DecAID Snag Distribution - Percent of Landscape	Existing Condition - Percent of Shake Table Fire Area (11,045 acres)	Existing Condition Percent of MC-FC Analysis Area (75,545 acres)
Snags equal to or greater than 20” DBH				
1	0-2	80	24.2	63.0
2	2-4	15	20.4	15.9
3	4-6	3	7.3	8.2
4	6-8	0	5.0	3.5
5	8-10	1	5.7	2.8
6	10-12	0.5	2.0	0.7
7	12-14	0	3.0	1.0
8	14-16	0.5	3.9	0.6
9	16 –18	0	5.4	0.8
10	>18	0	23.1	3.4
		100%	100%	100%
DecAID provides HRV distribution for snags based on Regional CVS plots. Data (see below) suggests that the high snag density classes exceed HRV, confirming potential for salvage.				

The snag distribution for the Shake Table fire provides a good snapshot of post-fire snag densities. The fire caused moderate to high tree mortality over much of area. Over 82% of the fire area (snags 10+” dbh; snag categories 6 – 10) has snag densities exceeding 20 snags per acre; 58% of the fire area (category 10) has snag densities exceeding 36 snags per acre.

The snag distribution for the Murderers Creek-Fields Creek analysis is a good indicator of departure from the reference condition. When the analysis area is expanded to 75,545 acres, the percentage of the landscape in Category 10, snag densities > 36 snags per acre, comprises 9.8 % of the area compared to 0% for the DecAID distribution. Note that the percentage of the landscape with the highest snag densities decreases from 58% for the Shake Table fire area to 9.8% for the MC-FC analysis area; this is to be expected because the expanded analysis area includes both burned stands within the fire area and unburned stands outside the fire area.

A similar comparison indicates that the portion of the landscape with low snag densities (Category 1, snag densities 0-4 snags per acre) comprises <1% of the fire area and 24.8% of the MC-FC area, far less than the reference condition of 78%.

The large diameter snag densities (snags 20” dbh and greater) show a similar situation, but the disparity between the DecAID reference condition and the existing condition is noticeably reduced.

This comparison suggests that because of the fire, the PP/DF habitat type may be providing far more habitat for cavity excavator species than is typical for this habitat type.

The EMC habitat type comprises 1,134 acres of the Shake Table Fire area. The majority of this habitat type burned moderately to severely. Snag level ranges from 2 to 400 snags per acre with 97% of the habitat supporting 20 snags per acre or greater. These snag densities may or may not exceed HRV; as stated previously, we are unable to compare the existing snag distribution against the DecAID snag distribution due to the relatively small number of acres in this habitat type. Our data does confirm that snag densities are high and would provide for increased use by cavity excavators.

DecAID Wildlife Data

The *wildlife use data* is derived from a thorough review of published literature and other available data on wildlife use of snags and down wood, primarily in Oregon and Washington. Most of the data collected is for bird species, primarily cavity nesters such as woodpeckers. The data allows the user to relate the abundance of dead wood habitat for both snags and down wood to the frequency of occurrence of selected wildlife species. The information presented on wildlife species use of snags and down wood is based entirely on scientific field research, and does not rely on modeling the biological potential of wildlife populations.

The wildlife data in DecAID is provided in the form of tolerance levels of 30 percent, 50 percent, or 80 percent. The tolerance level is defined as the "estimates of the percent of all individuals in the population that are within some specified range of values" (Mellen et al. 2006). For example, wildlife data in DecAID provides the following tolerance levels for black-backed woodpeckers in post-fire conditions:

Snag density (>10"dbh) for black-backed woodpeckers:

- 30% tolerance level = 57 snags/acre
- 50% tolerance level = 82 snags/acre
- 80% tolerance level = 119 snags/acre

This data can be interpreted as follows:

- Areas with <57 snags/acre would be expected to be used for nesting by only 30% of the individuals within the population of black-backed woodpeckers, and conversely 70% of the population would be expected to nest in areas with ≥57 snags/acre.
- Half the individuals within the population would be expected to nest in areas with <82 snags/acre and the other half would be expected to nest in areas with ≥82 snags/acre.
- 80% of the individuals within the population of black-backed woodpeckers would be expected to nest in areas with <126 snags/acre and conversely 20% of the population would be expected to nest in areas with ≥126 snags/acre.

Snag density, size and distribution influence use levels and vary by individual species. For example, post-fire data in DecAID suggests that Lewis' woodpecker would need 62+ snags/acre to meet the 80 percent tolerance level, whereas black-backed woodpeckers would need 119+ snags/acre.

DecAID is not a viability model, and thus tolerance levels should not be interpreted as population viability "thresholds". Rather, DecAID tolerance levels "may be interpreted as three levels of "assurance": low (30% tolerance level), moderate (50% tolerance level), and high (80% tolerance level)" (Mellen et al. 2006). The higher the tolerance level, the higher the "assurance" that snag habitat is being provided.

DecAID suggests that snag level and down log levels for some primary cavity excavators may need to be higher than the levels based on 100 percent of biological potential population models. Post-fire habitats may need to provide much higher levels of snags than live, unburned forests to support use by primary cavity excavators.

Table 86 and Table 87 provide estimates of available habitat for Forest Plan MIS species as a percentage of the Shake Table fire area. Table 86 displays habitat for the Ponderosa Pine/Douglas-fir habitat type; Table 87 displays habitat for the Eastside Mixed Conifer (Blue Mountains) habitat type. Calculations are based on forested acres and exclude acres unsuitable as forestlands, i.e., acres that do not support trees or snags.

Habitat is displayed by tolerance interval obtained from the post-fire wildlife data found in DecAID. Values are displayed for seven species that the Forest Plan identifies as Management Indicator

Species (MIS). For the remaining MIS in the Forest Plan, DecAID does not provide wildlife use information for post-fire habitats; discussions will be more qualitative than quantitative.

Generally, Table 86 and Table 87 indicate that the Eastside Mixed Conifer wildlife habitat type may support higher levels of use than the Ponderosa Pine/Douglas-fir wildlife habitat type (i.e., percentages of the landscape meeting the 80% tolerance level are higher). This is likely a function of site productivity; these drier sites are less likely to support the same tree densities, and thus the same snag densities, as the Eastside Mixed Conifer habitat type.

The primary study used to assess wildlife use of post-fire habitat was Saab and Dudley (1998). These data are from habitat fairly similar to conditions found in the Shake Table fire area. However, there were more areas of very high snag density in the Saab and Dudley (1998) study than found in the fire area.

Table 86. Post-fire Habitat In Ponderosa Pine/Douglas-fir (PP/DF) Habitat Type for Shake Table Fire Area (11,045 acres). Information is displayed by wildlife tolerance level based on snag density and size data in DecAID.

Species	Percentage of total forested habitat in Shake Table Fire area by Tolerance Level. PP/DF Habitat Type (11,045 ac).*			
	<30% Tolerance Level	*30% Tolerance Level*	*50% Tolerance Level*	*80% Tolerance Level*
	Dry	*Dry*	*Dry*	*Dry*
Black-backed Woodpecker	52%	11%	31%	6%
Hairy Woodpecker	45%	9%	31%	15%
Lewis' Woodpecker	26%	30%	18%	26%
Northern Flicker	40%	37%	23%	0%
White-headed Woodpecker	17%	33%	32%	18%
Three-toed Woodpecker**	45%	10%	37%	8%
Williamson's Sapsucker**	5%	29%	16%	50%

*Based on DecAID Woodpecker Use Data: Wildlife Habitat Type = Ponderosa Pine/Douglas-fir; Structural Condition = Post-fire Habitats. DecAID Table PPDF_PF.sp-23.
**For three-toed woodpecker and Williamson's sapsucker, DecAID provides species use levels for snag densities greater than 3" dbh. For the TFSR project, data was available only for snags 10" dbh and greater; therefore, values in this table under-represent the level of habitat available at the higher tolerance levels.

Table 87. Post-fire Habitat In Eastside Mixed Conifer (Blue Mountain) Habitat Type for Shake Table Fire Area (1,134 acres). Information is displayed by wildlife tolerance level based on snag density and size data in DecAID.

Species	**Percentage of total forested habitat in Thorn Fire area by Tolerance Level. EMC Habitat Type (1,134 acres).***			
	<30% Tolerance Level	***30% Tolerance Level***	***50% Tolerance Level***	***80% Tolerance Level***
	Moist	***Moist***	***Moist***	***Moist***
Black-backed Woodpecker	24%	11%	9%	56%
Hairy Woodpecker	24%	5%	14%	57%
Lewis' Woodpecker	3%	21%	30%	46%
Northern Flicker	3%	47%	50%	0%
White-headed Woodpecker	3%	21%	19%	57%
Three-toed Woodpecker**	24%	5%	15%	56%
Williamson's Sapsucker**	1%	7%	16%	76%

*Based on DecAID Woodpecker Use Data: Wildlife Habitat Type = Eastside Mixed Conifer Blue Mountains; Structural Condition = Post-fire Habitats. DecAID Table EMC_PF.sp-23.
**For three-toed woodpecker and Williamson's sapsucker, DecAID provides species use levels for snag densities greater than 3" dbh. For the TFSR project, data was available only for snags 10" dbh and greater; therefore, values in this table under-represent the level of habitat available at the higher tolerance levels.

Woodpecker species tend to invade post-fire habitats in a series of waves, although there is certainly a considerable amount of overlap. Initially, black-backed, three-toed and hairy woodpeckers invade a fire area. These woodpeckers are strong excavators and can drill into newly created, hard snags. These species favor areas with high snag densities. The ponderosa pine/Douglas-fir habitat type (Table 86) displays relatively low percentages for these species at the 80% tolerance level, ranging from 6% of the landscape for black-backed woodpeckers to 15% for hairy woodpeckers. As discussed previously, this is likely a function of site productivity; these drier sites are less likely to support the high tree densities that the Eastside Mixed Conifer habitat type provides.

Lewis' woodpeckers require softer snags for excavating nest sties. Fire-killed trees that were previously sound, soften with decay introduced by the multitude of insects that colonize dead ad dying trees following a burn. Lewis' woodpeckers also use burned forests because of the relatively open canopy that allows for shrub development and associated arthropods prey, perch sites for foraging, good visibility, and space for foraging maneuvers (Saab et al. 2002, Marshall 1992b, Jackman 1974, Raphael and White 1984, Saab and Dudley 1997). About 50% of the PP/DF and EMC habitat types are providing snag densities at the 50% to 80% tolerance level. Maximum use by Lewis' woodpeckers may be delayed for several years until fire-killed trees began to fall, stands become more open, snags are well decayed and shrub densities have increased.

Northern flickers respond positively to fire (Hutto 1995, Sallabanks 1995, Saab and Dudley 1997). Like Lewis' woodpecker, they prefer large, soft snags for nesting. Snag densities in the PP/DF habitat type of the Shake Table fire area support use primarily at the 30% tolerance level and in the EMC habitat type primarily at the 50% level. DecAID data indicates that burned stands would need to have over 39 snags per acre greater than 20 inches DBH to exceed the 80% tolerance level; an unlikely scenario in either habitat type due to site capability.

Other species, including the white-headed woodpecker and Williamson's sapsucker, prefer the mixed mortality of low intensity fire. The degree to which they benefit from this condition depends on tree density and the amount of pre-fire and post-fire mortality. White-headed woodpeckers primarily forage on live, mature and overmature ponderosa pine, feeding on seeds from cones and scaling tree bark for insects. The species may use large, well-decayed snags in the burned area for nesting, provided that the burned area is within a potential home range that includes large, live ponderosa pine (Hutto 1995, Sallabanks 1995, Raphael and White 1984, Saab and Dudley 1997). The Williamson's sapsucker primarily uses live trees for foraging; however, they do obtain food by fly-catching, gleaning, and pecking, and could take advantage of habitat provided by the numerous dead trees (Jackman 1974). Table 86 and Table 87 indicate that the fire would provide habitat for both species across the full range of tolerance levels.

DecAID does not provide any post-fire woodpecker use data for pileated woodpecker. The pileated woodpecker has strong preference for mature or old growth stands with high canopy cover. The woodpeckers are unlikely to nest in the fire area, but would likely use the area for foraging if it is within a potential home range that also includes mature or old growth forest with high canopy cover for nesting and roosting.

The red-naped sapsucker and downy woodpecker are also not strongly associated with post-fire habitats (Hutto 1995, Sallabanks 1995, Saab and Dudley 1997). DecAID does not provide any post-fire woodpecker use data for these species. Sapsuckers primarily use live trees for foraging; however, they do obtain food by fly-catching, gleaning, and pecking, and could take advantage of habitat provided by the numerous dead trees (Jackman 1974). These species are strongly associated with forests containing pure stands of aspen or mixed stands of aspen and conifers (Jackman 1974, Hutto 1995). These habitats are very limited within the fire area.

A key to understanding snag dynamics following fire is to know something about the longevity of snags. In an unburned forest, enough snags are left to provide for 100 percent potential populations, and enough live trees, of various sizes, are left to become snags in the future, ensuring that snag habitat is provided over time. In areas where fire burned severely and killed all or nearly all trees, there are few live, green trees left to become snags in the future. Few snags will be available again until a new forest develops, trees reach sizes useful for woodpeckers, and these trees begin to die. This “snag gap” could extend for many decades.

Numerous factors influence the length of time snags remain standing on a site, including weather events, tree species, snag diameter, snag height, aspect, slope, elevation, and soil type/moisture. Diameter is an important factor that influences 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. Morrison and Raphael (1993) found that snags created by fire decayed rapidly and fell quicker than those on unburned forests, and that large snags had greater longevity than smaller 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 such as lodgepole pine, Engelmann spruce, white/grand fir, etc.

Dahms (1949) found 10 years post-fire, 50 percent of fire killed ponderosa pine snags remained standing but this declined to 22 percent standing after 22 years. It is estimated that about 75 percent of all snags may fall within 20 years (Keen 1929, Dahms 1949, Parks et al. 1999, and Everett et al. 1999). The effect of the Shake Table fire is an immediate increase in snag habitat and woodpecker populations followed by a reduction in available habitat and a decrease in local populations as snags fall.

DecAID does not provide wildlife tolerances for down logs in post-fire conditions. DecAID does summarize inventory information for the ponderosa pine/Douglas-fir forest types in eastern Oregon and Washington; information is presented as percent cover of down logs rather than log length. As with snag densities, DecAID suggests that the down log levels were much more variable on the landscape, with some areas having no down logs and other areas having concentrations greater that the Forest Plan standard.

Currently, there is a limited amount of down wood within the TFSR project area and the Shake Table fire area because it was burned. While large down logs are not always abundant in early post-fire years, fire-killed trees eventually fall and become woody debris. As snags in the Shake Table Fire area start to fall, there is an opportunity to mimic a more variable level of down logs.

ENVIRONMENTAL CONSEQUENCES

To evaluate alternative effects on dead wood habitats several analyses have been conducted. Post-fire and post-salvage snag distributions are compared for the Shake Table fire area to determine changes in snag habitat within the fire area from salvage logging. Post-fire and post-salvage distributions are also compared for the expanded Murderers Creek-Fields Creek analysis area to determine departure from HRV or a reference condition for snags. DecAID snag distributions are used as the reference condition. Wildlife tolerances in DecAID are used to indicate changes in habitat for seven Forest Plan MIS species; qualitative discussions are used for species that are not addressed in DecAID. The effects analysis compares the number of treated and untreated acres. The analysis includes a comparison of the snag gap that is created once existing snags fall and before new trees grow sufficiently large to provide future snag replacements. Natural reforestation and planting are compared to discuss time differences in re-foresting moderately- and severely burned stands.

As discussed previously, the HRV analysis will focus on the Ponderosa Pine/Douglas-fir habitat type; there are insufficient acres of Eastside Mixed Conifer in the analysis area to apply the DecAID inventory data. Wildlife tolerances can be discussed for both the Ponderosa Pine/Douglas-fir habitat type and the Eastside Mixed Conifer habitat type to assess habitat availability within the fire area.

Saab and Dudley (1998) and Saab et al. (2002), suggest that management strategies that incorporate the continuum of habitat used by black-backed and Lewis' woodpeckers would likely provide habitat for the entire assemblage of cavity nesting birds. Generally, black-backed woodpeckers prefer high density snags of small diameters in an unlogged condition. Lewis' woodpecker prefers moderate snag densities with larger diameter snags in partially logged conditions. Discussion will highlight effects to these species.

Snag management guidelines were developed for the Thorn Fire Recovery project using a variety of information including scientific literature, standards and guidelines outlined in the Forest Plan, local knowledge of the area, and information contained in the Decayed Wood Advisor (DecAID) developed by Mellen et al. (2006). Alternative 1 is the No Action alternative and serves as a surrogate for the existing condition. Alternative 2 would harvest 3,907 acres compared to Alternative 3 which would harvest 2,769 acres.

Habitat is evaluated at multiple spatial scales (e.g., specific unit/stand prescription, TFSR project area at 7,783 acres, Shake Table fire at 13,536 acres and the Murderers Creek-Fields Creek analysis area at 88,042 acres).

***Comparison of Inventory Data**:* In Table 88, comparison of inventory data will focus on the Ponderosa Pine/Douglas-fir habitat type. The table compares snag distributions in DecAID to snag distributions in the Shake Table fire area (11,045 acres). The snag distribution for the Shake Table fire area provides a good snapshot of post-fire snag densities; Alternative 1 displays the existing condition post-fire. Alternatives 2 and 3 indicate the effects of fire salvage. The DecAID snag distribution was derived from unharvested inventory plots in ponderosa pine/Douglas-fir habitat types in Oregon and Washington Eastside Forests.

Table 88. Post-salvage snag densities for the Shake Table fire area; PP/DF Habitat Type (11,045 acres). Percentage of landscape by density group (snags/acre). Alternative 1 (Existing Condition), Alternative 2 (Proposed Action) and Alternative 3. DecAID Distribution (Mellen et al. 2006) is provided as a reference condition.

Density Group Code	Snags per Acre	DecAID Snag Distribution - Percent of Landscape	Alternative 1 – % of Shake Table Fire Area - PP/DF Habitat Type (11,045 ac.)	Alternative 2 - % of Shake Table Fire Area - PP/DF Habitat Type	Alternative 3 – % of Shake Table Fire Area - PP/DF Habitat Type
Snags equal to or greater than 10" DBH					
1	0-4	78	0.6	35.8	25.7
2	4-8	7	1.7	1.9	2.0
3	8-12	10	5.9	4.9	5.2

Density Group Code	Snags per Acre	DecAID Snag Distribution - Percent of Landscape	Alternative 1 – % of Shake Table Fire Area - PP/DF Habitat Type (11,045 ac.)	Alternative 2 - % of Shake Table Fire Area - PP/DF Habitat Type	Alternative 3 – % of Shake Table Fire Area - PP/DF Habitat Type
4	12-16	3	5.9	5.0	5.0
5	16-20	0	3.0	2.8	2.9
6	20-24	1	7.9	5.4	5.7
7	24-28	0	9.6	6.4	7.2
8	28-32	0	2.9	1.7	1.9
9	32-36	1	4.5	3.3	3.3
10	> 36	0	58.0	32.8	41.1
		100%	100%	100%	100%
Snags equal to or greater than 20" DBH					
1	0-2	80	24.2	26.1	26.4
2	2-4	15	20.4	40	31.3
3	4-6	3	7.3	4.5	4.9
4	6-8	0	5.0	3.9	4.0
5	8-10	1	5.7	3.3	3.7
6	10-12	0.5	2.0	0.8	0.9
7	12-14	0	3.0	1.4	1.7
8	14-16	0.5	3.9	2.8	3.3
9	16 –18	0	5.4	3.0	3.8
10	>18	0	23.1	14.2	20.0
		100%	100%	100%	100%
*DecAID Inventory Data: Wildlife Habitat Type = Ponderosa Pine/Douglas-fir; Structural Condition = Larger Trees					

Table 88 does not provide snag distributions for the Eastside Mixed Conifer habitat type; there insufficient acres in the fire area and expanded analysis area to permit comparison to DecAID distributions. No salvage is proposed for this habitat type except to remove danger trees. Habitat would be remain as described in the existing condition section.

***Comparison of Wildlife Use Data**:* Table 89 through Table 102 provide estimates of available habitat for Forest Plan MIS species as a percentage of the Shake Table fire area. Table 89 through Table 95 displays habitat for the Ponderosa Pine/Douglas-fir habitat type; Table 96 through Table 102 display habitat for the Eastside Mixed Conifer (Blue Mountains) habitat type.

Habitat is displayed by tolerance interval obtained from the post-fire wildlife data found in DecAID. The tables display tolerance levels for each alternative. Calculations are based on forested sites acres and exclude acres unsuitable as forestlands, i.e., acres that do not support trees or snags.

Values are displayed for seven species that the Forest Plan identifies as Management Indicator Species (MIS). For the remaining MIS in the Forest Plan, DecAID does not provide wildlife use information for post-fire habitats; discussions will be more qualitative than quantitative.

DecAID Wildlife Tolerance Levels (% of Shake Table Fire) - Ponderosa Pine/Douglas-fir Habitat Types - Dry Forest

Table 89. Black-backed Woodpecker

Alternative	**Wildlife Tolerance Levels**			
	0-29%	***30-49%***	***50-79%***	***80% +***
1	52%	11%	31%	6%
2	74%	5%	19%	2%
3	66%	9%	22%	3%
*Based on DecAID Woodpecker Use Data: Wildlife Habitat Type = Ponderosa Pine/Douglas-fir; Recent Post-fire Habitats				

Table 90. Hairy Woodpecker

Alternative	**Wildlife Tolerance Levels**			
	0-29%	***30-49%***	***50-79%***	***80% +***
1	45%	9%	31%	15%
2	69%	6%	18%	7%
3	60%	7%	25%	8%
*Based on DecAID Woodpecker Use Data: Wildlife Habitat Type = Ponderosa Pine/Douglas-fir; Recent Post-fire Habitats				

Table 91. Lewis' Woodpecker

Alternative	**Wildlife Tolerance Levels**			
	0-29%	***30-49%***	***50-79%***	***80% +***
1	26%	30%	18%	26%
2	57%	17%	10%	16%
3	47%	18%	12%	23%
*Based on DecAID Woodpecker Use Data: Wildlife Habitat Type = Ponderosa Pine/Douglas-fir; Recent Post-fire Habitats				

Table 92. Northern Flicker

Alternative	**Wildlife Tolerance Levels**			
	0-29%	***30-49%***	***50-79%***	***80% +***
1	40%	37%	23%	0%
2	64%	22%	14%	0%
3	55%	25%	20%	0%
*Based on DecAID Woodpecker Use Data: Wildlife Habitat Type = Ponderosa Pine/Douglas-fir; Recent Post-fire Habitats				

Table 93. White-headed Woodpecker

Alternative	**Wildlife Tolerance Levels**			
	0-29%	***30-49%***	***50-79%***	***80% +***
1	17%	33%	32%	18%
2	50%	22%	20%	8%
3	40%	24%	26%	10%
*Based on DecAID Woodpecker Use Data: Wildlife Habitat Type = Ponderosa Pine/Douglas-fir; Recent Post-fire Habitats				

Table 94. Three-toed Woodpecker

Alternative	Wildlife Tolerance Levels			
	0-29%	***30-49%***	***50-79%***	***80% +***
1	45%	10%	37%	8%
2	69%	6%	21%	4%
3	61%	7%	27%	5%
*Based on DecAID Woodpecker Use Data: Wildlife Habitat Type = Ponderosa Pine/Douglas-fir; Recent Post-fire Habitats				

Table 95. Williamson's Sapsucker

Alternative	Wildlife Tolerance Levels			
	0-29%	***30-49%***	***50-79%***	***80% +***
1	5%	29%	16%	50%
2	40%	22%	10%	28%
3	30%	24%	10%	36%
*Based on DecAID Woodpecker Use Data: Wildlife Habitat Type = Ponderosa Pine/Douglas-fir; Recent Post-fire Habitats				

DecAID Wildlife Tolerance Levels (% of Shake Table Fire Area) - Eastside Mixed Conifer Habitat Type – Moist Forest Types.

Table 96. Black-backed Woodpecker.

Alternative	Wildlife Tolerance Levels			
	0-29%	***30-49%***	***50-79%***	***80% +***
1-3	24%	11%	9%	56%
*Based on DecAID Woodpecker Use Data: Wildlife Habitat Type = Ponderosa Pine/Douglas-fir; Recent Post-fire Habitats				

Table 97. Hairy Woodpecker

Alternative	Wildlife Tolerance Levels			
	0-29%	***30-49%***	***50-79%***	***80% +***
1-3	24%	5%	14%	57%
*Based on DecAID Woodpecker Use Data: Wildlife Habitat Type = Ponderosa Pine/Douglas-fir; Recent Post-fire Habitats				

Table 98. Lewis' Woodpecker

Alternative	Wildlife Tolerance Levels			
	0-29%	***30-49%***	***50-79%***	***80% +***
1-3	3%	21%	30%	46%
*Based on DecAID Woodpecker Use Data: Wildlife Habitat Type = Ponderosa Pine/Douglas-fir; Recent Post-fire Habitats				

Table 99. Northern Flicker

Alternative	Wildlife Tolerance Levels			
	0-29%	***30-49%***	***50-79%***	***80% +***
1-3	3%	47%	50%	0%
*Based on DecAID Woodpecker Use Data: Wildlife Habitat Type = Ponderosa Pine/Douglas-fir; Recent Post-fire Habitats				

Table 100. White-headed Woodpecker

Alternative	Wildlife Tolerance Levels			
	0-29%	***30-49%***	***50-79%***	***80% +***
1-3	3%	21%	19%	57%
*Based on DecAID Woodpecker Use Data: Wildlife Habitat Type = Ponderosa Pine/Douglas-fir; Recent Post-fire Habitats				

Table 101. Three-Toed Woodpecker

Alternative	Wildlife Tolerance Levels			
	0-29%	***30-49%***	***50-79%***	***80% +***
1-3	24%	5%	15%	56%
*Based on DecAID Woodpecker Use Data: Wildlife Habitat Type = Ponderosa Pine/Douglas-fir; Recent Post-fire Habitats				

Table 102. Williamson's Sapsucker

Alternative	Wildlife Tolerance Levels			
	0-29%	***30-49%***	***50-79%***	***80% +***
1-3	1%	7%	16%	76%
*Based on DecAID Woodpecker Use Data: Wildlife Habitat Type = Ponderosa Pine/Douglas-fir; Recent Post-fire Habitats				

NO ACTION ALTERNATIVE

The No Action alternative provides the most burned forest habitat and the greatest number of snags for primary and secondary cavity excavators. The highest tolerance level or assurance of habitat availability for all burned forest and cavity dependent species occurs with this alternative. All existing snags would be available in multiple size classes with variable densities. Initially, snag distributions and wildlife habitat would be as described in the existing condition section (Table 85 through Table 87). Table 88 compares snag distributions under no action to snag distributions for Alternatives 2 and 3. Table 89 through Table 102 describe available wildlife habitat and compare habitat levels to post-salvage levels under Alternatives 2 and 3.

The No Action alternative would meet or exceed Forest Plan snag standards of 2.39 snags per acre, 21 inches DBH or greater, over most of the fire area. Consequently, the No Action alternative would provide the number of snags for 100 percent of potential population levels of primary cavity excavators (LRMP 1990, Thomas 1979).

Saab and Dudley (1998) and Saab et al. (2002), suggest that management strategies that incorporate the continuum of habitat used by black-backed and Lewis' woodpeckers would likely provide habitat for the entire assemblage of cavity nesting birds (Saab et al. 2002). Effects discussion will be more detailed for these species over the other MIS.

It is likely that black-backed, three-toed and hairy woodpeckers would benefit the most from this alternative as they take advantage of the elevated snag levels. Three-toed and black-backed woodpeckers are strongly associated with early post-fire conditions and they tend to select nest sites with the highest snag densities and the least amount of logging (Saab and Dudley 1997). They rapidly colonize stand-replacement burns within 1 to 2 years of a fire; however, within 5 years they become rare, presumably due to declines in prey of bark and wood-boring beetles (Kotliar et al. 2002).

DecAid suggests that snag densities the Shake Table fire area currently provides favorably for black-backed woodpecker up to the 80 percent tolerance level. In the Ponderosa Pine/Douglas-fir habitat type, about 31% of the fire area meets the 50 percent tolerance level and 6% meets the 80 percent tolerance level. In the Eastside Mixed Conifer habitat types, 9% of the fire area meets the 50 percent tolerance level and 56% meets the 80 percent tolerance level (see Table 89 and Table 96). In the PP/DF habitat type, higher snag levels are likely limited by site capability. Available habitat for three-toed and hairy woodpeckers are similar.

Minimum management requirements for black-backed woodpecker establish habitat areas of 75 acres for every 2,000 to 2,500 acres of analysis area (USDA 1986). Stand size and number of areas was based on Forest Plan Management Area (MA-13) recommendations for three-toed woodpeckers, which have similar habitat requirements to black-backed woodpeckers. The 75-acre patch size also matches minimum recommendations for black-backed woodpeckers made in several Idaho post-fire studies, i.e., 75-125 acres (Saab and Dudley 1997, Saab et al. 2002). No salvage harvest or fuels reduction activities would be conducted in these areas. This alternative leaves large blocks of unlogged habitat at the 80% tolerance level. These contiguous blocks of habitat could provide 7 to 11 territories for the black-backed woodpecker based on the 75- to 125-acre recommendations. Due to the mosaic burn pattern of the fire area and site capability, stands may not be ideally distributed. Additional black-backed habitat is available at the 50 percent and 30 percent tolerance level.

Lewis' woodpecker and the northern flicker would benefit from this alternative as a maximum number of large snags would be available. Snag density may be too high for use by Lewis' woodpecker in the short-term (5-10 years). Saab et al. (2002) found that Lewis' 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' woodpecker. Maximum use may be delayed for several years until stands become more open, snags are well decayed and shrub densities have increased. Suitable habitat conditions would persist longer, upwards of 25 to 30 years. Once the majority of snags fall, cavity excavators would not likely occupy the area, or they would exist at greatly reduced levels.

DecAid suggests that snag densities the Shake Table fire area currently provides favorably for Lewis' woodpecker. In the PP/DF habitat type, about 18% of the fire area meets the 50 percent tolerance level and 26% meets the 80 percent tolerance level. In the EMC habitat types, 30% of the fire area meets the 50 percent tolerance level and 46% meets the 80 percent tolerance level (see Tables 88 and 95). Lewis woodpecker nesting territories are 16 to 17 acres verses 75 to 125 acres for black-backed woodpeckers (Saab 2002). Habitat is well distributed across the fire area.

Green stands with little tree 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. white-headed woodpecker, pileated woodpecker, and Williamson's sapsucker). Green trees throughout the burn area will serve as snag recruitment trees for future snag development in the area, although few live trees exist in the severely burned areas.

Downy woodpecker and red-naped sapsucker are strongly associated with riparian hardwoods. They are not strongly associated with post-fire habitats, although they may use them to a small extent, probably to take advantage of high insect numbers resulting from the fire. Hardwood habitats are limited in the projects area.

Snag Persistence

Snag numbers do not continually increase over time because the process of tree mortality and snag recruitment are balanced by the processes of snag decay and fall (Everett et al. 1999). Over time, snag habitat will decrease creating a gap in time when little snag habitat exists (primarily in stand replacement areas) because there are few green trees of sufficient size to provide recruitment. This "gap" would occur for many decades. Although snag levels currently exceed Forest Plan standards, it is expected that most post-burn snags will be on the ground within 20-30 years. The time it takes to reforest burn areas differs between natural regeneration and planting. Natural regeneration can be delayed indefinitely depending on the availability of a live tree seed source. The No Action Alternative relies on natural regeneration. In severely burned area, the No Action creates a snag gap of 120 years or greater. If larger snags persist longer than expected, the snag gap would be reduced further.

Currently, there is a limited amount of down wood within the TFSR Project area and the Shake Table fire area because it was burned. As snags begin to fall, down log levels would greatly increase, thereby increasing denning, nesting and feeding habitat. Down levels would exceed Forest Plan standards across all portions of the fire area.

ACTION ALTERNATIVES

Snag Retention

Snag retention guidelines were developed to leave a wide range of snag densities across the landscape. Snag retention guidelines were based upon various existing guidelines and literature sources.

- A landscape approach to snag retention would be used. Varying densities of snags naturally occur outside harvest units. Within units, a portion of the dead trees would be removed based on the prescribed silvicultural strategies. There would be no removal of trees with a moderate to high likelihood of survival. Pre-fire down wood and soft snags would not be removed and would not count toward the snags per acre to be left. Removal of trees will focus on those >9"dbh primarily due to economics.
- Within harvest units by leaving 3 snags per acre, greater than 21" dbh would be retained within OFMS and OFSS units, 4 snags per acre, greater than 21" dbh, would be retained. Hard snags would be selected for retention, with a preference for ponderosa pine, western larch, and Douglas-fir. Soft snags are not considered merchantable, and therefore would not be removed from the unit. Generally, non-merchantable snags < 9 inches would be maintained within the unit; however, harvest activities may knock down and/or breakup a portion of these snags. In addition, snags will be clumped and provided on a 40 acre basis to meet Forest Plan standards. For example: for every 40 acres 120 large snags would remain. To ensure the snags most likely to persist will be retained, species preference, size, damage, form, and arrangement would all be considered. Clump size, number of clumps per unit, arrangement, and species preference would also be addressed regarding the 40 acre retention areas.

Danger tree removal includes the routine removal of snags along roads, high-use recreation areas and around facilities. This activity occurs up to approximately 150 feet 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, snags not posing a danger would be retained in the area. Additional snags would be retained outside and adjacent to these areas to assure the prescribed density for the affected area. Snag habitat would decrease along roadways, landings, and areas where concentrated use occurs.

The goal and objective of this strategy is to be able to recover the value of dead and dying trees, improve safety for the public by removing danger trees, while still providing sufficient snag and down wood habitat for primary and secondary cavity users. Snags would be retained across the project area in non-treated areas as well as within treatment units. This strategy would provide for a mosaic of conditions regarding density and distribution.

The action alternatives vary by the number of acres to be treated. Alternative 2 would harvest 3,907 acres compared to alternative 3 which would harvest 2,769 acres. Table 88 displays post-salvage snag distributions for Alternatives 2 and 3. Stands in the Shake Table Fire area, but outside of proposed salvage harvest units, would maintain current snag and down wood levels with the exception of danger trees removed along roads.

Proposed harvest treatments would reduce snag densities on the landscape, specifically snags > 9 inches dbh. This would result in a decrease in roosting, nesting and foraging habitat for primary and secondary cavity excavators. Table 89 to Table 102 describe post-salvage habitat for the various MIS. Portions of the fire area would still support species at the 30% to 80% tolerance levels, but more acres would fall into the 0-29% tolerance level.

Following treatment, harvest units under both action alternatives would still meet or exceed Forest Plan snag standards, as amended, i.e., 2.39 snags per acre, 21 inches dbh or greater. Consequently, most acres, both treated areas and untreated areas would provide the number of snags for 100 percent of potential population levels of primary cavity excavators (LRMP 1990, Thomas 1979).

Direct effects would primarily be displacement from nests by removal or destruction of nest structures (snags, ground nests) during salvage operations. Adverse effects would likely be higher for such species as the black-backed, three-toed and hairy woodpeckers. These species tend to use post-fire habitats first because of their ability to excavate hard snags. Logging would likely be completed within 2 to 3 years of the fire when most snags would still be hard enough to limit use by other species.

Black-backed and three-toed woodpeckers tend to select nest sites with the highest snag densities and the least amount of logging. Therefore, it is unlikely that they would use salvage-logged units for nesting or foraging. In both action alternatives, a portion of the Shake Table fire area would not be treated, benefiting species which utilize high density snag patches. Black-backed, three-toed and hairy woodpeckers would likely benefit the most. Approximately, 8,783 acres in Alternative 2 and 9,921 acres in Alternative 3, of the forested area in the Shake Table fire area would not have harvest activities, including inaccessible stands, riparian areas and inventoried roadless areas.

In the PP/DF habitat type, black-backed woodpecker habitat at the 80% tolerance level would be reduced from 6% of the fire area to 2% and 3% for Alternatives 2 and 3, respectively. In the EMC habitat type, habitat would be maintained.

- **Alternative 2**: In the PP/DF habitat type, harvest is proposed on 421 of 654 acres (64 percent) identified as optimum black-backed woodpecker habitat, including three blocks 212, 238 and 393 acres in size. The remaining blocks of habitat proposed for harvest are more fragmented; no contiguous blocks meet the 75-acre size suggested for black-backs. Snags are estimated at levels that meet the 80 percent tolerance level (119+ snags per acre). Combined, the PP/DF and EMC habitat types would provide 5-9 nesting territories based on 75-125 acre leave blocks recommended by Saab and Dudley (1997). Table 89 and Table 96 compared wildlife tolerance levels for black-backed woodpecker in PP/DF and EMC habitat types across all three alternatives. These tables show that habitat still exists at other tolerance levels.

- **Alternative 3**: Harvest is proposed on 322 of 654 acres (49 percent) identified as optimum black-backed woodpecker habitat, including one block 212 acres in size. The remaining blocks of habitat proposed for harvest is more fragmented; no contiguous blocks meet the 75-acre size suggested for black-backs. This alternative harvests 99 acres less of the prime black-backed habitat than the other alternative, retaining one additional 75-acre block of prime habitat. Snags are estimated at levels that meet the 80% tolerance level (119+ snags per acre). Habitat would provide 6 to 10 nesting territories based on 75-125 acre leave blocks recommended by Saab and Dudley (1997).

The Lewis' woodpecker, northern flicker and, other species that prefer soft snags over hard snags would begin to expand into the fire area as snags begin to decay and fall. However, harvesting dead trees would also provide habitat sooner for species that utilize moderate to low density patches like Lewis' woodpecker (Saab and Dudley 1998 and Saab et al. 2002). Snag habitat is reduced, but still maintained across all tolerance levels.

Habitat for white-headed woodpeckers and Williamson's sapsuckers would be reduced, but still provide habitat across all tolerance levels. These species would likely tend towards the periphery of the burned areas where there is a mosaic of live and dead trees to meet their habitat needs.

Pileated woodpeckers would probably not be directly affected by the removal of large diameter snags, as studies show they are rare visitors to early post-fire communities. Indirectly, removal of large diameter snags precludes accumulation of large, down logs, and consequently, reduces further foraging habitat. In salvage units, the low densities of snags left would not provide high quality foraging habitat even after snags fall. In non-salvage areas, the potential for quality foraging habitat would remain high.

Red-naped sapsuckers and downy woodpeckers would not be significantly affected by the reduction in nesting and foraging habitat, since they stay mostly in deciduous stands of aspen and cottonwoods. Treated areas would eventually develop into desired habitat components because desirable tree species would be planted on the landscape.

Ponderosa pine and Douglas-fir trees would eventually dominate stand composition on the site. Establishment of habitat in the Ponderosa pine/Douglas-fir and Eastside Mixed Conifer habitat types would be beneficial for species like the white-headed woodpecker.

Snag Persistence

Snag numbers do not continually increase over time because the process of tree mortality and snag recruitment are balanced by the processes of snag decay and fall (Everett et al. 1999). Over time, snag habitat would decrease creating a gap in time when little snag habitat exists (primarily in stand replacement areas) because there are few green trees of sufficient size to provide recruitment. The period when snags are not available can be referred to as the "snag gap." Although snag levels currently exceed Forest Plan standards, it is expected that most post-burn snags would be on the ground within 20-30 years. The time it takes to reforest burn areas differs between natural regeneration and planting. The Action Alternatives primarily use planting.

Essentially, the "snag gap" would occur for many decades, because of the lack of snag recruitment. 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 (8-9") should reoccur in the burn area 40-50 years after the burn. These snags would begin providing foraging habitat for cavity excavators;

however nesting habitat could still be limited for several years. Larger snags (> 20”) would remain on the landscape for several decades longer than smaller snags; however, all snags will eventually fall. Recruitment of large snags on the landscape may take more than 70-120 years to develop, depending on the site. If larger snags persist longer than expected, the snag gap would be reduced further.

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 > 10 inches in diameter at the small end and 6 feet or more in length, 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. Outside harvest units, down logs would increase rapidly and would greatly exceed Forest Plan standards. Inside harvest units, snag retention would also meet or exceed Forest Plan standards.

CUMULATIVE EFFECTS

The cumulative effects analysis consists of the 88,042 acre analysis area, including the 13,536 acre Shake Table fire area. All of the activities in **DEIS Appendix N** have been considered for their cumulative effects. Past actions that have affected dead wood dynamics include; fire suppression, Burned Area Emergency Response (BAER), timber harvest, and fuel wood harvest, fuels treatment, and wildfire. These management activities and disturbances have led to the current dead wood condition. Overall, snag densities would meet or exceed Forest Plan standards, because of the high snag densities in the Shake Table fire area.

Comparison of Inventory Data*:* In Table 103, comparison of inventory data will focus on the ponderosa pine/Douglas-fir habitat type. The table compares snag distributions in DecAID to snag distributions in the Murderers Creek-Fields Creek analysis area (75,545 acres). Table 103 displays snag distributions by alternative and compares them to the inventory distribution derived from DecAID. The DecAID snag distribution was derived from unharvested inventory plots in ponderosa pine/Douglas-fir habitat types in Oregon and Washington Eastside Forests; it is used to reflect a reference of natural condition of snags.

Table 103. Post-salvage snag densities for the Murderers Creek-Fields Creek (MC-FC) Analysis Area; PP/DF Habitat Type (75,145 acres). Percentage of landscape by density group (snags/acre). Alternative 1 (Existing Condition), Alternative 2 (Proposed Action) and Alternative 3. DecAID Distribution (Mellen et al. 2006) is provided as a reference condition.

Density Group Code	Snags per Acre	DecAID Snag Distribution - Percent of Landscape	Alternative 1 –% of MC-FC Analysis Area - PP/DF Habitat Type (11,045 ac.)	Alternative 2 - % of MC-FC Analysis Area - PP/DF Habitat Type	Alternative 3 – % of MC-FC Analysis Area - PP/DF Habitat Type
Snags equal to or greater than 10” DBH					
1	0-4	78	24.8	29.9	28.5
2	4-8	7	21.6	21.6	21.6
3	8-12	10	15.8	15.6	15.7
4	12-16	3	10.7	10.5	10.5
5	16-20	0	5.0	5.0	5.0
6	20-24	1	4.0	3.6	3.7
7	24-28	0	3.7	3.2	3.3
8	28-32	0	2.1	1.9	2.0
9	32-36	1	2.7	2.5	2.5
10	> 36	0	9.8	6.1	7.3

Density Group Code	Snags per Acre	DecAID Snag Distribution - Percent of Landscape	Alternative 1 –% of MC-FC Analysis Area - PP/DF Habitat Type (11,045 ac.)	Alternative 2 - % of MC-FC Analysis Area - PP/DF Habitat Type	Alternative 3 – % of MC-FC Analysis Area - PP/DF Habitat Type
		100%	100%	100%	100%
Snags equal to or greater than 20” DBH					
1	0-2	80	63.0	67.3	63.3
2	2-4	15	15.9	14.8	17.5
3	4-6	3	8.2	7.8	7.8
4	6-8	0	3.5	3.3	3.4
5	8-10	1	2.8	2.5	2.6
6	10-12	0.5	0.7	0.5	0.5
7	12-14	0	1.0	0.8	0.8
8	14-16	0.5	0.6	0.5	0.6
9	16 –18	0	0.8	0.5	0.6
10	>18	0	3.4	2.1	3.0
		100%	100%	100%	100%
*DecAID Inventory Data: Wildlife Habitat Type = Ponderosa Pine/Douglas-fir; Structural Condition = Larger Trees					

The DecAID distribution reflects the reference condition. Comparisons suggest that the high snag density classes exceed HRV (DecAID distribution) for both action alternatives. Table 103 does not provide snag distributions for the Eastside Mixed Conifer habitat type; there are insufficient acres to permit comparison to DecAID distributions. Effects would be similar to those described for No Action. No salvage is proposed for this habitat type except to remove danger trees. At least initially, habitat for primary and secondary cavity excavators would be maintained above HRV under all alternatives.

In general, fire effects have combined with other past activities in the analysis area to result in both excessive and deficient snags when compared to the distribution of snag density classes in DecAID. However, 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, at least in the severely burned fire area. Snag densities would likely move closer towards the reference condition provided by DecAID. Most of the Murderers Creek-Fields Creek area is in green timber stands where new snags would be recruited from existing green trees; therefore, most reductions at the landscape level would be due to losses in snags in the fire area.

Stand replacement fires are particularly important for species such as the black-backed and three-toed woodpecker. In unburned forests, species numbers are relatively low and may be sink populations (populations that are generally decreasing). Fires serve as source habitats (populations increase and spread). When habitat conditions in a fire area become unsuitable, birds are likely to immigrate to the unburned areas (Hutto 1995). Consequently, periodic fires may be needed to maintain populations across the landscape.

DecAID suggests that the Ponderosa Pine/Douglas-fir wildlife habitat type would have historically provided high-density snag pulses (>36” snags/acre) on 0 to 1 percent of the landscape depending on the DecAID structural stage used. At the landscape level, all alternatives maintain high density habitat in excess of this percentage.

Due to past management which includes overstory removal, salvage harvest, roadside danger tree removal, firewood cutting, and fire suppression; snag and down wood quantities have declined from historical levels in some areas. In non-harvested areas outside the fire area, snag density is often in excess of the Forest Plan standard of 2.39 snags per acre and provides for 100 percent potential population levels of most species. In harvested areas outside the fire area, snag density is often below the Forest Plan standard and does not provide for 100 percent population levels. Past, present, foreseeable and proposed actions in the analysis area have resulted in a change to snags in the Ponderosa pine/Douglas-fir and Eastside Mixed Conifer types.

Current trends indicate that snag and down wood numbers are increasing due to reduced harvest over the past decade and increased retention levels required by Regional Forester's Eastside Forest Plans Amendment #2. Any future timber harvest or prescribed fire activities would be designed to promote the development of late and old growth habitat and retain a snag and down wood component. Such management strategies are expected to improve habitat for cavity dependent species.

Stand replacement fires in the immediate area have been rare in the last 30 years; generally, initial attack of wildfires has been successful in minimizing stand replacement fires. The closest fire to the project area occurred in the Todd Creek subwatershed in 2005. It totaled 270 acres with 45 acres occurring within the boundaries of the Shake Table fire. The Widows Creek fire occurred in 1939 with 1,028 acres occurring within the boundaries of the Shake Table fire. The 2150 Road fire burned 46 acres in 2002, 14 acres were salvaged.

Future firewood cutting could reduce snag levels further; however, through design of harvest units snags would be designed in clumps away from roads so that they would not become future danger trees or removed for firewood. In addition, firewood cutting would be delayed within the fire area until after harvest under Alternatives 2 and 3.

Private lands typically do not provide large diameter snags. In the past, adjacent landowners have generally harvested damaged or dying trees to capture their economic value before they decay to a level where they no longer have any market value. Timber management has favored harvest of large diameter trees because of their higher economic value; removal of overstory trees releases smaller trees that are then managed over the next harvest cycle. Adjacent private lands that burned in the Thorn fire have already been salvage logged.

Livestock grazing has been discontinued in the burn area until ground vegetation recovers. Cumulatively, these actions will help reestablish hardwood vegetation to the benefit of primary cavity species that use these habitats, such as the Lewis woodpecker, red-naped sapsucker, and downy woodpecker.

In the TFSR project area, snag densities would meet or exceed Forest Plan standards. Snag densities in unharvested stands are well above 2.39 snags/acre. In addition, at least 3 snags/acre > 21 inches would be retained in harvested stands, which is above the Forest Plan standard. Harvest would not occur in moist forest types except to remove danger trees.

The Forest Plan requires that snag levels be averaged on a 40-acre basis to maintain an even distribution across the landscape. Retaining all snags in the fire area would not necessarily elevate woodpecker use in snag deficient, unburned areas, except along the periphery of the fire where a mosaic of burned and unburned forest occurs or where territories overlap with the fire area. Black-backed and three-toed woodpeckers may be the exception; these species use post-fire habits as source habitats and immigrate to non-burn areas once snags fall in the burn area.

Cumulatively, Alternatives 2 and 3 contribute to reductions in habitat for primary cavity excavator species, but at the landscape level, snags still exceed HRV. Alternative 1, by retaining nearly all snags, would not contribute to further declines in snag habitat.

Cumulatively, retaining high levels of snags within the project area (particularly in the Alternative 1), along with moving toward the 100 percent population levels in the surrounding area, would ensure that populations of cavity-dependent species would increase over time.

Summary

Table 104. Acres by Habitat Type for Shake Table Fire Area and Thorn Fire Recovery Analysis Area

Habitat Type	Shake Table Fire Area (National Forest Lands)	Thorn Analysis Area (National Forest Lands)
Ponderosa Pine/Douglas-fir (PP/DF) Habitat Type	11,045	75,145
Eastside Mixed Conifer (EMC) Habitat Type	1,134	5,166
Non-Forested Acres	1,357	7,731
Total Acres	13,536	88,042

The differences in alternatives are best evaluated by comparing 1) acres treated, 2) acres unharvested, 3) ability to meet Forest Plan standards, 4) predicted snag distributions for each alternative against DecAID snag distributions, 5) predicted woodpecker tolerance or use levels as derived from DecAID, and 6) differences in the snag gap, i.e., period after existing snags fall and newly established trees grow large enough to provide future snags.

Alternative 2 would harvest about 3,907 acres (31% of the forested acres) in the Shake Table fire area. Alternative 3 would harvest about 2,769 acres (22% of the forested acres) in the fire area.

In Alternative 2, about 8,783 acres (69% of the forested acres) in the Shake Table fire area would not have harvest activities, including inaccessible stands, riparian areas and inventoried roadless areas. In Alternative 3, about 9,921 acres (78% of the forested acres) in the fire area would not have harvest activities,

All alternatives would meet or exceed Forest Plan snag standards, as amended, i.e., 2.39 snags per acre, 21 inches DBH or greater. Snag densities in unharvested stands in the Shake Table fire area are well above 2.39 snags/acre. In addition, at least 3 snags/acre > 21 inches would be retained in harvested stands. Harvest would not occur in the Eastside Mixed Conifer habitat type except to remove danger trees. Consequently, all alternatives would provide the number of snags for 100 percent of potential population levels of primary cavity excavators (LRMP 1990, Thomas 1979).

All alternatives would meet design criteria set for the project, meet standards for affected land management allocations, and provide for viable populations of wildlife species. All alternatives would provide for the diversity of animal communities in the project area, based on the suitability and capability of the project area.

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 cavity excavators expected to occur in the area.

Comparing Snag Distributions: The alternatives retain varying levels, sizes and distribution of snags. Table 103 displays snag distribution by alternative, and compares them to the inventory distribution derived from DecAID. Table 103 suggests that the high snag density classes exceed HRV, confirming potential for salvage. Following implementation, Alternative 2 may come closest to mimicking the DecAID snag distributions, followed by Alternative 3. Because Alternative 1 does not consist of any activities, snag densities would remain at current levels which are highly elevated compared to distributions in DecAID. Therefore, the inventory data suggests that reductions in snag levels under Alternatives 2 and 3 could still provide sufficient habitat for cavity excavators.

Comparing Wildlife Tolerance or Use Levels: Tolerance levels have less to do with viability of species and populations, and more to do with the distribution of individuals across a project area. The alternatives represent different levels of snag retention, and thus would affect woodpecker presence and distribution differently. The No Action alternative would maintain existing snag habitats across the entire fire-affected area.

Table 89 and Table 102 display cavity excavator use or tolerance levels as an overall range for cavity excavator species. Alternative 1, followed by Alternative 3 supports the most primary cavity excavators at the 30 percent to 50 percent tolerance level or better. Alternative 2 reduces the most habitat, and is the least favorable to dead wood associated species, but still maintains habitat at levels above HRV.

Saab and Dudley (1998) and Saab et al. (2002), suggest that management strategies that incorporate the continuum of habitat used by black-backed and Lewis' woodpeckers would likely provide habitat for the entire assemblage of cavity nesting birds (Saab et al. 2002).

Species such as the black-backed and three-toed woodpeckers would rapidly colonize stand-replacement burns within 1 to 2 years of the fire; however, within 5 years they would decline, presumably due to declines in bark and wood-boring beetles (Kotliar et al. 2002).

For the black-backed woodpecker, Alternative 1 leaves large blocks of unlogged habitat at the 80% tolerance level. These contiguous blocks of habitat provide 7 to 11 territories for the black-backed/three-toed woodpecker. Alternative 2 would retain 5 to 9 black-backed/three-toed woodpecker areas set aside for their high snag densities where as Alternative 3 would retain 6 to 10 areas. Tables 86 and 99 compared wildlife tolerance levels in both PP/DF and EMC forest types across all three alternatives. These tables show that habitat still exists at all tolerance levels. Note that at the 80% tolerance level in Table 88 for the black-backed woodpecker results show that in alternative 2 and 3 there is 2% and 3% of Thorn fire area left, respectively, leaving large blocks of optimum habitat on the landscape. These levels would be in excess of levels suggested by DecAid for high snag density areas of 0-1% of the landscape.

For other species, such as the Lewis' woodpecker, northern flicker and hairy woodpecker, suitable habitat conditions will persist longer, upwards of 25 to 30 years. Once the majority of snags fall, cavity excavators would not likely occupy the area, or they would exist at greatly reduced levels. Lewis' woodpecker habitat would be maintained across all tolerance levels and under all alternatives.

Snag numbers do not continually increase over time because the process of tree mortality and snag recruitment are balanced by the processes of snag decay and fall (Everett et al. 1999). Over time, snag habitat will decrease creating a gap in time when little snag habitat exists (primarily in stand replacement areas) because there are few green trees of sufficient size to provide recruitment. This "gap" would occur for many decades. Although snag levels currently exceed Forest Plan standards, it is expected that most post-burn snags will be on the ground within 20-30 years. The time it takes to reforest burn areas differs between natural regeneration and planting. Natural regeneration can be delayed indefinitely depending on the availability of a live tree seed source. The No Action Alternative relies on natural regeneration; the Action Alternatives primarily use planting. In severely burned area, the No Action creates a snag gap of 120+ years, depending on the success of natural regeneration. Alternatives 2 and 3 create a snag gap of 70-120 years, as tree planting helps reduce the snag gap. If larger snags persist longer than expected, the snag gap would be reduced further, particularly for Alternative 1, which retain the most large diameter snags.

None of the alternatives would reduce population viability for any cavity excavator management indicator species analyzed in this section.

3.5.5 ENDANGERED SPECIES

GRAY WOLF

Existing Condition

Historically, wolves occupied all habitats on this Forest (Wisdom et al. 2000), but are currently considered extirpated. Today, the Malheur, Wallowa-Whitman and Umatilla National Forests are probably suitable habitats for wolves. In 1999, a collared wolf from the experimental, non-essential Idaho population traveled to the three Blue Mountain National Forests and stayed until it was captured and returned to Idaho. A second wolf was found dead near Baker City in the spring of 2000 and a third wolf was found shot north of Ukiah, Oregon in 2000. Over time, wolves dispersing from the Idaho wolf population could return to the Blue Mountains and establish packs.

Environmental Consequences - Direct, Indirect and Cumulative Effects, and Determination

All Alternatives

Wolves are limited by prey availability and are threatened by negative interactions with humans. Generally, land management activities are compatible with wolf protection and recovery, especially actions that manage ungulate populations. Habitat and disturbance effects are of concern in denning and rendezvous areas. No such habitat is currently occupied in Oregon.

Determination

At this time, the determination for almost all project activities on the Malheur National Forest is NO EFFECT (NE) for the following reasons:

- No populations currently occupy the Malheur National Forest.
- No denning or rendezvous sites have been identified on the Malheur National Forest.
- There is an abundance of prey on the Forest; therefore prey availability is not a limiting factor.

3.5.6 THREATENED SPECIES

BALD EAGLE

Existing Condition

Bald eagle nests are usually in multistoried, predominantly coniferous stands with old growth components near water bodies which support adequate food supply (U.S. Dept. Interior 1986).

On the Malheur National Forest, bald eagles congregate at winter roost sites during the late fall, winter and spring. Eagles roost and feed along the main stem of the John Day River, three miles north of the project area and along the South Fork of the John Day River, about seven miles west of the project area. They scavenge on carrion including deer and elk killed by predators, road-killed animals along highway 26, and in agricultural areas where cattle concentrate and give birth. No nest sites have been found in this area. The project area is located far enough from eagle concentration areas that management activities pose little to no threats. Eagles typically arrive in early November and depart about the end of April. No winter roost sites are adjacent to or within the project area. .

Environmental Consequences - Direct, Indirect and Cumulative Effects

No Action Alternative

Under the No Action Alternative, there would be no new management activities; therefore, there should be no direct, indirect or cumulative effects to bald eagles or their habitat.

Action Alternatives

Human activities have the potential to disturb perching or roosting eagles (Spahr 1991; Steenhof 1978). Of these activities, vehicle traffic is the least disturbing, as long as the vehicle does not stop, because eagles apparently become accustomed to traffic (Steenhof 1978). Log haul along Road 21 and Hwy 26 is not expected to elevate traffic levels high enough beyond normal traffic levels to disturb eagles along John Day River.

No additional direct, indirect or cumulative effects are anticipated from management activities under any of the Action alternatives. Proposed activities within the project area are sufficiently distant from any nest sites or winter roost sites that no disturbance risks are expected.

Cumulative Effects

Human activities have the potential to disturb perching or roosting eagles (Spahr 1991; Steenhof 1978). Of these activities, vehicle traffic is the least disturbing, as long as the vehicle does not stop, because eagles apparently become accustomed to traffic (Steenhof 1978). Log haul along Road 21 and Hwy 26 is not expected to elevate traffic levels high enough beyond normal traffic levels to disturb eagles along John Day River.

No additional direct, indirect or cumulative effects are anticipated from management activities under any of the Action alternatives. Proposed activities within the project area are sufficiently distant from any nest sites or winter roost sites that no disturbance risks are expected.

Determination

There would be **NO EFFECT (NE)** to bald eagles or their habitat under the No Action alternative or any of the action alternatives. No bald eagles nest or roost within the project area.

CANADA LYNX

Existing Condition

Potential lynx habitat on the Malheur National Forest is defined as stands above 5,000 feet that are subalpine fir, lodgepole pine, Engelmann spruce, or moist grand fir types. Lynx require a mix of early and late seral habitats to meet their food and cover needs. Early seral habitats provide the lynx with a prey base, primarily snowshoe hares, while mature forests provide denning space and hiding cover (Koehler 1990). Pockets of dense forest must be interspersed with prey. Lynx den sites are in forests with a high density of downfall (Koehler 1990). Favored travel ways within and between habitat areas include riparian corridors, forested ridges, and saddles. Although there are several unconfirmed sightings of lynx in Grant County, there is no indication that lynx occurs in the project area. In 2005, the U.S. Fish and Wildlife Service determined that the Blue Mountains of eastern Oregon are currently unoccupied by lynx.

Research indicates that lynx need approximately 10 to 15 square miles of high quality habitat to support a functional home range (Ruggiero et al. 1994). Forest managers have conducted several mapping analyses of lynx habitat on the Malheur National Forest; none of these analyses classified the TFSR project area as a Lynx Analysis Unit (LAU). The number of acres is considered insufficient for lynx and what does exist is noncontiguous; therefore, this area is not considered suitable habitat for lynx to occupy. The nearest area that approximates lynx source habitat is located in the Strawberry Mountains, about 25 miles to the east.

In general, the project area is relatively dry, with mostly ponderosa pine dominated stands. Mixed conifer, high canopy closure stands with grand fir did exist prior to the fire, but they comprised only a smaller portion of the area and are still relatively dry sites. Historically, under natural fire regimes, the area was probably even more dominated by open, ponderosa pine stands than it is today, so it is not as if site potential would be conducive to historical lynx habitat.

Environmental Consequences - Direct, Indirect Effect and Cumulative Effects, and Determination

All Alternatives

Because lynx habitat is so limited in the project area, both now and historically, there would be no direct, indirect or cumulative effects expected from any of the alternatives. It is very unlikely that lynx would use the project area due to the lack of habitat. Project actions would have no effect on Canada lynx or their habitat; therefore, the call is **No Effect (NE)**.

3.5.7 SENSITIVE SPECIES

WOLVERINE

Existing Condition

Wolverines were always rare in Oregon, although recent sightings, tracks, and collected remains document their continued presence at low densities in the state (Csuti et al. 1997). Current distribution appears to be restricted to isolated wilderness areas. Verts and Carraway (1998) believe that while there is a possibility of self-maintaining population of wolverine in the state, most animals seen or collected are likely dispersers from Washington and Idaho populations. Confirmed observations on the Malheur National Forest are from the Strawberry Mountain Wilderness and include a partial skeleton found in 1992 and tracks and a probable denning site found in 1997. Additional sightings of animals and tracks have occurred on the District, but none have been confirmed. Surveys were conducted in the early 1990’s but no animals were located at that time. There are no confirmed records of wolverine occurring in the project area; therefore, there would be no direct effect to this species.

Foraging and dispersal habitat for wolverine occurs throughout the Blue Mountain Ranger District. Wolverines could possibly use any area of the District to satisfy life needs; however, areas of high deer and elk concentrations, low human impacts, low human disturbance, and potential denning sites, that appear to be home range requirements, are limited.

The Shake Table fire severely or moderately burned approximately 12,000 acres of forested ground, eliminating the contiguous forested conditions favored by wolverine. Prior to the fire, much of the area was considered high quality foraging/reproductive habitat. The Shake Table fire reduced habitats for many mammal species by destroying much of the cover, both vegetation and down logs. Much of the fire area is part of the Aldrich home range that includes Aldrich Mountain, McClellan Mountain and Timber Mountain areas. Post-fire, the loss of cover further reduces area use by wolverine and its prey species. The likelihood exists that wolverines would still utilize the area for travel. Forage seeding and area closures would benefit big game species, which would subsequently benefit wolverine. Over the larger home range, sufficient reproduction/foraging habitat remain to provide for wolverine.

Environmental Consequences - Direct and Indirect Effects

No Action

The No Action alternative would have no direct effects to wolverine or potential habitat. Indirect effects result from potential changes in habitat for wolverine prey. Overall habitat effectiveness for deer and elk would be expected to improve over time as cover develops. Big game population numbers are expected to remain stable; distribution and use may change initially as a result of improved forage and reduced cover (See big game section). By relying on natural regeneration for reforestation, recovery of trees would be slower than under a planting scenario. Cover/forage habitat for small mammals, i.e., alternative prey, is expected to increase as vegetation recovers and snags fall and provide down logs.

Action Alternatives

Indirect effects to wolverine, and its preferred habitat, would be minimal, regardless of the alternative. Post-fire, the project area is considered unfavorable for wolverine occupation. Human disturbance related to proposed salvage activities might displace transient or dispersing wolverine from potential foraging habitat during the duration of the project. Post-salvage road closures would help reduce the level of human disturbances as habitat conditions become more favorable to prey species.

Management recommendations by Banci (1994) suggest that management activities should incorporate strategies that improve the deer and elk forage base for wolverine, without significantly changing vegetation structure. The action alternatives would improve big game habitat; and planting of trees would accelerate recovery of hiding and thermal cover. Big game population numbers are expected to remain stable; distribution and use may change initially as a result of improved forage and reduced cover. Overall habitat effectiveness for deer and elk would be expected to improve over time as cover develops (see big game habitat section). Cover/forage habitat for small mammals, i.e., alternative prey, is expected to increase as vegetation recovers and snags fall and provide down logs.

Cumulative Effects

All Alternatives

The area considered for cumulative effects is the Todd Creek, Dry Creek, Murderers-Duncan Creek and Fields Creek subwatersheds. All of the activities in **DEIS Appendix N** have been considered for their cumulative effects on wolverines. Past adverse effects on wolverine foraging and dispersal habitat have been primarily a result of timber harvest and road construction. Activities that have cumulatively affected big game habitat and populations can also have contributing effects to wolverine. This project, combined with ongoing and reasonably foreseeable future projects, is expected to improve big game habitat (see the Big Game Habitat, Cumulative Effects section).

Adjacent private lands have already been salvage logged. Reforestation is required where commercial timber harvest has occurred and the land is left under-stocked. Adjacent private lands are intensively managed and even less likely to support wolverine than National Forest lands in the project area.

Future timber and access management activities have yet to be proposed for the unburned areas of the affected subwatersheds. Since the TFSR project is expected to have few negative effects on wolverine in the short-term, and since future activities are expected to create more continuous, unfragmented habitat, wolverines are expected to benefit. Conifer planting would improve habitat for wolverine prey species with recognition of habitat losses due to the fire, adverse cumulative effects are expected to be incidental regardless of the alternative selected. In the mid- to long-term, the effects of this project would be considered favorable to wolverine.

Determination

Due to the nature of the No Action alternative, there would be NO IMPACT (NI) to wolverine.

Action alternatives 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 (MIIH). Human disturbance related to proposed salvage activities could have short-term, indirect effects on wolverines, although the risk of disturbance to wolverines is considered low. Wolverines are considered transient based upon their large home ranges. None of the treatment areas include denning habitat. Following management activities, re-closing opened roads would reduce motorized access to the benefit of wolverines. . None of the alternatives will affect wolverine habitat or species viability because the principal big game prey base is expected to remain stable.

WESTERN SAGE GROUSE

Existing Conditions

Sage grouse are obligate residents of sagebrush habitat, usually inhabiting sagebrush-grassland or juniper-sagebrush-grassland communities.

In 1993, Oregon Department of Fish and Wildlife (ODFW) biologists estimated that Bear Valley had about 60 birds and a stable population. Little monitoring has been done in recent years, but numbers are believed to be decreasing on private lands in Bear Valley due to predation, livestock grazing and agricultural conversion.

ODFW performed a helicopter search for leks in 2005. The survey area consisted of the south flats (Murderers Creek) from Timber Mountain to the South Fork of the John Day River, and south to Deer Creek. The area surveyed also included Battle Creek on the Ochoco National Forest and the Phillip K. Schneider Wildlife area north of Aldrich Mountain. No greater sage grouse were observed on a lek.

There is very little sage grouse habitat on Forest Service managed lands. In the project area, about 72 acres, classify as juniper/sagebrush, sagebrush shrublands or dry grasslands.

Habitat in the project area is considered marginal. There is no documented occurrence of sage grouse within the TFSR project area; there are no known leks or suspected leks. It is possible that adult sage grouse with young may use non-forested areas, but use would be only occasional and random. Better sagebrush habitats exist on BLM and ODFW lands to the north and east of the fire area, although no leks have been recorded in these locations.

Within the fire area, the shrub-steppe habitats burned in a mosaic pattern depending on vegetation patterns and fire behavior. Unburned islands of sagebrush can retain habitat features important to sagebrush-dependent species. Given, the small extent of habitat within the project area, the wildfire likely had minimal effect on species that depend on these semi-arid environments.

Environmental Consequences - Direct and Indirect Effect

No Action

Under the No Action Alternative, there would be no new management activities; therefore, there should be no direct/indirect effects to sage grouse or their habitat.

Given the small extent of sagebrush habitats, the wildfire likely had minimal effect on species that depend on these environments. Recovery of sagebrush habitats is dependent on the severity of the burn. Grass and herb species respond more rapidly after fire than sagebrush (Smith 2000). Because sagebrush does not sprout from underground buds, these communities can require several decades to establish post-fire vegetation composition and structure similar to that on unburned sites (Smith 2000). A mosaic burn, such as occurred in much of the Thorn sagebrush communities, can accelerate recovery of these habitats as compared to completely burned areas. Unburned islands of sagebrush could provide limited habitat for sagebrush-dependent species and a seed source for regenerating burned areas.

Action Alternatives

Juniper woodland, shrub-steppe and grassland habitats would not be treated under any of the action alternatives; therefore, there would be no direct or indirect effects to sage grouse. Effects would be as described for the No Action alternative.

Cumulative Effects

All Alternatives

All of the activities in **DEIS Appendix N** have been considered for their cumulative effects on western sage grouse. The following discussion focuses on those past, ongoing and reasonable foreseeable future activities that may contribute adverse effects to the species or its habitat.

Juniper woodlands, sagebrush shrublands and dry grasslands have probably changed due to 100 years of fire suppression. Other conifer species have encroached on these habitats, reducing their size. On residual acres, juniper density probably has increased. Livestock grazing, primarily early in the century, may have caused changes in shrub, grass and forbs composition or abundance. Juniper woodland and shrubland habitats are very limited in the project area. Few management activities are proposed, and natural recovery rates from the fire are expected.

As stated in the existing condition section, sage grouse populations on private lands in Bear Valley have declined primarily as a result of predation, livestock grazing and agricultural conversion. Adjacent private lands have already been salvage logged. Generally, these lands are not managed to preserve or restore sagebrush habitats.

At moderate grazing levels, livestock grazing can be compatible with sage grouse management.

With all cumulative effects considered, the additive effects of the proposed alternatives will not lead to any adverse effects to the population nor will it contribute to a trend toward federal listing or loss of viability to the population or species.

Determinations

Due to the nature of a No Action alternative, there would be NO IMPACT (NI) to western sage grouse or it habitat.

Activities proposed under the action alternatives are not expected to measurably change sagebrush habitats or potential late brood-rearing habitat. Given that there would be no direct, indirect or cumulative effects, there would be NO IMPACT (NI) to this species.

GRAY FLYCATCHER

Existing Condition

The gray flycatcher prefers relatively treeless areas with tall sagebrush, bitterbrush, or mountain mahogany communities, but is also associated with pinyon-juniper woodland with understory sagebrush, and open ponderosa pine forests (Csuti et al. 1997). This species is most abundant in extensive tracts of big sagebrush, often selecting areas along washes where the sagebrush is especially tall. In the western Great Basin, this species nests in tall big sagebrush shrublands (Ryser 1985). During the nonbreeding season, this species commonly inhabits arid scrub, riparian woodland, and mesquite (NatureServe 2006). The Malheur National Forest considers this species as a rare (not seen every year) summer resident. Gray flycatchers have not been reported in the project area. No surveys for gray flycatchers have been conducted.

There is very little gray flycatcher habitat on Forest Service managed lands. In the project area, about 72 acres, classify as juniper/sagebrush, sagebrush shrublands or dry grasslands. Within the fire area, the shrub-steppe habitats burned in a mosaic pattern depending on vegetation patterns and fire behavior. Unburned islands of sagebrush can retain habitat features important to sagebrush-dependent species. Given, the small extent of habitat within the project area, the wildfire likely had minimal effect on species that depend on these semi-arid environments.

Environmental Consequences - Direct, Indirect and Cumulative Effects

All Alternatives

In the Thorn area, gray flycatchers occupy many of the same habitats as western sage grouse. Effects to sagebrush habitats would be similar to those for sage grouse. In harvest units, occasional bitterbrush, mountain mahogany, and sagebrush shrubs could be affected, but damage would be incidental. Harvest design typically avoids larger shrub areas.

Determinations

Neither the No Action alternative nor the Action alternatives are expected to measurably change bitterbrush, mountain mahogany, or sagebrush shrub habitats. Given that there would be minimal direct, indirect or cumulative effects from this project, there would be NO IMPACT (NI) to this species.

UPLAND SANDPIPER

Existing Condition

In the Blue Mountains, upland sandpiper habitat is large flat or gently rolling expanses of grassland in mountain valleys and open uplands with small creek drainages and wet to dry meadows (Akenson and Schommer 1992). Use areas have a wide diversity of plants, and forb abundance is particularly important. They often use stringer meadows, which generally are at least 125 acres. Bear Valley and Logan Valley to the east have supported breeding populations, but numbers have declined dramatically since the late 1980s/early 1990s. The reasons for the declines are uncertain.

There are no known sightings of sandpipers within the project area. Surveys have not been conducted specifically for this species on either federal or private lands. Meadow habitats are smaller than the recommended 125 acres. Compared to the extensive habitat in Bear and Logan Valley there is limited suitable upland sandpiper habitat. Therefore, use is expected to be occasional and random within the TFSR project area.

Environmental Consequences - Direct and Indirect Effect

No Action

Under the No Action Alternative, there would be no new management activities; therefore, there should be no direct or indirect effects to upland sandpipers or their habitat.

Action Alternatives

The proposed activities will not enter meadow habitats; therefore, no impacts to upland sandpipers would be expected.

Cumulative Effects

All Alternatives

Major threats to breeding habitat are from predation, forest succession and livestock grazing (NatureServe 2006). All of the activities in **DEIS Appendix N** have been considered for their cumulative effects on upland sandpipers. Few management activities would affect sandpiper habitat.

Prescribed burning, grazing, or mowing can be used to provide essential nesting conditions, but these activities can be detrimental if conducted inappropriately.

Livestock grazing and agricultural activities can influence sandpiper habitat, although as stated previously, management activities can be compatible with sandpiper management. Salvage logging of private timberlands has had little effect on sandpiper habitat.

Neither the No Action nor the Action Alternatives would contribute additive adverse effects.

Determination

Neither the No Action alternative or the Action Alternatives are expected to measurably change upland sandpiper habitat; therefore, there would be NO IMPACT (NI) to this species.

BOBOLINK

Existing Condition

Bobolinks are found in native and tame grasslands, hay fields, lightly to moderately grazed pastures, no-till cropland, small-grain fields, wet meadows, and planted cover (Dechant et al., 2001). If habitat is not maintained, use by bobolinks declines significantly, possibly due to the accumulation of litter and encroachment of woody vegetation. Bobolinks respond positively to properly timed burning or mowing treatments, and moderate grazing.

Bobolinks are very local and scattered in the eastern one-third of Oregon and are known to breed on the Malheur National Wildlife Refuge, south end of Blitzen Valley, Harney County, Union County, and Wallowa County (Marshall 1996). Meadows exist in the project area, but they tend to be small or habitat is naturally dry and low in productivity. Bobolinks have not been reported in the project area. No surveys for bobolinks have been conducted.

Environmental Consequences - Direct and Indirect Effect

No Action

Under the No Action Alternative, there would be no new management activities; therefore, there should be no direct or indirect effects to bobolinks or their habitat.

Action Alternatives

The proposed activities will not enter meadow habitats; therefore, no impacts to bobolinks would be expected.

Cumulative Effects

All Alternatives

All of the activities in **DEIS Appendix N** have been considered for their cumulative effects on bobolinks. Few management activities would affect bobolink habitat.

In the Thorn area, bobolink habitat overlaps many of the same habitats as those available to upland sandpipers; therefore, cumulative effects from past, ongoing and reasonably foreseeable future activities are similar to those described in the Upland Sandpipers, Cumulative Effects section. Livestock grazing is likely to have the most influence on habitat, but at moderate grazing levels, grazing can be compatible with bobolink management.

Neither the No Action nor the Action Alternatives would contribute additive adverse effects.

Determination

Neither the No Action alternative or the Action alternatives are expected to measurably change bobolink habitat; therefore, there would be NO IMPACT (NI) to this species.

3.5.8 THREATENED, ENDANGERED LISTED AND SENSITIVE SPECIES DETERMINATIONS SUMMARY

Table 105. Summary of Determinations.

Species	Status	Alternative 1	Alternative 2	Alternative 3
Gray wolf	Endangered	No Effect	No Effect	No Effect
Bald eagle	Threatened	No Effect	No Effect	No Effect
Canada lynx	Threatened	No Effect	No Effect	No Effect
Wolverine	Sensitive	No Impact	MIIH	MIIH
Western sage grouse	Sensitive	No Impact	No Impact	No Impact
Gray flycatcher	Sensitive	No Impact	No Impact	No Impact
Upland sandpiper	Sensitive	No Impact	No Impact	No Impact
Bobolink	Sensitive	No Impact	No Impact	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

3.5.9 FEATURED WILDLIFE SPECIES

CALIFORNIA BIGHORN SHEEP

Existing Condition

Bighorn Sheep inhabit steep, mountainous terrain often with rock outcrops and cliffs. They prefer open, non-forested areas which allow them to identify danger from a distance. Bighorn sheep tend to congregate outside the fire area on Aldridge Mountain to the west and McClellan Mountain to the east. Much of the fire area has been identified for potential use by bighorn sheep, both as foraging and connectivity habitat. Animals occasionally pass through the burn area, when traveling between the Aldrich and McClellan Inventoried Roadless Areas. They are usually found up on the rimrock as it provides better protection from predators. ODFW 2004 spring surveys of the McClellan sub-population recorded a total of 53 sheep. However, the surveys were incomplete due to weather. The fire has opened up stands and increased visibility. As with elk and deer, aerial seeding combined with natural recovery of ground vegetation will increase forage habitat.

Habitat trend information derived from Interior Columbia Basin studies (Wisdom et al. 2000) indicated that about 70 percent of the watersheds in the Blue Mountains showed a decreasing trend in bighorn sheep habitat and 30 percent showed an increasing trend. Bighorn sheep populations declined substantially throughout their geographic range in the late 1800s and early 1900s. However because of the establishment of hunting regulations, better understanding of disease transmission, and concentrated reintroduction efforts, bighorn numbers have steadily increased over the last 50 years (Wisdom et al. 2000).

Environmental Consequences - Direct, Indirect, and Cumulative Effects

No Action Alternative

There would be no direct adverse effects to Bighorn sheep from Alternative 1 because no salvage logging or fuels reduction activities would occur.

Action Alternatives

Under both action alternatives, roads reopened for the project will be closed after treatment. Generally, road closures reduce the potential for disturbance of foraging sheep; however, site-specific effects are difficult to assess in the Thorn Fire area due to the inability to predict if and where sheep will forage until vegetation is restored. No adverse impact to this species is expected due to harvest activities within the project area (ODFW, Miller comm.).

Aerial seeding combined with natural recovery of ground vegetation will increase forage habitat.

There would be no indirect or direct effects to big horn sheep because they tend to concentrate outside the area and only use the burn area as a travel corridor between Aldrich and McClellan Inventoried Roadless Areas. ODFW biologist conclude that the logging may alter travel patterns but effects are minimal and short term (1-2 year) and will not have an overall effect on population viability

Cumulative Effects

All of the activities in **DEIS Appendix N** have been considered for their cumulative effects on California Bighorn Sheep. Alternatives 2 and 3 also leave some burn areas untreated, but salvage logging and fuels reductions reduce overall fuel loads and break up the continuity of fuels remaining.

Summary

Neither the No Action alternative nor the Action alternatives are expected to affect populations or viability of Bighorn sheep.

NORTHERN GOSHAWK

Existing Condition

The northern goshawk inhabits conifer-dominated forests. Goshawks utilize a wide range of forest structural conditions, often hunting prey in more open stands, yet relying on mature to old growth structure for nesting and fledging. Nests are commonly on north aspects in drainages with dense canopy (60-80%), in large trees, and near water or other forest “edges” (Reynolds et al. 1992 and Marshal 1992).

Habitat trend information derived from Interior Columbia Basin studies (Wisdom et al. 2000) indicated that about 50 percent of the watersheds in the Blue Mountains showed a decreasing trend in goshawk habitat and 35 percent showed an increasing trend. Breeding Bird Survey (BBS) data suggests stable populations in western North America from 1966 through 1995; trend information derived from a study in the southwest indicated a 4 percent annual decline in populations (Wisdom et al. 2000).

Post-fire, it is highly unlikely that goshawks will use the interior portion of the fire area for nesting, as forested stands with 60 to 80 percent canopy cover and suitable trees no longer exist. It is likely that goshawks will forage in the burn area. In light to moderately burn areas, fires typically improve foraging habitat for raptors by reducing hiding cover and exposing prey populations (Smith 2000). In the more severely burned areas, it is uncertain to what degree goshawks will use these areas for foraging because of the loss of cover; limited literature is available.

No nesting goshawks were identified within or immediately adjacent to the burn perimeter. Foraging goshawks have been periodically sighted in the fire area; it is assumed that these individuals are taking advantage of the improved foraging conditions. Surveys would be conducted in spring of 2007 and 2008 in mature and old growth stands suitable for nesting. The area would be monitored annually for goshawk activity as needed. If active nest sites are identified during the 2007/2008 surveys, within or immediately adjacent to the project area, including along haul routes, the nest stand would be protected with a 30 acre buffer.

Environmental Consequences - Direct and Indirect Effects

No Action

There would be no direct/indirect adverse effects to goshawks from Alternative 1 because no salvage logging or fuels reduction activities would occur. Reforestation of the area would be dependent on natural regeneration, which would delay development of future forest including mature and old growth forest. See Old Growth section for the time it would take to reestablish old growth. Because goshawks will prey on dead wood associated species, retention of large quantities of snags and down logs will provide goshawks high quality foraging habitat.

Action Alternatives

Some live trees would be removed for helicopter landings and to reduce safety hazards, but effects would be considered incidental. The action alternatives would positively affect northern goshawk habitat by accelerating reforestation so that stands would become mature sooner than if no action was taken (see Old Growth section for the time it would take to reestablish old growth).

Although the fire destroyed suitable nesting habitat within the burn area, goshawks may establish nests in unburned stands located outside the fire perimeter. If active nest sites are identified during the 2007/2008 surveys, within or immediately adjacent to the project area, including along haul routes, the nest stand would be protected with a 30 acre buffer, but a seasonal restriction would not be applied due to expediency of the project timeline. The project economic viability would be adversely affected if log haul is restricted during the period April 1 to September 30.

A Forest Plan amendment (See WL-7 in Chapter 1) would permit log haul during the breeding season, even if a new nest site is located. The Forest Plan Amended Standard would state that log haul would not be restricted if a nest site is found adjacent to a haul route. All other protections would remain in force as noted in the Regional Foresters Amendment #2. This amendment would apply only for the duration of, and to those actions proposed for the site-specific project called Thorn Fire Salvage Recovery Project.

As goshawks are highly sensitive to disturbance during the breeding season (April 1 to September 30) this management activities could potentially cause a goshawk to abandon a nest for the year and cause it to not reproduce. There are currently 53 known goshawk territories that are being tracked on the southern half of the Blue Mountain Ranger District (i.e., south of the John Day valley), so even in the event that a goshawk does get pushed off a nest in the TFSR project area this would not affect the species viability.

Salvage harvest would reduce foraging habitat by removing snag habitats that can support goshawk prey. Because goshawks will prey on primary cavity excavators, retention of dead wood habits will help improve goshawk foraging habitat. Goshawks prey on a variety of small mammal species as well; as snags fall and vegetation recovers, habitat for these prey species will improve. The greater the number of snags retained, the better the goshawk foraging habitat. The action alternatives prescribe different snag densities (see Primary Cavity Excavator section of this chapter). In salvage units, Alternative 2 and 3 would retain 3 large snags per acre in excess of Forest Plan standards. Adult goshawks foraging in the area are not likely to be disturbed by project activities.

Research (Reynolds et al. 1992 and Marshal 1992) varies on conclusions as to the effects of salvage harvest in and adjacent to nest stands and whether or not goshawks will use these stands following harvest. Several studies (Marshal 1992) have suggested that selection harvest of trees can reduce nesting; however, it is unclear whether restricting harvest to dead trees would have a similar effect. Goshawk management recommendations by Reynolds et al. (1992) do not exclude timber harvest.

Under both action alternatives, roads reopened for the project will be closed after treatment. Generally, road closures reduce the potential for disturbance of nesting birds; however, site-specific effects are difficult to assess in the Thorn Fire area due to the inability to predict if and where goshawks will nest until vegetation is restored.

Alternatives 2 and 3 also leave some burn areas untreated, but salvage logging and fuels reductions reduce overall fuel loads and break up the continuity of fuels remaining.

Cumulative Effects

All of the activities in **DEIS Appendix N** have been considered for their cumulative effects on northern goshawk. The following discussion focuses on those past, ongoing and reasonable foreseeable future activities that may contribute adverse effects to the species or its habitat.

Nesting habitat is typically the limiting factor for goshawks. Since 1993, the Forest Plan as amended, has directed the Malheur National Forest to conduct timber sales in a manner that moves stands towards OFMS and OFSS structural stages, and timber sales planned since that time should not have contributed to loss of mature and old growth forest.

In the past, adjacent private timber stands have generally not provided nesting habitat for goshawks. These stands are not being managed for old growth conditions, and therefore are not expected to provide nesting habitat in the future.

Forage is not considered a factor limiting goshawk population viability, and consequently cumulative changes to foraging habitat, whether positive or negative, would not contribute to a measurable change in goshawk populations.

Goshawks are highly sensitive to disturbance during the breeding season. When seasonal restrictions on management activities were disregarded in the past, breeding success may have been reduced. Since 1990, seasonal restrictions on activities have been regularly used in the vicinity of occupied nests.

In the short-term, the two action alternatives would not contribute to cumulative losses of mature and old growth habitat because stands treated no longer function as old growth. In the long-term, the action alternatives would contribute positively to cumulative effects by accelerating the development of old growth, i.e. goshawk nesting habitat. Cumulatively, management actions, including disturbance, are not expected to reduce population viability.

Summary

Neither the No Action alternative nor the Action alternatives are expected to affect populations or viability of northern goshawks. The Shake Table Fire Complex already reduced or eliminated potential nesting habitat. Harvest does not change live tree canopy; alternatives harvest few live trees. Removal of dead and dying trees would reduce snag habitat used by goshawk prey, but forage, particularly in the fire area, is not considered a limiting factor for goshawks.

Although the fire destroyed suitable nesting habitat within the burn area, goshawks may establish nests in unburned stands located outside the fire perimeter. There are no known goshawk nest sites existing within or adjacent to the project area. Surveys would be conducted in spring of 2007 and 2008 in mature and old growth stands suitable for nesting. The area would be monitored annually for goshawk activity as needed. If active nest sites are identified during the 2007/2008 surveys, within or immediately adjacent to the project area, including along haul routes, the nest stand would be protected with a 30 acre buffer, but a seasonal restriction would not be applied due to expediency of the project timeline.

A Forest Plan amendment (See WL-7 in Chapter 1) would permit log haul during the breeding season, even if a new nest site is located. The Forest Plan Amended Standard would state that log haul would not be restricted if a nest site is found adjacent to a haul route. All other protections would remain in force as noted in the Regional Foresters Amendment #2. This amendment would apply only for the duration of, and to those actions proposed for the site-specific project called Thorn Fire Salvage Recovery Project.

As goshawks are highly sensitive to disturbance during the breeding season (April 1 to September 30) this management direction could potentially push a goshawk off the nest and cause it to not reproduce. There are currently 53 known goshawk territories that are being tracked on the southern half of the Blue Mountain Ranger District (i.e., south of the John Day valley), so even in the event that a goshawk does get pushed off a nest in the TFSR project area this would not affect the species viability.

By planting trees, the action alternatives would accelerate recovery of vegetation; in severely burned areas, development of nesting habitat could take 10 to 40 years less than under the No Action alternative.

BLUE GROUSE

Existing Condition

Blue grouse inhabit coniferous forests intermixed with grassy or scabby openings. They use large mistletoe infected Douglas-fir trees, generally located within the upper 1/3 of slopes, as winter roosts.

Habitat trend information derived from Interior Columbia Basin studies (Wisdom et al. 2000) indicated that about 80 percent of the watersheds in the Blue Mountains showed a decreasing trend in blue grouse habitat and 10 percent showed an increasing trend. Declines in source habitat are primarily attributed to a reduction in late seral forest. No population data is available, but populations are likely lower than they were historically (Wisdom et al. 2000).

Pre-fire, blue grouse likely inhabited the project. Post-fire, there is little or no habitat within the burn area considered suitable for winter roost habitats; however, nesting habitat will be available once a variety of grasses and forbs becomes established and provide hiding cover.

Environmental Consequences - Direct, Indirect, and Cumulative Effects

No Action

Relying on natural regeneration to reforest the burn area would delay development of mature and old growth trees. Blue grouse favor mature/over-mature trees as winter roosts. Since fuels would not be treated under Alternative 1, there is the high risk of an intense re-burn that could delay recovery of vegetation.

Action Alternatives

Direct effects of salvage logging and fuels reduction would be disturbance to blue grouse nesting/foraging in the project area, forcing them out of activity areas and into adjacent undisturbed areas. Generally, trees expected to survive the fire would be retained, even if they were infected with mistletoe; only incidental live trees would be removed for safety or operational reasons during logging. Indirect effects to blue grouse could be increased competition for nesting/foraging habitat outside the burn area. It is assumed that salvage logging and fuels reduction activities will have minimal effects on blue grouse, as there is little habitat favored by blue grouse remaining within the burn area. Ground vegetation for nesting/foraging is expected to recover rapidly. Grasses and forbs are expected to reestablish naturally in 2 to 5 years; shrubs are expected to reestablish in 2 to 15 years. Blue grouse favor mature/over-mature trees as winter roosts; planting trees would accelerate development of mature and old growth trees.

Cumulative Effects

All of the activities in **DEIS Appendix N** have been considered for their cumulative effects on blue grouse. Cumulatively, where livestock grazing coincides with nesting/foraging, grazing would likely reduce height of ground vegetation and possibly degrade nesting/foraging habitat. The alternatives under this proposal contribute minimal adverse effects to ground vegetation recovery.

Summary

Neither the No Action alternative nor the Action alternatives are expected to affect populations or viability of blue grouse.

3.5.10 WILDLIFE SPECIES OF CONCERN

LANDBIRDS INCLUDING NEOTROPICAL MIGRATORY BIRDS (NTMB)

Existing Condition

Neotropical migratory birds breed in temperate North America and spend the winter primarily south of the United States-Mexico border. Of the 225 migratory birds that are known to occur in the western hemisphere, about 102 are known to breed in Oregon and about 82 are known to breed on the Malheur National Forest. They include a large group of species, including many raptors, cavity excavators, warblers and other songbirds, with diverse habitat needs spanning nearly all plant community types and successional stages. Long-term population data on many of these birds indicate downward population trends although not all species populations are declining (Sharp 1996, Saab and Rich 1997, Altman 2000, USFWS 2002). Habitat loss is considered the primary factor in decline of neotropical migratory birds.

In 2000, the Oregon-Washington Chapter of Partners in Flight published its Northern Rocky Mountains Bird Conservation Plan (Altman 2000). The Plan provides conservation recommendations for the various species of landbirds that occupy the Oregon and Washington portions of the Interior Columbia Basin. The Plan identified the following priority habitats for landbird conservation: old-growth dry forest, old growth moist forest, riparian woodland and shrubland, and unique habitats including alpine and subalpine forests, shrub-steppe, montane meadow and aspen habitats. The Conservation Plan also identified burned old forest as a limited habitat due to fire suppression; the Shake Table Fire Complex has obviously created a large amount of burn habitat that could provide for various landbird species.

Some neotropical migratory birds respond positively to fire, while others respond negatively in burned areas. However, generally, species richness and overall species abundance tends to decrease. Discussion will only focus on those habitats that exist in the project area now or that existed prior to the fire.

Old Growth Dry Forests

The dry forest types refer to the dry ponderosa pine dominated habitats and the dry mixed conifer habitats, i.e., conifer stands of ponderosa pine, Douglas-fir, and/or grand fir. The majority of the forest acres in the Thorn area are classified as dry forest types.

The Conservation Strategy (Altman 2000) identifies four habitat components of the dry forest types that are important to landbirds; old forest single stratum (OFSS), OFSS with patches of regenerating pines, OFSS with grassy openings, and burned habitats. Because of past timber harvest and fire suppression, all old growth was classified as old forest multiple strata (OFMS) rather than old forest single stratum (OFSS). Prior to the fire, burned old forest was also lacking, as fire suppression had all but eliminated the influence of this disturbance factor in the project area. Large-scale declines in OFSS have raised concern for such species as the white-headed woodpecker, flammulated owl, white-breasted nuthatch, pygmy nuthatch, Williamson’s sapsucker, and Lewis’ woodpecker. These bird species have likely suffered some of the greatest population declines and range retractions (Altman 2000).

The fire converted essentially all, except approximately 14%, mature and old growth stands to early or very early successional stages (see Old Growth Section). Dense understory thickets and regeneration patches burned extensively, although patches remain scattered throughout the area.

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 adversely affected may include the pine siskin, golden-crowned kinglet, mountain chickadee, hermit thrush, ruby-crowned kinglet, yellow-rumped warbler, and western tanager.

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. The Primary Cavity Excavator Section describes woodpecker, sapsucker and flicker species in more detail; most of these species respond positively to the fire.

Riparian Woodlands and Shrublands

Riparian woodlands and shrub habitats are typified by the presence of hardwood tree and shrub species, along with associated wetland herbaceous species. Water is obviously an important component of these habitats, whether it is in the form of standing wetlands, spring and seeps, or flowing water (rivers and streams). 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 Conservation Strategy (Altman 2000) identifies three habitat components within the riparian woodlands and one within the riparian shrub habitats that are important to many landbirds. They include large snags, canopy foliage cover, understory shrub cover, and dense shrub patches. In addition, the Conservation Strategy identifies aspen and montane grasslands as unique habitats important to landbirds. In the Thorn area, many of these habitats are associated with riparian areas or ephemeral draws.

Degraded riparian habitats have likely affected such landbird species as Lewis' woodpecker, red-naped sapsucker, downy woodpecker, red-eyed vireo, willow flycatcher, ash-throated flycatcher, tree swallow, house wren, swainson's thrush, calliope hummingbird, song sparrow, spotted towhee, western wood pewee, warbling vireo, American redstart, orange-crowned warbler, and mountain chickadee.

Mapped fire severity shows that degree of burn in riparian areas was variable. The fire likely improved habitats for species that use riparian snags, such as the Lewis woodpecker and downy woodpecker. Initially, the fire likely reduced habitat for species such as the red-eyed vireo, veery and willow fly catcher; however, species are expected to recover rapidly as hardwood shrubs recover.

Shrub-steppe Habitats

Shrub-steppe habitats are comprised primarily of dry woodlands, shrublands and grasslands. Dry shrublands/grasslands comprise approximately 72 acres of the project area. The project area provides limited shrub-steppe habitats as compared to the large expanses of habitat in Bear Valley to the east or habitat on BLM and ODFW lands to the west. Within the fire area, the shrub-steppe habitats burn in a mosaic pattern depending on vegetation patterns and fire behavior. Unburned islands of sagebrush can retain habitat features vital to species such as vesper and Brewer's sparrow. Given, the small extent of habitat within the project area, the wildfire likely had minimal effect on species that depend on these semi-arid environments.

Environmental Consequences -Direct and Indirect Effects

No Action

The fire removed large expanses of forest, including nearly all the mature and old growth habitat, except approximately 14 percent. 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 burn areas. Delays in reforestation under the no action alternative would delay recovery of forest canopy, with adverse effects to landbird species that feed and nest in forest canopies. 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 Primary Cavity Excavator section describes effects to cavity excavators in detail.

The fire reduced riparian vegetation. Initially, many landbirds associated with these habitats likely 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 2 to 5 years; shrubs are expected to reestablish in 2 to 15 years. Population numbers for grass and shrub nesting neotropical migratory birds is expected to remain stable or increase due to recovery of ground vegetation, both inside and outside riparian areas. Species such as the willow flycatcher, red-eyed vireo and western meadowlark, would likely respond positively.

Juniper woodlands/sagebrush shrublands comprise approximately 72 acres of the project area. Given, the small extent of these habitats, the wildfire likely had minimal effect on landbird species that depend on these environments. Recovery of sagebrush habitats is dependent on the severity of the burn. Because sagebrush does not sprout from underground buds, these communities can require several decades to establish post-fire vegetation composition and structure similar to that on unburned sites (Smith 2000). A mosaic burn, such as occurred in much of the Thorn sagebrush communities, can accelerate recovery of these habitats as compared to completely burned areas.

Action Alternatives

Salvage logging is known to further reduce species richness in burn areas (Sexton 1998). Raphael and White (1984) reported that in their studies that species richness declined only in the most severely salvaged burns, although even partial salvaging altered species composition.

Salvage logging between May and August, the primary nesting season, would present the highest risk to any neotropical migratory birds nesting in the area. Some individual birds could be directly affected, but this should not be a significant number and would not affect populations or viability.

At a minimum, it is expected that removal of snags would have a negative effect on population numbers of cavity nesting landbirds including neotropical migratory species (see Primary Cavity Excavator Species section). Direct effects would primarily be displacement from nests by removal or destruction of nest structures (snags, ground nests) during salvage operations. The degree of impact varies by alternatives and is best correlated with the number of acres treated. Alternatives 2 and 3, propose timber salvage on 3,907 acres, and 2,769 acres respectively.

The action alternatives would accelerate reforestation of the project area through planting conifers. Reforestation would reestablish trees in the burn area within 5 years. 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 even remotely mimic pre-fire conditions. Habitat for species that require mature or old growth conditions may take 75 to 150+ years to develop (see Old Growth discussion).

In riparian areas, no salvage logging or fuels reduction activities are proposed under any of the action alternatives. Where open roads are located in riparian areas, danger trees may be felled. Direct effects to riparian landbirds, including neotropical migratory species, are likely to be minimal due to the short timeframe expected to complete these activities and the low percent of overall acres being treated. 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.

Juniper woodland, shrub-steppe and grassland habitats would not be treated under any of the alternatives. Neotropical migratory species that utilize these habitats would not be adversely affected. Effects would be as described for the No Action alternative.

Cumulative Effects

The following discussion focuses on those past, ongoing and reasonable foreseeable future activities that may contribute adverse effects to the landbirds or their habitat. See DEIS Appendix N).

Habitat loss is considered the primary factor in decline of neotropical migratory birds. Previous sections identified high priority habitats for conservation of neotropical migratory birds: old-growth dry and moist forest types including burn habitats, riparian woodland and shrubland, and juniper woodlands.

Cumulative effects on mature and old growth coniferous forest are discussed in the Old Growth section, and conclude that the action alternatives would have varying positive effects for mature and old growth habitat and for the species that use those habitats.

Cumulative effects to snag and related post-fire habitat are discussed in the Primary Cavity Excavator Species section. Snag habitat would be reduced under both action alternatives, although less in Alternative 3.

Riparian vegetation within and adjacent to the TFSR project area has been altered by many years of livestock grazing, primarily earlier in this century, that concentrated use in riparian areas; and by suppressing historical fire regimes that allowed encroachment of conifers, which shaded out hardwoods. Livestock grazing also negatively affected grasslands by reducing native species' abundance and diversity. The condition of some riparian areas and grasslands has been improved by new management practices and restoration activities in more recent years, but many are still not fully restored to conditions that are most suitable for associated native wildlife species.

Shrub-steppe habitats have probably changed due to 100 years of fire suppression. Other conifer species have encroached on these habitats, reducing their size. On residual acres, juniper density probably has increased. Livestock grazing, primarily early in the century, may have caused changes in shrub, grass and forbs composition or abundance. Juniper woodland and shrubland habitats are very limited in the project area. No management activities are proposed, and natural recovery rates from the fire are expected.

Adjacent private lands have already been salvage logged. Reforestation is required where commercial timber harvest has occurred and the land is left under-stocked. Private lands are not typically managed to maximize wildlife habitat; therefore, habitat needs become more demanding on federal lands. Private lands likely provide for neotropical migratory birds at lower levels than the federal lands.

Future projects would have to abide by existing management direction to maintain or enhance mature and old growth habitat, maintain snags and down log standards, and protect or enhance riparian areas, grassland and woodland communities. Future planning will consider potential effects to neotropical migratory birds.

In the mid- to long-term, the effects of this project, when combined with the effects of past, present and reasonably future projects, would be considered neutral to favorable to landbirds.

Summary

Alternatives would not be expected to reduce viability of any landbird species including neotropical migratory species. The primary effect of the action alternatives would be to reduce snag habitats; the Primary Cavity Excavator section summarizes effects to landbirds that use these habitats. Action alternatives propose few to no activities within riparian areas, grasslands, and juniper woodlands, habitats considered a high priority for landbird conservation. Therefore, all other adverse affects to landbird species, including neotropical migratory species, would be considered minimal.

By planting trees, the action alternatives would accelerate recovery of vegetation; in severely burned areas, regeneration of conifer trees could take 10 to 40 years less than under the No Action alternative.   Alternatives 2 and 3 also leave some burn areas untreated, but salvage logging and fuels reductions reduce overall fuel loads and break up the continuity of fuels remaining.

3.5.11 CONSISTENCY WITH FOREST PLAN DIRECTION AND REGULATIONS

The Malheur National Forest Plan objective for old growth is to provide suitable habitat for old growth dependent wildlife species, ecosystem diversity and preservation of aesthetic qualities. Regional Forester's Eastside Forest Plan Amendment #2 provided additional direction to protect existing late and old structure (LOS) stands and to manipulate vegetation that currently does not classify as LOS towards LOS. All alternatives are consistent with the Forest Plan, as amended. None of the alternatives will reduce old growth habitat remaining after the fires. Only incidental live trees will be cut. Natural regeneration and planting are expected to revegetate forest although at different rates. Planting accelerates recovery of vegetation and development of old growth. Although changes in MA-13 Old Growth and MA-1 General Forest designations will require a non-significant Forest Plan amendment, these changes remain consistent with the Forest Plan, as amended. All alternatives meet old growth connectivity standards in the Regional Forester's Eastside Forest Plans Amendment #2.

Management Area 20A – Dry Cabin Wildlife Emphasis Area-with scheduled timber harvest. Due to the catastrophic nature of the Shake Table Complex fire, timber harvest would occur in order to rapidly recover economic value of the dead and dying trees. Actions will have short term effects on individual wildlife species but will not affect the species population viability. Planting efforts will accelerate habitat.

Management Area 21 – Wildlife Emphasis Area with non-scheduled timber harvest. We are proceeding without a long term wildlife management plan despite that we are meeting most Forest Plan wildlife standards. The existing standard states: Forest Plan Standard #10, p. IV-133,- Exclude scheduled timber harvest. Lands are classified as "unsuitable" for timber management. Harvest may occur to accomplish wildlife habitat or fish habitat objectives, as established in a project-level environmental analysis. The need for the amendment is that the economic value of the dead and dying trees need to be recovered as rapidly as practicable to maximize potential economic benefits. The amended standard state that "lands are classified as "unsuitable for timber harvest", however, due to the catastrophic nature of the Shake Table Complex fire, timber harvest would occur in order to rapidly recover economic value of the dead and dying trees." This amendment would apply only for the duration of, and to those actions proposed in MA-21 for the site-specific project called Thorn Fire

Salvage Recovery Project. Actions will have short term effects on individual wildlife species but will not affect the species population viability. Planting efforts will accelerate habitat.

The Malheur Forest Plan was amended in 1995 by Regional Forester's Forest Plan Amendment #2 (commonly referred to as the "Eastside Screens"). Eastside Screen wildlife standard at 6d(2)(a). The existing standard at 6d(2)(a): Maintain all remnant late and old seral and/or structural live trees >=21"dbh at currently exist within stands proposed for harvest activities. The need for the amendment is to modify East Side Screens wildlife standard at 6d(2)(a) to define both live and dead trees. The amended standard state: (a) Maintain all remnant late and old seral and/or structural live trees >=21" diameter at breast height that currently exist within stands proposed for harvest activities. A live tree is defined as a tree rated to have a high or moderate probability to survive the effects of a fire as determined by the ``Factors Affecting Survival of Fire Injured Trees: A Rating System for Determining Relative Probability of Survival of Conifers in the Blue and Wallowa Mountains'' (Scott et al. 2002, as amended) (commonly referred to as the Scott Guidelines). This amendment would apply only for the duration of, and to those actions proposed for the site-specific project called Thorn Fire Salvage Recovery Project.

All alternatives would meet or exceed Forest Plan snag standards, i.e., 2.39 snags per acre, 21 inches DBH or greater. Large down logs do not meet Forest Plan standards as a result of the fire, at least in the severely- and moderately-burned areas. In the action alternatives, PDFs have been incorporated to retain all existing down logs required to meet the standards. As snags begin to fall, down log levels would increase thereby increasing denning, nesting, and feeding habitat for down wood dependent species. In all stands, including harvest units, stands would be expected to meet or exceed Forest Plan standards once snags fall.

Studies show that cavity dependent species select nest sites with higher tree densities and cavity nesters as a group prefer patches of snags as opposed to single snags retained in uniform, even spaced distribution (Rose et al, 2001, Saab et al, 2002, Kotliar 2002).

All alternatives are consistent with the 1918 Migratory Bird Treaty Act (MBTA) and the Migratory Bird Executive Order 13186. Alternatives were designed under current Forest Service policy for landbirds. The Northern Rocky Mountains Bird Conservation Plan (Altman 2000) and the U.S. Fish and Wildlife Service's Birds of Conservation Concern (USFWS 2002) were reviewed for effects disclosure. Salvage logging and other vegetation management cannot completely avoid unintentional take of birds, no matter what mitigations or PDFs are imposed on the activities. Project design features such as retention of snags and down logs, retention of live trees, and avoidance of riparian areas, grasslands and juniper woodlands proposed in this project will minimize take of migratory birds

All alternatives are consistent with the Endangered Species Act. Alternatives are expected to have No Effect on threatened and endangered species. Alternatives are expected to have a No Impact to all sensitive species except the California wolverine. In which case the action alternatives 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. Based on these effects calls, consultation with the US Fish and Wildlife Service was not considered necessary.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The loss of snags would be an irretrievable loss until replacements function as snags. There are no other irreversible or irretrievable commitments of resources associated with wildlife or wildlife habitat that may result from the implementation of alternatives.

3.6 FISHERIES

3.6.1 INTRODUCTON

This fisheries specialist analysis / Biological Evaluation (BE) satisfies requirements of Forest Service Manual 2672.4 requiring the Forest Service to review all its planned, funded, executed or permitted programs and activities for possible effects on proposed, endangered, threatened or sensitive species. The BE process is intended to review the TFSR Project in sufficient detail to determine effects of alternatives on species in this evaluation and ensure proposed management actions would not:

- Likely jeopardize the continued existence, or cause adverse modification of habitat, for a species that is proposed (P) or listed as endangered (E) or threatened (T) by the USDI Fish and Wildlife Service or NOAA National Marine Fisheries Service; or

- Contribute to the loss of viability for species listed as sensitive (S) by USDA Forest Service, Region 6, or any native or desired, non-native species; nor cause any species to move toward federal listing (FSM 2672.4).

The following sources were used during the pre-field review phase to determine the presence or absence of TES species in TFSR project area:

- Malheur N.F. GIS database
- Regional Forester's (R6) sensitive animal list
- Forest Service stream survey reports, Blue Mountain Ranger District, John Day, OR

The following analysis addresses the potential effects of the TFSR Project on threatened, endangered, and sensitive fish species. This determination, required by the Interagency Cooperation Regulations (Federal Register, January 4, 1978), ensures compliance with the ESA.

ANALYSIS AREA DESCRIPTION

The Malheur National Forest Land and Resource Management Plan (Forest Plan) as amended (USDA 1990), provides direction to protect and manage resources. Of special interest are Forest Plan amendment 29 and PACFISH (1995). Recommendations regarding fisheries habitat within the TFSR project area would adhere to this regulatory framework.

The analysis area encompasses all fish habitats that have the potential for effects from the TFSR project. Information was compiled from stream surveys based on Region 6 Stream Survey protocol (1993) and Malheur National Forest Geographic Information System. The Existing Condition was evaluated qualitatively, based on the principles of applied fisheries and watershed science, professional judgment and knowledge of the area.

The proposed project would occur within the 110,887 acre Fields Creek watershed and the 84,936 acre Murderer's Creek watershed. The Fields Creek watershed is composed of 2 subwatersheds within the Shake Table Fire Complex perimeter and the Murderer's Creek watershed is composed of two subwatersheds within the fire perimeter. Middle Columbia Steelhead (*Oncorhynchus mykiss*) is a federally listed threatened species. Redband trout (*Oncorhynchus mykiss*) and westslope cutthroat trout (*Oncorhynchus clarki lewisi*) are on the Regional Forester's sensitive species list. These three species exist within the project boundary. Critical habitat for Middle Columbia Steelhead is also designated within both the Fields Creek and Murderer's Creek watersheds. These species would be used to analyze the effects to aquatic fish habitats, including other native species associated with similar habitats.

Based on topography, drainage patterns and the effects analysis, the project analysis area includes the following streams: Buck Cabin Creek, Cabin Creek, Dry Duncan Creek, Duncan Creek, East Fork Dry Creek, Fields Creek, Thorn Creek, Todd Creek, West Fork Dry Creek, Wickiup Creek and Widows Creek.

Wickiup, Widows, Fields, Buck Cabin, Todd and Duncan Creeks are all fish-bearing streams and are protected by 600-foot wide (total width) RHCAs (as defined within PACFISH). RHCA widths along other streams in the project area vary depending on whether streamflow is perennial or intermittent.

All four subwatersheds in the TFSR Project area meet the three criteria for PACFISH Key Watersheds. The intent of designating Key Watersheds is to provide a pattern of protection across the landscape where habitat for anadromous fish would receive special attention and treatment. Priority within these watersheds would be to protect, or restore habitat for listed stocks, stocks of special interest or concern, or salmonid assemblages of critical value for productivity or biodiversity**.** Criteria considered to designate Key Watersheds are:

- Watersheds with stocks listed pursuant to the ESA, or stocks identified in the 1991 American Fisheries Society report as “at risk” or subsequent scientific stock status reviews; or,
- Watersheds that contain excellent habitat for mixed salmonid assemblages; or,
- Degraded watersheds with a high restoration potential.

3.6.2 AFFECTED ENVIRONMENT

STATUS OF LISTED AND FS SENSITIVE FISH SPECIES

Table 106 below is a summary of the USFWS Listed and FS Sensitive fish species considered for this analysis. Detailed species discussions are in subsequent sections.

Table 106. Threatened, Endangered, Sensitive and MIS fish species that may occur on the Malheur National Forest

Species	Status	Considered	Rationale
Bull Trout *(Salvelinus confluentus)*	Threatened MIS	No	Has not been documented in any streams in the analysis area
Middle Columbia Steelhead *(Oncorhynchus mykiss)*	Threatened MIS	Yes	Occurs in Wickiup Creek, two unnamed tributaries to Todd Creek and two unnamed tributaries to Duncan Creek
Steelhead Critical Habitat	Designated	Yes	Critical Habitat is designated within the analysis area on the John Day River, Widows Creek, Fields Creek, Wickiup Creek, Buck Cabin Creek, Cabin Creek, Todd Creek, Duncan Creek, Thorn Creek and Murderer’s Creek
Essential Fish Habitat	Designated	No	No salmon occur within the analysis area, therefore ESF does not occur
Malheur mottled sculpin *(Cottus bendirei)*	Sensitive	No	Has not been documented in any streams in the analysis area
Spring Chinook salmon (mid-Col. R. ESU) (*Oncorhynchus tshawytscha*)	Sensitive	No	Has not been documented in any streams in the analysis area
Westslope cutthroat trout (*Oncorhynchus clarki lewisi*)	Sensitive MIS	Yes	Occurs in Wickiup Creek and Buck Cabin Creek
Interior redband trout (*Oncorhynchus mykiss*)	Sensitive MIS	Yes	Occurs in Wickiup, Buck Cabin Creek, two unnamed tributaries to Todd Creek and two unnamed tributaries to Duncan Creek.

Middle Columbia Steelhead

Listing History

The Middle Columbia River steelhead Evolutionary Significant Unit (ESU) was listed as threatened on March 25, 1999 (64 FR 14517). The Middle Columbia River ESU encompasses Columbia River basin and tributaries upstream from and exclusive of the Wind River in Washington and the Hood River in Oregon, to and including the Yakima River in Washington. Recovery planning for Middle Columbia River steelhead is ongoing, and recovery planning status can be reviewed online at: http://research.nwfsc.noaa.gov/trt/trt_columbia.htm

Critical Habitat

Critical habitat was designated for Middle Columbia River steelhead on September 2, 2005 (70 FR 52630). NMFS designates critical habitat based on physical and biological features that are essential to the listed species. Essential features of designated critical habitat are: (1) substrate, (2) water quality, (3) water quantity, (4)water temperature, (5) water velocity, (6) cover/shelter, (7) food for juveniles, (8) riparian vegetation, (9) space, and (10) safe passage conditions (50 CFR 226.212). The three freshwater primary constituent elements of critical habitat are:

1. Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development;
2. Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks;
3. Freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

Critical Habitat is designated within the analysis area on Widows Creek, Fields Creek, Wickiup Creek, Buck Cabin Creek, Cabin Creek, Todd Creek, Duncan Creek, Thorn Creek and Murderer's Creek.

Life History

The Mid-Columbia River steelhead trout is named for the timing of their adult spawning run. The name "summer" refers to the time of year the fish enter the Columbia River for migration to the middle portion of the Columbia River, between Mosier Creek in Oregon and the Yakima River in Washington. First time spawning fish are generally 4-5 years old. Individuals are capable of spawning more than once before they die, though spawning more than twice is rare. Adult steelhead trout in this DPS spend up to one year in fresh water prior to spawning. These fish can utilize headwater areas for spawning purposes and require clean gravels with nearby resting pool habitat during the three to six week spring spawning period. Steelhead eggs incubate 1.5 to 4 months before hatching which varies with water temperature. Juveniles spend 1-4 (generally 2) years in fresh water before migrating to the ocean as smolts. While in the fresh water rearing stage, young steelhead prefer a water temperature range between 10-13° C, adequate pool habitat, and cover in the rearing streams.

Most steelhead trout spawning and rearing occurs in the second to fourth order streams in a forested environment. Even when small streams are not accessible to migrating fish, because of barriers or steep gradients, they are vitally important to the quality of downstream habitats.

Threats

The Middle Columbia River steelhead “threatened” listing has been attributed to a number of factors. Among them are dams, recreational and incidental commercial fishing, habitat modification, hatchery influences, and non-point source pollution.

Hydropower and other dams on the mainstem Columbia, Deschutes, White Salmon River and smaller river systems disrupt both upstream and downstream migrations and reduce historically available habitat. Impacts from inland recreational fishing can be important, particularly during low flow or drought periods, when reduced habitat availability concentrates fish. Steelhead are not generally targeted in commercial fisheries, but incidental harvest in mixed-stock sport and commercial fisheries in the Columbia River may exceed 30 percent of some listed populations. Agriculture, cattle grazing, mining, and forestry, have degraded and simplified habitat.

Action Area Information

Middle Columbia Steelhead are found within the analysis area in Wickiup Creek, two unnamed tributaries to Todd Creek and two unnamed tributaries to Duncan Creek.

Westslope Cutthroat Trout

Westslope cutthroat trout inhabit small mountain streams, main rivers, and large natural lakes. They require cool, clean, well-oxygenated water and prefer large pools and slow velocity areas. Juveniles of migratory populations may spend 1-4 years in their natal streams, and then move (usually in spring or early summer, and/or in fall in some systems) to a main river or lake where they remain until they spawn (Spahr et al. 1991, McIntyre and Rieman 1995). Many fry disperse downstream after emergence (McIntyre and Rieman 1995). Juveniles tend to overwinter in interstitial spaces in the substrate. Larger individuals congregate in pools in winter.

The John Day River basin has been identified as one of six major river basins in which interior Westslope cutthroat trout (*O. clarki lewisi*) reside. Westslope cutthroat trout spawn in small tributary streams on clean gravel substrate where mean water depth is 17-20 cm and mean water velocity is 0.3-0.4 m/sec. They tend to spawn in natal stream (McIntyre and Rieman 1995). Adfluvial populations live in large lakes in the upper Columbia drainage and spawn in lake tributaries. Fluvial populations live and grow in rivers and spawn in tributaries. Resident populations complete the entire life history in tributaries. All three life-history forms may occur in a single basin (McIntyre and Rieman 1995). Migrants may spawn in the lower reaches of the same streams used by resident fishes. Maturing adfluvial fishes move into the vicinity of tributaries in fall and winter and remain there until they begin to migrate upstream in spring. Of migratory spawners, some remain in tributaries during summer months but most return to the main river or lake soon after spawning (Behnke 1992).

The westslope cutthroat trout differ from other fish in their relatively small size and their feeding habits. These species specialize as invertebrate feeders and, consequently, do not compete directly with more piscivorous (fish-eating) species like bull trout (Behnke 2002). In addition to habitat degradation, hybridization with nonnative rainbow trout and displacement by brook trout in small streams represent the common biological threats to the species (Behnke 2002).

Westslope cutthroat trout are native to the upper Missouri River drainage in Montana, extreme northwestern Wyoming, and southern Alberta; the Salmon, Clearwater, and Spokane (including the Coeur d'Alene and St. Joe drainages) river drainages in Idaho; and the Clark Fork and Kootenai river drainages in Idaho, Montana, and British Columbia (Spahr et al. 1991); also westward to the Cascade

Mountains as disjunct populations, for example, in the Lake Chelan drainage in Washington, the John Day River drainage in Oregon (where limited hybridization with redband trout apparently has occurred), and elsewhere in mid-Columbia tributaries (Behnke 1992), including the Methow, Entiat, and Wenatchee river Basins in Washington (McIntyre and Rieman 1995).

Action Area Information

Westslope cutthroat trout are found within the analysis area in Wickiup Creek and Buck Cabin Creek.

Interior Redband Trout

Inland redband trout are the same species as steelhead (*O. mykiss*) and juveniles cannot be distinguished phenotypicaly. Isolated populations of *O. mykiss* above longstanding natural passage barriers (and barring hatchery introductions) may be reasonably assumed to be resident redband.

Redband trout are sensitive to changes in water quality and habitat. Redband trout of interior Oregon basins are believed to be best adapted to cold (less than 21° C), clean water, but a few Great Basin populations possess a hereditary basis to function at high temperatures (Behnke 1992). Adult redband trout are generally associated with pool habitats, although various life stages require a wide array of habitats for rearing, hiding, feeding, and resting. Pool habitat is important refugia during low water periods.

Spawning success decreases as fine sediment increases. The quantity and quality of pool and interstitial habitat also decrease as fine sediment increases. Other important habitat features include healthy riparian vegetation, undercut banks, and LWD (large woody debris).

Spawning occurs during the spring, generally from March to June. Redds tend to be located where velocity, depth and bottom configuration induce water flow through the stream substrate, generally in gravels at the tailouts of pools. Water temperatures influence emergence of fry, which is typically from June through July.

Redband trout are still widespread in interior western North America, but with local declines and extirpations. The global range includes the Columbia River basin east of the Cascades to barrier falls on the Kootenay, Pend Oreille, Spokane, and Snake Rivers; the upper Frazier River basin above Hell’s Gate; and Athabasca headwaters of the Mackenzie River basin, where headwater transfers evidently occurred from the upper Frazier River system (Benke 1992). In the Columbia River basin, nearly all upriver and many lower river stocks appear to be improving after having declined (Nehlsen et al. 1991). Many stocks in the Columbia River basin are, however, threatened by mainstem passage problems, habitat damage (due to past logging, road construction, mining, and grazing, which can decrease water quality and increase siltation), and interactions with hatchery fishes (Nehlsen et al. 1991).

Action Area Information

Interior redband trout are found within the analysis area in Wickiup Creek, Buck Cabin Creek, two unnamed tributaries to Todd Creek and two unnamed tributaries to Duncan Creek.

WATERSHED CONDITION – ENVIRONMENTAL BASELINE

The quality of fish habitat is affected by conditions within the stream channel and riparian areas along the channel. This section presents information on riparian and instream conditions. Stream surveys were completed on six fish-bearing streams within the analysis area prior to the Shake Table Fire Complex (See Table 106).

PACFISH RMOs and Forest Plan Amendment 29 DFCs

Important aquatic habitat elements as defined by PACFISH and/or Forest Plan Amendment 29 include: 1) pool frequency, 2) water temperature/stream shading, 3) large woody debris, 4) bank stability, 5) width to depth ratio, and 6) embeddedness. These habitat elements are important in maintaining aquatic habitat function and health. Stream survey information was analyzed to compare existing habitat conditions to Forest Plan Riparian Management Objectives (RMOs)/Desired Future Condition (DFC) for aquatic habitat (See Table 107).

Table 107. Fish habitat summary data for surveyed streams in the TFSR Project Fisheries Analysis Area

Watershed	Stream	Pools/Mile	Wetted Width	LWD/Mile	% Units Embedded	% Habitat Units with Dominant Particles < 2 mm	Wetted W/D Ratio	% Stable Banks	% Shade
Fields Creek	Fields Creek	98	13.3	99	67	28	10.9	59	84
	Wickiup Creek	134	8.2	142	33.3	41	6.8	95	64
Murderer's Creek	Todd Creek	21	15.1	62	95	45	8.9	65	81
	Todd Creek Trib 2	35	12.8	44	93.3	36	8.1	64	75
	Todd Creek Trib 2B	37	20.3	57	88.9	61	10.6	59	82
	Duncan Creek	32	13.7	83	92.2	27	9.9	94	86
PACFISH RMO		See Table 108	--	20 pieces >20' diameter and 35' length	--	--	<10	>80	--
Amend 29 DFC		See Table 109	--	20% >20" diameter and 35' Length	≤20 Embedded	--	<10	>90	80% shaded

Table 108. PACFISH RMO for Pool Frequency

Wetted Width (ft)	Pools/Mi
10	96
20	56
25	47
50	26
75	23
100	18
125	14
150	12
200	9

Table 109. Amendment 29 DFC for Pool Frequency

Bankfull Width (ft)	Pools/Mi
5	151-264
10	75-132
20	38-66
25	30-53
50	15-26
75	10-23
100	8-18
125	6-14
150	5-12
200	4-9

Pool Frequency

Pool frequency is a gage of aquatic habitat diversity, and is an indicator of the degree to which streams are capable of supporting a varied and complex community of fish species. Pools are important for providing rearing habitat for juvenile fish and cool-water refuge areas for adult fish during periods of low flow and elevated temperatures. Pool spacing varies by channel morphology (Rosgen 1996). Deep pools also provide important habitat for adult steelhead trout.

Pool habitat can be reduced where management activities result in reductions of pool forming elements (e.g. LWD), changes in bedload (e.g. large increases in fine sediment), or changes in channel morphology (e.g. widening or straightening).

Changes in pool frequencies are unlikely to have occurred as yet relative to documented pre-fire conditions. Change would most likely be triggered by natural processes which have not yet interacted in any substantial way with the post-fire landscape, processes such as increased peak flows, inputs of Large Wood and/or sediment from surface erosion or debris flows initiated by intense storms and/or spring snowmelt.

Fields Creek Watershed

Stream surveys indicate that the pool frequencies in Fields Creek and Wickiup Creek meet the Forest Plan DFC and PACFISH RMO.

Murderer's Creek Watershed

Stream surveys indicate that none of the streams in the Murderer's Creek watershed meet the Forest Plan DFC or PACFISH RMO for pool frequency.

Water Temperature/Stream Shading

Water temperature influences the metabolism, behavior, and health of fish and other aquatic organisms. Fish can survive at temperatures near extremes of suitable temperature ranges. However, growth is reduced at low temperatures because all metabolic processes are slowed. At the opposite extreme, growth is reduced at high temperatures because most or all energy from food must be used for maintenance needs. Fish are also more susceptible to diseases near the extremes of a species suitable temperature ranges.

The Forest Plan water temperature standard is for no measurable increase in maximum water temperature, and maximum water temperatures below 64°F within migration and rearing habitat and below 60°F within spawning habitats (PACFISH RMO). In general, redband trout, and juvenile steelhead would occupy water that is from 55 to 64°F. Upper lethal temperatures range from about 75°F for steelhead.

Riparian stream shading is critical in regulating water temperature extremes and providing instream cover against predation. Stream temperatures increase following disturbance to riparian vegetation (i.e., harvest, grazing, or fire) (Beschta and Taylor 1988). Given the importance of riparian vegetation in regulating extreme temperatures, it is important to identify stream reaches that are limited in shade and ultimately may be limited in providing quality instream habitat to fish species. In addition, it is known that shade from conifers and deciduous trees and shrubs functions differently. In winter, cold temperatures can be moderated by conifer shade acting as thermal cover. Percent stream shade was surveyed on six streams in the Thorn analysis area.

Canopy closure over the Fields Creek and Murderer's Creek watersheds was relatively high before the fire. This is assumed to be at or near natural condition for streams this wide.

Fields Creek Watershed

Within the Fields Creek watershed, Fields Creek met the FP DFC of 80 percent with an average percent shade of 84 percent. Wickiup Creek was under the DFC with a total of 64 percent. Stream and riparian surveys for the Billy Timber sale (USDA, 1993) were conducted on that portion of Fields Creek within the present proposed project area, Buck Cabin and Wickiup Creeks from their confluence with Fields Creek to the headwater source area. Water temperatures were between 48 and 50 degrees Fahrenheit throughout, during the summer time surveys. Fields Creek is listed on the State of Oregon 303d list of impaired waters for temperature concerns all year for salmonid spawning and migration and rearing of anadromous and salmonid fish.

Project area stream temperatures during summer surveys, albeit one-time measurements, were well under thresholds set by the state of Oregon for cold water spawning and rearing (State of Oregon, 2007).

Murderer's Creek Watershed

Within the Murderer's Creek watershed all streams surveyed except Todd Creek Tributary 2 met the FP DFC of 80 percent shade.

Project area stream temperatures during summer surveys, albeit one-time measurements, were well under thresholds set by the state of Oregon for cold water spawning and rearing (State of Oregon, 2007).

Large Woody Debris

LWD plays an important role in forested stream reaches. LWD aids in dissipating stream energy, trapping sediment and the formation of pools and associated aquatic habitat.

Quantity of LWD in streams can be altered by removal of streamside trees for timber production or salvage of instream pieces. In extreme cases, large increases in peak flows and/or large increases in channel width can result in destabilization of instream pieces and subsequent transport downstream thus resulting in a decrease in LWD.

Riparian forests, especially individual trees that are within ½ to ¾ tree length of the stream channel, produce LWD that is recruited into a stream where it creates critical habitat features for aquatic species.

Large wood quantities prior to the fire likely reflected the impacts of earlier state and private land harvest, natural mortality rates and flood transport. Harvest of large overstory trees was a wide spread silvicultural practice in earlier decades, although the actual amount of past harvest on state and private lands along the river is unknown.

Owing to the lineal extent of moderate and high-severity burning adjacent to the several of the upper reaches of project area streams, some instream large wood present within the bankfull channel prior to the fire, may have been consumed during the fire due to exposure and drying during summer low flow conditions. Consequently, present quantities of Large Wood may now be lower than recorded in previous surveys. Increases in Large Wood from blowdown of fire-killed trees in RHCAs have not yet begun in any substantial way, particularly in the absence of significant wind events and in part due to delayed mortality of some partially burned trees

Fields Creek Watershed

Stream surveys indicate that the Forest Plan DFC and PACFISH RMO for LWD quantity is being met in both surveyed streams in the Fields Creek watershed.

Murderer's Creek Watershed

Stream surveys indicate that the Forest Plan DFC and PACFISH RMO for LWD quantity are being met in all surveyed streams in the Murderer's Creek watershed.

Embeddedness/Fine Sediment

Composition of the stream substrate is an important feature of aquatic habitat. Cobble and gravel substrates provide habitat for a diverse assemblage of benthic macroinvertebrates as well as eggs and early life stages of numerous fish species. Macroinvertebrates represent a substantial portion of the diet available to various fish species.

Filling of interstitial spaces (i.e. the gaps between rocks on the stream bottom) with fine sediment (particles < 2 mm in size) eliminates habitat for many macroinvertebrates. Fish eggs and early life stages can also be buried and smothered when interstitial spaces are embedded with fine sediment. Winter habitat for juvenile salmonids is also lost as interstitial spaces are embedded with fine sediment.

Embeddedness was rated as either yes or no at the time stream surveys were completed on Vance Creek and Canyon Creek. In order for embeddedness to have been rated as yes for that reach, the substrate must have been embedded to a degree greater than 35 percent for the majority of the reach.

Embeddedness data is no longer collected during Region 6 stream surveys. Instead, stream substrate data is collected using pebble count procedures. Either methodology can be used to estimate the amount of fine sediment in streams. Adverse impacts to macroinvertebrates and fish can occur where fine sediment exceeds 20 percent of the surface area of the streambed or embeddedness exceeds 20 percent.

Fine sediment in streams is a normal component of salmonid habitat; however, major disruption of the system occurs when sediment levels substantially exceed natural levels. Deposition of fine sediment can eliminate habitat for aquatic insects; reduce density, biomass, and diversity of aquatic insects; reduce permeability of spawning gravels; and reduce emergence of fry from redds (Nelson et al. 1991). Studies have shown that an increase in 1-3mm size sand from 20 percent to 30 percent can decrease emergent survival of salmonid species from 65 percent down to 40 percent (Phillips et al. 1975). Fine sediments are known to impact fry emergence and survival, and fine sediment (<6.5mm in size) levels above 40 percent can effectively eliminate salmonid populations and many macroinvertebrate species (Everest and Harr 1982).

Increases in fine sediment can occur from both increases transport of fine sediment from upland areas and from destabilized stream banks. Increases can result from both episodic sources such as wildfires or from chronic sources such a native surface roads. Episodic sources normally result in short-term increases that return to pre-disturbance levels through recovery processes. Chronic sources can result in long-term changes of stream channels and aquatic habitat. Numerous roads in the project area have been identified as potential sources of fine sediment based on field reviews.

Stream surveys recorded whether measured units were embedded to a degree greater than 35 percent, not greater than 20 percent, therefore it is not possible to determine whether Fields Creek or Murderer's Creek watersheds meet or do not meet Forest Plan DFC.

Substantial changes in values for these variables are unlikely to have occurred since data collection was completed. Ground disturbance in RHCAs from fire suppression activities was minimal. Change would most likely be triggered by natural processes which have not yet interacted in any substantial way as yet with the post-fire landscape, processes such as increased peak flows, debris flows or surface erosion initiated by rain-on-snow, fall storm runoff and/or spring snowmelt, the magnitude and timing of which cannot be predicted with any certainty for the fire area.

Aerial seeding and mulching was conducted in the fall of 2006 on virtually all very high and high severity burn areas in the project watersheds at levels that would be considered heavy (USDA Forest Service, 2006). These mulch applications are in place to reduce the potential for surface erosion in these locations until ground-stabilizing vegetation can be re-established.

Fields Creek Watershed

Within the Fields Creek watershed stream surveys indicate that approximately 67 percent of the measured units were embedded greater than 35 percent in Fields Creek and 33 percent were embedded greater than 35 percent in Wickiup Creek.

Murderer's Creek Watershed

Within the Fields Creek watershed stream surveys indicate that more than 85 percent of the measured units were embedded greater than 35 percent in all streams surveyed.

Width-to-Depth Ratio

The Forest Plan DFC/RMO for width-to-depth ratio is based on wetted width and depth. A large wetted width-to-depth ratio indicates a wide, shallow stream channel morphology. Wide shallow streams are prone to increases in stream temperatures due to their high surface area to volume ratio. Shallow streams also provide little habitat for fish, due to the lack of water depth.

Width to depth ratios can be increased by increases in peak flows, direct bank alteration, or increases in sediment or a combination of these factors. Conversely, reductions in these factors can lead to reductions in width to depth ratios.

Fields Creek Watershed

Fields Creek barely exceeded the Forest Plan DFC/RMO for width-to-depth ratio and Wickiup Creek met the width-to-depth ratio.

Murderer's Creek Watershed

All streams in the Murderer's Creek Watershed met the Forest Plan DFC/RMO width-to-depth ratio with the exception of Todd Creek Trib 2B, which barely exceeded.

Bank Stability

The Forest Plan DFC for stream bank stability is for 90 percent of the banks to be stable and the PACFISH RMO is 80 percent stable. Channel types differ in their sensitivity to management activities due to differences in bank erosion potential and the influence of streamside vegetation on bank stability. Data available from the project area stream surveys was not adequate to type streams based on Rosgen stream classification, therefore channel typing was not done.

Fields Creek Watershed

Riparian Area Pace Transect surveys were conducted in 1993 and determined that streambank stability in Fields Creek did not meet Forest Plan DFC or the PACFISH RMO and Wickiup Creek exceeded both standards.

Murderer's Creek Watershed

Riparian Area Pace Transect surveys were conducted in 1993 and determined that only Duncan Creek met the Forest Plan DFC and the PACFISH RMO for streambank stability. All other streams were below 80 percent.

Fish Passage Barriers and Stream Improvements

The only known fish passage barrier within the analysis area is a potentially impassible culvert on Thorn Creek (at the Martin Corrals/Oregon Mine unit boundary), which may preclude steelhead access into the Oregon Mine portion of Thorn Creek.

Distribution

Information on species occurrence (i.e., presence/absence) was obtained from GIS layers on file at the Blue Mountain Ranger District as well as the Shake Table BAER Fisheries Report.

Fields Creek Watershed

Buck Cabin and Wickiup Creek contain some steelhead rearing habitat in addition to supporting redband and cutthroat trout spawning and rearing habitat. A recon survey was conducted on May 25, 2000 and determined these streams did not contain anadromous spawning habitat. The upper end of fish distribution extends approximately 1.8 miles into the fire area or 2.1 miles from its confluence with Fields Creek.

Lower within their range, the Fields Creek population of westslope cutthroat trout may be more susceptible to hybridization with redband trout, however towards the upper end of their distribution in Fields Creek, Buck Cabin Creek and Wickiup Creek, westslope cutthroat may approach 100 percent genetic purity (ODFW 2006).

Fields Creek has steelhead spawning habitat. While less than 1 percent of the steelhead spawning in the mainstem John Day River occurs in Fields Creek, it is nevertheless an extremely important stream for steelhead rearing due to its excellent water quality and habitat (ODFW 2006).

Murderer's Creek Watershed

Duncan Creek contains steelhead rearing habitat, and potentially provides spawning habitat but availability of spawning habitat has not been evaluated through surveys. Thorn Creek provides neither spawning nor rearing habitat for steelhead due to an impassible culvert downstream at the Oregon Mine/Martin Corrals unit boundary. Redband trout are present in this section of Thorn Creek. Approximately 4.5 miles of Todd Creek within the fire area are fish bearing (approximately 2.5 miles are Forest Service ownership).

3.6.3 ENVIRONMENTAL CONSEQUENCES

The following analysis addresses the potential effects of TFSR project on federally listed and sensitive aquatic species. Project design features (See 2.2.5 - Chapter 2) are prescribed to minimize potential adverse effects to federally listed aquatic species and their habitat

ALTERNATIVE 1 – NO ACTION

Under this alternative, none of the management activities proposed in the TFSR Project would be implemented. No vegetation management actions (salvage timber harvest, tree planting etc.) or associated activities would be performed**.**

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. 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 the no action alternative, 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.

Water Quality

Temperature - High losses (>70%) of live trees in RHCAs from the Shake Table Fire Complex would negatively affect stream shade and summer water temperatures in fishbearing streams for decades**.** Summer temperatures, specifically in Widows, Wickiup and Todd 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.

The Shake Table Fire Complex would indirectly affect water temperatures for the long-term in some fish-bearing tributaries within the analysis area due to near total loss of riparian shade, based on high tree mortality predictions modeled after the fire. Temperatures in the smaller fishbearing tributaries would likely show temperature increases as high as 5°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.

Sediment - 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. Channel erosion (including gullying of draws), surface erosion, primarily from steep severely burned slopes and secondarily from the road network, are expected to be the dominant processes for immediate sediment delivery to stream channels during the first 2 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 surface erosion and roads. Thereafter, BAER treatments, 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 prefire levels and erosion rates are expected to drop once more to pre-fire rates**.**

Fishbearing reaches of Widows Creek and Duncan Creek 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. Aerial seeding and mulching was conducted in the fall of 2006 on virtually all very high and high severity burn areas in the project watersheds at levels that would be considered heavy (USDA Forest Service, 2006). 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 project area streams.

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. Post-fire BAER seeding, particularly the second year post-fire, would somewhat reduce the risk of indirect sediment delivery to fish-bearing reaches.

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 Wickiup, Fields and Buck Cabin Creek due to the number of road crossings of headwater streams in burned portions of the Fields Creek watershed**.**

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 delivery of sediment to project area streams.

Chemical Contaminations/Nutrients - 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.

Habitat Elements

Substrate Embeddedness - While there is no way to rate substrate embeddedness against Forest Plan standards, embeddedness does appear high in all surveyed streams, except Wickiup Creek. There is a risk of an adverse effect from a sediment pulse following a large stand replacement wildfire, however it is likely that embeddedness would decrease over time as near stream large wood falls into the stream and subsequent high flow events sort substrate and wash fines out of the system. It would be critical that land management activities do not exacerbate the situation following such a wildfire.

Large Woody Debris - The upper portions of the Widows Creek, Todd Creek and Wickiup Creek RHCAs experienced severe burn severity resulting in very high mortality. Most other streams within the Shake Table Fire Complex perimeter generally experienced low burn severity resulting in low to moderate tree mortality.

Fire-injured trees would likely fall within the next 3-5 years in areas of high mortality. Thus a pulse of large wood recruitment is likely to extend over 5-15 years and would probably result in a net increase in Large Wood in both fishbearing and nonfishbearing 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 would 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 would likely be greatest in Widows, Todd and Wickiup creeks which all experienced very high tree mortality in most reaches affected by the fire. The felling of large snags into West Dry Creek, two tributaries to Widows Creek, Widows Creek, and the North and South Forks of Todd Creek 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.

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 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).

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 bankfull 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 tributaries of similar size (Todd, Wickiup Duncan and Fields 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 that have bankfull 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).

Pool Frequencies - The magnitudes and rates of change in pool frequencies within the fire area would 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.

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. It is likely that little of the Large Wood present prior to the fire on-Forest along Duncan and Buck Cabin Creeks was lost, since burn severity in both RHCA s on-Forest was low. Net recruitment of Large Wood, with subsequent increases in pool frequencies, is likely to occur quickly relative to other tributaries such as Todd and Widows Creeks, where the majority of fishbearing reaches were affected by moderate and high severity fire.

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 prefire levels as fire-killed trees (12-23 inches in diameter) fall and eventually exceed pre-fire levels.

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). As wood jams accumulate in steeper, narrower tributaries 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.

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 the 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.

Large Pools - Deep, large pools are important loci for thermal regulation and buffering. Deep pools buffer stream temperature extremes and provide areas of low stream energy to reduce physiological stress on fish. Deep pools often signal a stable river system. In contrast, a lack of deep pools may signal stream aggradation. The majority of pools identified in the stream surveys within the analysis area were less than three feet deep.

Off Channel Habitat - The potential for off-channel habitat is limited within the analysis area. The no action alternative is not likely to reduce off-channel habitat to the point where it can no longer support juvenile rearing with such features as depth, shade, submerged and overhanging large wood, or aquatic vegetation.

Refugia - The no action alternative is not likely to reduce the complexity of refugia to the point where these areas are no longer able to provide adequate hiding or foraging cover to support juvenile rearing**.**

Channel Condition and Dynamics

Wetted Width/Maximum Depth Ratio - Width to depth ratios can increase with increased bank instability and sedimentation. See discussion on sediment. Post-fire conditions are likely to increase sedimentation, thereby impacting width/depth ratios. In the long term, roads and culverts currently impacting streams would continue to do so as road maintenance is not likely to keep up with all needs.

Streambank Condition - See above sections on sediment and wetted width/maximum depth ratio. Limited road maintenance may improve stream bank condition at stream road crossing locations. Streambanks immediately downstream from culverts which are impacting stream banks would continue to erode from water velocities at peak or near peak flows.

Floodplain Connectivity - The road system would remain as it is. Roads impacting floodplain connectivity would continue to impact this indicator. This would maintain the current condition.

Hydrology/Flow

Change in Peak/Base Flows: Road systems affect peak flows by extending the drainage network (see below) and increasing delivery efficiency to the stream channel. As described below this alternative would not change peak flows from the existing condition.

Drainage Network Increase: Road management activities have the greatest potential to affect the drainage network. Road maintenance may result in a reduction of the drainage network by adding relief drainage structures and reducing the channeling of water in ephemeral draws. However, the limited amount of regularly scheduled road maintenance would not likely keep up with impacts on the landscape from the existing road system. This alternative is expected to maintain the baseline condition.

Watershed Conditions

Road Density and Locations - Stronghold populations of salmonids are associated with higher elevation forested lands and the proportion declines with increasing road densities (Quigley et al. 1996). The higher the road density, the lower the proportion of subwatersheds that support strong populations of key salmonids. Specifically, Quigley et al. (1996) shows a strong correlation with road densities of 2 miles/mile^2 or higher and reduction of strong populations of salmonids. Further reductions of strong salmonid populations were identified at densities of 3 miles/mile^2 and 4 miles/mile^2 or greater. Roads in the project area that occur within 100 feet of streams or cross streams commonly impact fish and fish habitat more than roads located in uplands.

Table 110. Road/Stream Interaction Information

	[1]Entire Subwatershed (Public & Private)			
Subwatershed	[2]Total Road Miles	Road Miles within 100 ft. of Cat. 1-4 Channels	Stream Crossings on Roads	Total Road Density Mi/ Mi^2
Dry Creek	42.4	7.8	29	1.6
Fields Creek	62.1	14.4	155	2.9
Todd Creek	11.7	1.3	10	0.7
Murderer's Creek – Duncan Creek	40.0	7.6	49	2.3
Total	156.2	31.3	243	NA

1 Note: Rounding road miles during calculations may result in minor (0.1) mile discrepancies. This information was derived from the Malheur National Forest GIS.
2 Note: Road miles include both open and closed roads

Road densities would remain above 2 miles/mile^2 in Fields Creek and Murderer's Creek-Duncan Creek subwatersheds and miles within 100 feet of Category 1-4 channels would remain high (See Table 110). There are nearly 32 miles of roads that likely impact streams due to proximity (100 feet or less). This alternative would not change road densities or location in the project area. Road densities and roads in close proximity to streams would remain at detrimental levels in Fields and Murderer's –Duncan Creek subwatersheds.

Roads in RHCAs would continue to confine stream channels and restrict spotted frog habitat by inhibiting the expansion of wetlands that were reduced or degraded by past road construction where these habitats originally existed.

Fish Passage - Although no culverts were previously identified as being 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 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.

Summary of Direct and Indirect Effects on Aquatic TES Species

In summary, there is an increasing risk, over time that this alternative would result in adverse effects to steelhead trout, redband trout and westslope cutthroat trout because of increasing impacts from the existing road system and post-fire condition. As noted by Dunham et al. (2003), the effects of wildfires depend on a variety of factors including their timing, location, area, extent, and severity. Other factors include the characteristics of the ecosystems and the species affected along with other indirect physical and ecological linkages. While such events can cause short term negative effects, such as those listed below, over long time periods the resulting habitat conditions may be more productive then in areas where natural disturbance has been suppressed (Dunham et al. 2003). Wildfires can have a number of detrimental effects to stream channels such as decreasing stream channel stability, increasing discharge and affecting discharge variability, altering coarse woody debris delivery and storage, increasing nutrient availability, increasing sediment delivery and transport, increasing solar radiation and altering water temperature regimes (Dunham et al. 2003). In cases where natural stream processes are already impaired, the recovery of the stream ecosystem from the effects of wildfire is likely to be slower, more sporadic, and potentially incomplete (Minshall 2003). These future impacts could reach a magnitude of "Likely to Adversely Affect" for steelhead trout because of the short term water temperature increase due to a high intensity fire burning through the riparian area which can lead to direct mortality of fish in the stream at that time. These impacts would not cover a large enough area to result in a WIFV determination for redband trout or westslope cutthroat trout (See Table 112 definitions).

The Middle Columbia steelhead, westslope cutthroat trout and interior redband trout in the Fields Creek and Murderer's Creek watersheds may be affected by the Shake Table Fire Complex for years, perhaps decades by habitat changes in streams within the downstream of the fire perimeter. Streams would 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 are likely to reduce both spawning and rearing success, particularly when cobble embeddedness levels exceed 25-50 percent (Chapman and McLeod 1998, MacDonald et al, 1991). Productivity is likely to remain depressed due to deteriorated substrate conditions until these fire-generated sediments are finally transported downstream and embeddedness levels drop below 25 percent 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 Wickiup, Buck Cabin and Todd Creeks where the majority of moderate and high-mortality occurred within the potential recruitment zone for Large Wood along the rivers. 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.

Potential Effects to Steelhead Critical Habitat

The planning area is within designated critical habitat for Mid-Columbia River steelhead. The specific PCEs that may be affected by the no action alternative include freshwater spawning, freshwater rearing, and freshwater migration corridors. The specific critical habitat units affected by the no action alternative are: HUC 5: Fields Creek (1707020111) and Murderer's Creek (1707020104)

Freshwater spawning sites

Water Quantity
Road systems affect peak flows by extending the drainage network and increasing delivery efficiency to the stream channel. As described below, this alternative would not change peak flows from the existing condition. The effects of road maintenance activities in this alternative on peak/base flows would maintain current conditions.

Due to the inherent variability of hydrologic characteristics these changes are unlikely to be measurable without intensive sampling over many years. Beaver are expected to repopulate the analysis area over time. Beaver dams may result in water storage both in ponds and off-channel in valley bottoms and floodplains which would augment late season stream flows**.**

Water Quality
The activities with the highest potential for affecting sediment input to streams are related to road maintenance, or a lack thereof. Road related impacts most likely to contribute high sediment inputs would be plugged culverts leading to washed out road fills, undersized culverts at stream crossings leading to high water velocities and subsequent erosion at culvert outlets, or sediment channeled on road surfaces and routed through road-side ditches and cross-drain culverts to streams. Under this alternative, there would be no road management activities other than routine road maintenance. This can be considered a no effect, or no change from the existing condition, in the short term, however, at existing funding levels road maintenance is not expected to keep up with all needs. This alternative would not do anything to reduce impacts of the existing road system. It would be expected that sedimentation from existing roads would increase over time, unless other projects are implemented to address these impacts

Minimal input of nutrients from livestock feces is expected. Because these inputs are expected to be minimal, it is unlikely that water quality would be impaired.

Freshwater rearing sites

Water Quantity
See discussion above.

Water Quality
See discussion above.

Water Temperature
See discussion of temperature in previous section.

Food
If the beaver population within the watershed increases, the carrying capacity of fish habitat would likely increase with more complex habitats for aquatic invertebrates, increased levels of detritus, lower summer water temperatures, lower embeddedness, and greater terrestrial and aquatic insect (food) abundance. Minshall (2003) found that the effect of fire on macroinvertebrates, in otherwise intact, unfragmented stream ecosystems is not catastrophic nor is recovery exceptionally long term, even where extended periods of fire suppression have occurred.

Freshwater migration corridors

Free Passage
This alternative would not obstruct steelhead migration corridors.

Water Quantity
See discussion above.

Water Quality
See discussion above.

Determination

The affects to all of the MPI Habitat Indicators were rated as “maintain”. This rating means that the function of the indicator does not change with the action.

PROPOSED ACTION AND ALTERNATIVE 3

The only difference between the action alternatives is the inclusion of Management Area 10 (semiprimitive nonmotorized recreation area), within Alternative 2 and its absence in Alternative 3. There is no difference between the action alternatives for the Murderer’s Creek watershed. Differences in the Fields Creek watershed are shown in Table 111, which are considered in the cumulative effects analysis below.

Table 111. Differences in Proposed Activities between Alternative 2 and Alternative 3

Watershed	Alternative 2 Yarding System (acres)		Alternative 3 Yarding System (acres)	
	Helicopter	Ground-based	Helicopter	Ground-based
Fields Creek	3040	223	1975	149

Water Quality

Temperature - Effects would be similar to the No Action, 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.

Sediment - Timber harvest units and landings would not be located in RHCAs under the Action Alternatives. Restricting these activities to areas outside of RHCAs would minimize the potential for sediment delivery to fish bearing streams. There would be soil disturbance associated with commercial timber harvest and other proposed activities, primarily as a result of tractor skidding, and subsoiling of landings. In most cases sediment generated from these activities, which has the potential to move off-site during rare large storm events, would be captured in the RHCA buffer.

There is also the potential for generating sediment from noncommercial thinning operations and burning hand piles. The risk of sediment from these activities reaching fish habitat is negligible because they do not involve heavy equipment and design elements have been developed to reduce the risk of sediment delivery to streams.

Haul Road Use - There would be an opportunity to perform road maintenance on approximately 55 miles of Forest roads commensurate with commercial uses associated with project activities. The type of road maintenance activities which may occur on roads used for commercial haul could include:

- Blading and shaping of road surface and ditches
- Maintenance or reshaping of drain dips or grade sags
- Maintenance of waterbars/cross ditches
- Spot rocking of road surface
- Brush removal from roadway
- Felling and or removal of danger trees
- Minor realigning of road junctions
- Cleaning culverts
- Seeding
- Removing excess materials from roadway

Because the maintenance work accomplishments would be commensurate with use, the amount actually accomplished would vary depending on existing road conditions, season of use and other factors. When road maintenance work is accomplished, commensurate with use, it would help to ensure that haul roads are kept in an appropriate condition so as to avoid deterioration of conditions and reduce erosion and sediment output from haul roads.

Approximately 5 miles of commercial haul routes are located within RHCAs in both Alternatives 2 and 3. Of these 5 miles within RHCAs, approximately 1.8 miles are over native surface roads. The Malheur National Forest has a policy (with direction from PACFISH RF-2) to regulate traffic during wet periods to minimize erosion and sediment delivery. This includes log haul, as well as, any other vehicle traffic. PDF features such as dust abatement (mainly for safety reasons), hauling on dry or frozen ground, and ceasing haul activities during muddy conditions are highly effective at minimizing sediment input to streams.

Because haul roads would receive pre/during and post haul maintenance, commensurate with use, and the majority of these roads are near intermittent tributaries, upstream from fish habitat; the magnitude of haul road use on sedimentation is insignificant, and therefore would result in a neutral effect.

Reopening of Closed Roads - Approximately 9 miles of currently closed roads would be opened for timber harvest and then effectively reclosed. Of these 9 miles to be opened, approximately 1.2 miles are located within RHCAs. The entire 1.2 miles are native surface. These closed roads were previously analyzed to derive subwatershed road densities under Alternative 1 (No Action alternative). The baseline condition of these roads was considered to be similar to open roads, with respect to the level of vegetation recovery, even though it is recognized that some of these roads have grown-in to varying degrees.

Reopening these closed roads would not change long-term road densities already analyzed under Alternative 1. Road densities and roads in close proximity to streams would remain at existing levels in all subwatersheds in the long-term.

Best Management Practices associated with the proposed activities are expected to control most run-off and sediment transport under common run-off events. However, because the proposed activities would be implemented in sub-drainages which have been previously disturbed by management activities, including roading at densities in excess of two miles/mile^2, a slight probability exists that previous disturbance would become connected to ground disturbance associated with the proposed actions.

The magnitude of reopening closed roads on sedimentation is insignificant, and therefore would result in a no effect for the following reasons: 1) reopened roads would receive pre/during and post haul maintenance, commensurate with use, and would be effectively reclosed after use and 2) the majority of these reopened roads (7.8 miles) are not located in RHCAs.

Road Maintenance - Roads used within the sale area would receive road maintenance at a level commensurate with use. Road maintenance includes several activities that potentially result in sedimentation from the road prism to the ditch line, or the adjacent slope. Typical road maintenance activities could include: blade and shape road including existing drainage dips, grade sags, and waterbars, repair damaged culverts, place rock in some existing drainage dips and grade sags, place rock in wet areas of road, brushing, remove danger trees, and dust abatement.

Project design features and protective measures from the 2005 Malheur National Forest Road Maintenance BA would be followed for the replacement, removal, or installation of ditch-relief culverts (**See DEIS-Appendix F-3**).

The longer term effects of road maintenance, commensurate with use, are to maintain or improve existing road conditions. Road maintenance, commensurate with use, may decrease chronic sedimentation in some locations. Improving drainage, removing ruts and rills from the driving surface, and adding less erosive surfacing material would reduce detachment and transport of sediment. This is especially important for roads within RHCAs. Because road maintenance activities would be commensurate with use, it is possible that if winter logging occurs, little to no road maintenance may be necessary and therefore would not occur. Alternatively, if operations occur in the summer, road maintenance, commensurate with use, may occur on all or nearly all of the roads.

The overall effect to the baseline conditions of sediment would not change baseline levels of sediment in spawning habitat of steelhead, redband trout and westslope cutthroat trout.

Chemical Contaminations/Nutrients: The Forest Service would require a Hazardous Substances Plan and a Prevention of Oil Spill Plan from the contractor to be reviewed and approved prior to implementation of activities. Refueling and fuel storage sites would be located at least 150 feet away from live streams. Other chemicals used may include saw gas and oil, and fuels used to ignite fires. All have the potential to adversely affect aquatic TES species, if they were to enter nearby stream systems. Handling procedures and spill plans would minimize the risk of potential effects. In the event of the need for fire suppression actions, no chemicals or retardant would be used within 150 feet of water or wetlands. There is minimal risk of an accidental spill from logging equipment, vehicles used to transport crews, equipment, ignition materials, or fire suppression activities in the event of an escaped burn.

Beche et al. (2005) found that ash deposition from the prescribed fire appeared to have a minimal impact on stream water chemistry with increases in some water chemistry parameters ($SO4^-$, total P, $CA2^+$, and $Mg2^+$). It should be noted that their study area had low to moderate hillslopes and so accelerated erosion and ash delivery would not be expected**.**

Dust abatement procedures would adhere to the Road Maintenance Specification in the Dust Abatement plan. Lignin sulfonate, magnesium chloride, or water may be used for dust abatement, as needed, during periods of heavier vehicle use associated with commercial timber harvest activities. Chemical dust abatement would be avoided on the 14 miles of commercial haul routes located within RHCAs. When the chemical treatments are used, these treatments are applied in spring-early summer, to provide dust abatement for the operating season. The maximum potential use would be an annual application during the years of commercial timber harvest. Water for application would come from the following designated water sources: Fields Creek near the confluence with Buck Cabin Creek and Murderer's Creek near the confluence with Oregon Mine Creek.

Because handling procedures, refueling restrictions and spill plans would be in place and there is a low probability of a fuel spill, there is a neutral effect of the project to streams from chemical or nutrient contamination. No change to baseline levels of nutrients or chemical contaminants are expected.

Habitat Access

Physical Barriers - No physical barriers from road/stream crossings limiting TES aquatic species would be created or removed as a result of this alternative. RHCA buffers remain in place and would not be affected by salvage or followup 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.

Habitat Elements

Substrate Embeddedness - See the previous discussion on sediment. No change to the baseline conditions are expected for embeddedness in steelhead, westslope cutthroat trout or redband trout habitat.

Large Woody Debris (LWD) - Approximately 171 acres of danger trees would be cut within RHCAs. Under PACFISH, trees may be felled in RHCAs when they pose a safety risk (PACFISH Standard RA-2). Felling of danger trees for human safety along haul routes in RHCAs has the potential to reduce the supply of LWD to stream channels and therefore pool habitat, however all trees felled in RHCAs for safety reasons would be kept on site in accordance with PACFISH Standard RA-2 to meet woody debris objectives.

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.

Pool Frequency and Quality - Timber harvest units, landings, and all temporary roads would be located outside RHCAs under Alternative 2. Restricting these activities to areas outside of RHCAs would prevent adverse impacts to existing pool habitat and future pool habitat.

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.

Large Pools - Current low levels of quality large pool habitat would be maintained.

Off-Channel Habitat - This baseline indicator would be maintained.

Refugia - This baseline indicator would be maintained

Channel Condition and Dynamics

Wetted Width/Maximum Depth Ratio - Proposed timber harvest activities would not result in increases in width to depth ratios since heavy equipment associated with felling and yarding activities would not be operated in RHCAs and therefore would not result in alteration of banks or bank vegetation.

Since no significant change to flow, sediment supply and streambank conditions are expected, no change to baseline conditions for width to depth ratios are expected.

Stream Bank Condition - Timber harvest units, landings, and all temporary roads would be located outside RHCAs under Alternatives 2 and 3. Increases in fine sediment of a magnitude that would result in destabilization of stream channels from ground disturbing activities associated with timber harvest activities are unlikely to occur because RHCA buffers are sufficient to trap the majority of fine sediment produced by these activities.

Floodplain Connectivity - No road work or other activity is proposed that could result in disconnecting any floodplain function from the adjacent stream.

Hydrology/Flow

Change in Peak/Base Flows - Approximately 5358 acres would receive treatment, including 3907 acres of salvage harvest and 1541 acres of danger tree removal in Alternative 2. Approximately 4311 acres would receive treatment, including 2769 acres of salvage harvest and 1542 acres of danger tree removal in Alternative 3. Reducing the number of trees growing on a site can result in increased summer base streamflow, by reducing evapotranspiration.

With the level of canopy reduction in the Action Alternatives, the expected magnitude of the increase in base flow would be negligible. No measurable changes in water quantity or runoff regime are expected because less than 30 percent of the vegetation in the project area would be cut (Troendle 1982). In eastern Oregon, it appears that more than 30 percent of a watershed vegetated with mixed conifer or lodgepole must be cut before changes in water quantity or runoff regime are measurable (Helvey & Fowler 1995).

Drainage Network Increase - No new or temporary road construction would occur, therefore no increase in drainage network is expected. This baseline indicator would be maintained.

Watershed Conditions

Road Density and Location - The Action Alternatives would not change road densities or location in the project area. Effects to this indicator would be negligible. See discussion on sediment.

Disturbance History - Alternatives 2 and 3 would have an effect on features of the disturbance history within this watershed, however no measurable changes in water quantity or runoff regime are expected because less than 30 percent of the vegetation in the project area would be cut (Troendle 1982).

Riparian Habitat Conservation Areas - Under Alternatives 2 and 3, the only proposed activities within RHCAs are road maintenance and danger tree removal. Danger trees would be left on-site to contribute to large woody debris. No change to the baseline conditions for RHCAs would result from this project.

Disturbance Regime - Alternatives 2 and 3 would have an effect on features of the disturbance history within this watershed; however project elements would have no effect on flow regime and sediment regime of the streams in the project area as a whole. The most likely effect on watershed hazard under the Action Alternatives is little or no change across the landscape compared to the Existing Condition since BMPs associated with the proposed activities are expected to control most run-off and sediment transport under common run-off events. However, because the proposed activities would be implemented in sub-drainages which have been previously disturbed by management activities and wildfire, a slight probability exists that previous disturbance would become connected to ground disturbance associated with the proposed activities.

While these connections would be expected to extend channels headward, runoff is not expected to be concentrated enough to cause accelerated erosion or to deliver increased sediment to live streams in most locations under common rainfall events. Watershed hazard is reduced about five years after implementation as ground cover recovers to slow run-off from common events and trap sediment. Large run-off events tend to exceed the potential of ground cover to slow run-off and trap sediment. Disturbance associated with past activities would continue to recover except where recovery is interrupted as described above. Proposed yarding increases watershed hazard less than that used in past harvest because BMPs and design elements direct implementation onto side slopes, out of the more sensitive ephemeral draws. Compaction in draw bottoms, typically resulting from past practices, tends to increase watershed hazard under large run-off events because of opportunities for erosion to be initiated and accelerated due to soil structure changes. Locating skid trails on sideslopes also permits drainage control to be effective. With implementation of BMPs and project design features, this baseline element would be maintained.

Summary of Direct and Indirect Effects on Aquatic TES Species

Based on effects to the selected indicators from the Action Alternatives direct and indirect effects of both Action alternatives are expected to have minimal additive effects on Middle Columbia steelhead, redband trout and westslope cutthroat trout.

Potential Effects to Steelhead Critical Habitat

The planning area is within designated critical habitat for Mid-Columbia River steelhead. The specific PCEs that may be affected by the proposed activities include freshwater spawning, freshwater rearing, and freshwater migration corridors. The specific critical habitat unit affected by the proposed action is HUC 5: Fields Creek (1707020111) and Murderer's Creek (1707020104)

Freshwater spawning sites

Water Quantity
Road systems affect peak flows by extending the drainage network and increasing delivery efficiency to the stream channel. As described above, the Action Alternatives are not expected to change peak flows from the existing condition. The effects of road maintenance activities on peak/base flows would maintain current conditions.

Water Quality
The activities with the highest potential for affecting sediment input to streams are related to road maintenance, or a lack thereof. Road related impacts most likely to contribute high sediment inputs would be plugged culverts leading to washed out road fills, undersized culverts at stream crossings leading to high water velocities and subsequent erosion at culvert outlets, or sediment channeled on road surfaces and routed through road-side ditches and cross-drain culverts to streams. Except for minor improvements associated with road maintenance, commensurate with use, similar conditions as described under Alternative 1 - with regard to road maintenance, would continue and it would be expected that sedimentation from existing roads would increase over time, unless other projects are implemented to address these impacts. Watershed Hazard is expected to increase slightly in the short term, for up to five years, under the most common run-off events. Some activities such as those associated with ground-based harvest would increase the exposure of mineral soil and the potential for drainage linkages to develop. Improvement in RHCA stand conditions is expected to reduce watershed hazard locally. Considering the effects of all the activities, watershed hazard is expected to increase for up to five years until ground cover recovers to Forest Plan standards.

Freshwater rearing sites

Water Quantity
See discussion above.

Water Quality
See discussion above.

Water Temperature
No effects on water quality or 303(d) listed streams are expected because none of the proposed activities are expected to remove vegetation which is providing shade from streamside areas. Other parameters which may affect water quality also affect watershed hazard; since no changes are expected in watershed hazard along perennial or fishbearing streams, no changes in water quality are expected.

Food
If the beaver population within the watershed increases, the carrying capacity of fish habitat would likely increase with more complex habitats for aquatic invertebrates, increased levels of detritus, lower summer water temperatures, lower embeddedness, and greater terrestrial and aquatic insect (food) abundance. Beche (2005) found that prescribed fire had little to no effect on macroinvertebrate communities.

Freshwater migration corridors

Free Passage
The Action Alternatives would not obstruct steelhead migration corridors.

Water Quantity
See discussion above.

Water Quality
See discussion above.

Determination

The affects to all of the MPI Habitat Indicators were rated as "maintain". This rating means that the function of the indicator does not change with the action.

3.6.4 CUMULATIVE IMPACTS

Other activities have been considered for their cumulative effects on aquatic TES species. The following discussion focuses on those past, ongoing and reasonable foreseeable future activities that may contribute adverse effects to aquatic TES species or their habitat. See list of potential cumulative actions in **DEIS - Appendix N**.

EFFECTS COMMON TO ALL ALTERNATIVES

Effects of Past Actions - Steelhead, redband trout and westslope cutthroat trout within the Dry Creek, Fields Creek, Todd Creek and Murderer's Creek-Duncan 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 Fields Creek and Murderer's Creek 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 Rehabilitation (BAER) actions

Since 1983 timber harvest has occurred on approximately 3,893 acres of Forest Service lands within the analysis area. These harvest activities likely reduced the amount of LWD in perennial streams within the analysis area. The amount of LWD and coarse wood available for delivery from intermittent drainages during storm events was also likely reduced.

Effects of Ongoing and Reasonably Foreseeable Actions - This section of the analysis focuses on those activities currently ongoing or expected to occur within 5 years post-fire with potential to affect current steelhead, interior redband trout and westslope cutthroat trout populations in project area streams relative to post-fire conditions and trends previously discussed.

Dispersed Recreation-On-going activities such as dispersed camping, hunting, fishing, sightseeing, etc. occurs year-round in the analysis area. Public firewood gathering and local snowmobile use would continue to occur, with limited effects to TES species. Firewood cutting within 300 feet of perennial streams is not allowed on the Malheur 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-ongoing control of known populations would continue, using manual methods in areas of infestation. Control of noxious weeds wherever found in the affected subwatersheds will 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. To the extent that reduced upland erosion translates to reduced sediment delivery, spawning and rearing TES species will benefit, particularly in Buck Cabin, Wickiup and Fields Creeks.

State Salvage Harvest*:* State logging operations in the Phillips Snider Cooperative Wildlife Area are conditioned by provisions of the Endangered Species Act, which ensure that Designated Critical Habitat for Middle Columbia steelhead is not Adversely Modified or Destroyed, and that adverse effects to Middle Columbia steelhead, if any, would be minimized.

State logging operations in the Aldrich Pond Area as well as Bridge Creek Area within the Phillips Snider Cooperative Wildlife Area are unlikely to cumulatively affect steelhead, redband and cutthroat habitat to any significant degree, in terms of water chemistry, temperature or fish passage, given the Best Management Practices and PDFs in place**.**

Sediment from state logging activity is likely to be negligible given Best Management Practices, no-cut management zones and logging systems employed. In a high-gradient channel (>5%), most fine sediments delivered to the channel are likely to be flushed downstream quickly to the river where they may accumulate. TES fish spawning and rearing success 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 steelhead, redband trout and westslope cutthroat trout.

These actions are unlikely to affect other habitat parameters previously considered in this document in any way that would significantly affect spawning or rearing success in the analysis area.

Grazing – Aldrich, Fields Peak and Murderer's Allotments **–**Grazing would not be authorized for the first year on fire burned pastures to allow time for BAER seeding to establish, soils to stabilize and residual forage species to recover vigor. Grazing would not be restored to the allotment in year 2 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 prior to the fire, it is unlikely that the effects of this activity, once resumed, would add cumulatively to the effects of the Shake Table Fire Complex in analysis area streams with regard to 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 are allowed essentially no access to fishbearing streams in the Fields Creek and Murderer's Creek watersheds.

Wild Horse Use **-** Wild horse territory is located in Murderers Creek/Duncan Creek subwatershed and in Todd Creek subwatershed. Due to easier access in the Shake Table Fire Complex burn area there is a chance that the horses could migrate into these newly burned areas. A large gather is scheduled for October of 2007. Air and ground operations may require road closures and temporary changes in travel routes. The Wild Horse Gather EA would address the wild horse management.

Shake Table Fire Complex Reforestation Activities **-** Riparian plantings of several thousand shrubs and trees along streams affected by the Shake Table Fire Complex would accelerate redevelopment of stream shade and reduce the timespan for restoration of water temperatures suitable for TES species. Faster recovery of stream temperatures would act synergistically to increase the habitat value of predicted increases in Large Wood and pools. 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 streambeds. Faster habitat recovery to pre-fire or better conditions would help recover local TES fish populations faster 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' increase density and distribution.

PROPOSED ACTION AND ALTERNATIVE 3

Continued livestock grazing is unlikely to degrade habitat pathways or indicators at the 5th field HUC level and is unlikely to retard near natural rates of recovery for PACFISH RMOs at project, subpopulation or watershed-scale in the Fields Creek and Murderer's Creek watersheds when management practices, proposed actions, conservation measures and monitoring are implemented as proposed. Consequently no cumulative effects on analysis streams are expected to develop from the proposed activities following common run-off events.

Road maintenance activities if performed on a regular basis would help to ensure that culverts are cleaned out and maintained, waterbars and other drainage features are properly constructed and maintained, and would result in reduced levels of fine sediment entering streams within the analysis area. However, at existing funding levels road maintenance would not keep up with all needs. It would be expected that sedimentation from existing roads would increase over time, unless other projects are implemented to address these impacts. Detrimental impacts from the proposed action are not expected to reach fish bearing streams because expected effects would be small enough so as to meet the Forest Plan standards, and because water quality BMPs and other design criteria would be in place. Consequently no cumulative effects on analysis area streams are expected to develop from the proposed activities following common run-off events.

As discussed above, with implementation of BMPs and project design features, the cumulative increase in sediment would be negligible. Consequently no cumulative effects to fish habitat in project area streams are expected to develop from the proposed activities following common run-off events.

3.6.5 SUMMARY

The following Threatened and Sensitive species and Designated Critical Habitats are documented (D) as occurring on the Malheur National Forest, and are documented as specifically present in the Fields Creek and Murderer's Creek Watersheds in the subwatersheds affected by the Shake Table Fire Complex and Proposed TFSR project:

- Middle Columbia Steelhead (*Oncorhynchus mykiss*) (T)
    - *Designated Critical Habitat for Middle Columbia Steelhead*

- Interior Redband/Rainbow trout (*Oncorhynchus mykiss*) (S)
- Westslope Cutthroat Trout (*Oncorhynchus clarki lewisi*) (S)

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 action alternatives result in the loss of viability or distribution throughout the analysis area of the sensitive species; or
- Would implementation of any of the action alternatives move sensitive species toward federal listing under the ESA?

SUMMARY OF FINDINGS FOR LISTED SPECIES AND DESIGNATED CRITICAL HABITATS:

Both of the action alternatives would implement land disturbing actions in subwatersheds where Listed and Sensitive Species and Designated Critical Habitats are present. Both Alternative 2 and Alternative 3 May Affect Listed species and Designated Critical Habitats in the affected sub watersheds, and effects are within the range of effects discussed in literature on post-fire salvage (see DEIS references section 5.2.6 for literature considered). The majority of effects would come from ongoing State and private actions and from foreseeable federal actions. Neither Action Alternative is expected to significantly add to effects of the Shake Table Fire Complex and ongoing recovery processes. The preferred alternative 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.

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 Shake Table Fire Complex, whether the No Action alternative is selected, or one of the Action Alternatives. 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 1995, Dunham et al 2003).

At the same time, recovery rates have also been observed to operate slowly for anadromous/fluvial species oriented to natal streams (i.e. steelhead), species which become reproductive at larger body sizes (>20cm) (i.e. redband trout and steelhead) and for species with limited home ranges. Recovery of fish populations even from pulse-type disturbances such as that epitomized by the Shake Table Fire Complex 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.

The No Action Alternative and both of the Action Alternatives **May Affect, but are Not Likely to**

Adversely Affect Middle Columbia Steelhead and Critical Habitat under the Endangered Species Act.

SUMMARY OF FINDINGS FOR SENSITIVE SPECIES:

Impacts 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 Action Alternative is expected to significantly add to effects of the Shake Table Fire Complex and ongoing recovery processes. Effects to fish habitat of both Alternative 2 and Alternative 3 in the affected subwatersheds would be within the range of effects discussed in literature on post-fire.

The no action alternative would impose its own independent effects on Sensitive Species through natural recovery processes triggered by the Shake Table Fire Complex. 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 1995, Dunham 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). Recovery of fish populations even from pulse-type disturbances such as that epitomized by the Shake Table Fire Complex 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 would be initiated at the time reasonably foreseeable federal projects are proposed and developed in further detail.

The No Action Alternative and both of the Action Alternatives **May Impact Interior Redband trout and Westslope cutthroat trout individuals, but are Not Likely to Result in a Trend toward Federal Listing** under the Endangered Species Act.

SUMMARY DETERMINATIONS

Table 112. Threatened, endangered and sensitive (TES) species considered in this analysis and the effects determination for the No Action and Action alternatives.

Species	Status	Occurrence	Alt. 1 No Action	Alt. 2 Proposed Action	Alt 3
Columbia River Bull Trout Salvelinus confluentus	T	HN	NE	NE	NE
Columbia River Bull Trout Designated Critical Habitat	N	HN	NE	NE	NE
Mid-Columbia River Steelhead Oncorhynchus mykiss	T	HD, D	NLAA	NLAA	NLAA
Mid-Columbia Steelhead Designated Critical Habitat	D	HD	NLAA	NLAA	NLAA
Chinook Salmon EFH[1]	MS	HN	NAE	NAE	NAE
Interior Redband Trout Oncorhynchus mykiss	S	HD, D	MIIH	MIIH	MIIH

Species	Status	Occurrence	Alt. 1 No Action	Alt. 2 Proposed Action	Alt 3
Westslope Cutthroat Trout Oncorhynchus clarki lewisi	S	HD, D	MIIH	MIIH	MIIH
Mid-Columbia River Spring Chinook Oncorhynchus tshawytscha	S	HN	NI	NI	NI
Columbia Spotted Frog Rana luteiventris	S	HN	NI	NI	NI
Malheur Mottled Sculpin Cottus bairdi ssp.	S	HN	NI	NI	NI

[1]Chinook salmon waters are designated Essential Fish Habitat by the Magnuson-Stevens Act.

Status

E Federally Endangered
T Federally Threatened
S Sensitive species from Regional Forester's list
C Candidate species under Endangered Species Act
D Designated Critical Habitat
N Designated Critical Habitat Not within Analysis Area
MS Magnuson-Stevens Act designated Essential Fish Habitat

Occurrence

HD Habitat Documented or suspected within the project area or near enough to be impacted by project activities
HN Habitat Not within the project area or affected by its activities
H Historical Occurrence
D Species Documented in general vicinity of project activities
S Species Suspected in general vicinity of project activities
N Species Not documented and not suspected in general vicinity of project activities

Effects Determinations - Threatened and Endangered Species

NE No Effect
NLAA May Effect, Not Likely to Adversely Affect
LAA May Effect, Likely to Adversely Affect
BE Beneficial Effect

Effects Determinations - Sensitive Species

NI No Impact
MIIH May Impact Individuals or Habitat, but Would Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species
WIFV Would 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

Designated Critical Habitat

NE No Effect
LAA May Effect, Likely to Adversely Affect
NLAA May Effect, Not Likely to Adversely Affect

Chinook Salmon Essential Fish Habitat

NAE No Adverse Effect
AE Adverse Effect

COMPLIANCE WITH THE FOREST PLAN AND OTHER REGULATORY DIRECTION

Malheur Forest Plan: The TFSR Project is consistent with the Forest Plan for the Malheur National Forest (USDA Forest Service 1990), as amended by PACFISH (USDA & USDI 1995) and Forest Plan Amendment 29. As stated in the analysis, the project would not retard attainment of PACFISH RMOs or Amendment 29 DFCs and is consistent with direction set forth in both documents.

Endangered Species Act: The TFSR Project is consistent with the Endangered Species Act (ESA). Effects to Federally listed fish species and critical habitat located within the analysis area would be consulted on with NOAA Fisheries and/or US FWS. This document serves the purpose for documentation of effects to sensitive species, otherwise known as a Biological Evaluation, and compliance with existing federal regulations on Forest Service actions with regard to aquatic species and aquatic habitat.

Consultation with American Indian Tribes: During tribal consultation, the Confederated Tribes of Warm Springs noted "the John Day River is the only system within Tribal ceded territory that does not support a subsistence fishery." The Thorn Fire Salvage Recovery Project is within the John Day River drainage and the Tribe identified retention of some large diameter wood and root wads for stream restoration projects. As discussed previously, no timber harvest will occur in RHCAs. Danger trees will be felled but left on site in RHCAs. During the BAER process large diameter wood was felled into stream channels as partial replacement for wood lost during the fire. These actions in concert with other PDFs will minimize the potential effects of the Shaketable Fire and the Thorn Fire Salvage Recovery Project on the John Day River fishery. The stream protection and restoration measures are consistent with the Wy-Kan-Ush-Mi Wa-Kish-Wit: Spirit of the Salmon restoration plan of which both the Confederated Tribes of Warm Springs and the Confederated Tribes of the Umatilla Indian Reservation are party (Columbia River Inter-Tribal Fish Commission).

IRREVERSIBLE/IRRETRIEVABLE EFFECTS

There are no irreversible or irretrievable commitments of resources that may result from the alternatives with respect to fisheries resources.

3.7 SENSITIVE PLANTS

3.7.1 INTRODUCTON

This section functions as a Biological Evaluation (BE) that analyzes effects or impacts from the proposed action and alternatives to plants listed threatened or endangered species, or proposed for listing, and Forest Service sensitive plant species. A BE is prepared for any planned, funded, executed, or permitted programs and activities for possible effects to proposed, threatened, endangered, or sensitive (TES) species. The BE is the means of conducting the review and documenting the findings (FSM 2672.4). The objectives of the BE are to

- Ensure that Forest Service actions do not contribute to the loss of viability of any native or desired non-native plant animal species or contribute to trends toward Federal listing of any species;
- Comply with the requirements of the Endangered Species Act (ESA) that actions of Federal agencies not jeopardize or adversely modify critical habitat of Federally listed species; and
- Provide a process and standard by which to ensure that threatened, endangered, proposed, and sensitive species receive full consideration in the decision making process.

3.7.2 AFFECTED ENVIRONMENT

This section evaluates plants included on the Pacific Northwest Region Regional Forester's Sensitive Species list known or suspected to occur on the Malheur National Forest (See **DEIS Appendix G-1**). Complete lists of Forest Service sensitive species in Oregon and Washington National Forests can be viewed at this website: http://www.fs.fed.us/r6/sfpnw/issssp/agency-policy/. Federally listed endangered or threatened plants or plants proposed for federal listing under the ESA are neither known nor suspected to occur on the Malheur National Forest.

The Forest Geographic Information System (GIS) was examined to identify whether sensitive plants are located in or near the project planning area. Two plants, Luina serpentina (colonial Luina) and Phacelia minutissima (least Phacelia) have been located within or immediately adjacent the project area boundary (See **DEIS Appendix G-2**). The project area may provide additional suitable habitat for the sensitive plants listed below in Table 113.

Table 113. Sensitive Plant Species with Suitable Habitat in the Project Area

SENSITIVE SPECIES	Documented or Suspected	Habitat Type
Achnatherum hendersonii	S	Lithosolic substrate, scablands
Achnatherum wallowaensis	S	Lithosolic substrate, scablands
Botrychium ascendens	S	Riparian
Botrychium crenulatum	S	Riparian
Botrychium lanceolatum	S	Riparian, meadows
Botrychium minganense	S	Riparian, meadows
Botrychium montanum	S	Riparian
Botrychium pinnatum	S	Riparian
Carex backii	S	Riparian in PIPO/SYAL; PSME/SYAL
Carex interior	S	Seeps, riparian
Cypripedium fasciculatum	S	Moist bottomland, riparian

SENSITIVE SPECIES	Documented or Suspected	Habitat Type
Listera borealis	S	cool-wet forest, springs
Lomatium ravenii	S	Lithosolic substrate, scablands
Luina serpentina*	D	Talus, rock outcrops
Phacelia minutissima*	D	Upper montane meadows, balds
Thelypodium eucosmum	S	Juniper, sagebrush

Suitable habitat for the species listed in Table 113 was identified in the project area using color aerial photography and plant association maps in the Forest GIS. The following assumptions were used to guide the identification of suitable habitats for species suspected to occur in the project planning area:

- Forested habitats that were most severely burned, including riparian areas, no longer provide suitable habitat for any sensitive plant species.
- Areas with lightest burn severity may still provide suitable habitat for sensitive plant species, notably Carex backii (syn. C. cordillerana) in ponderosa pine/common snowberry or Douglas-fir/common snowberry riparian terraces.
- Meadows and seeps, springs, and non-forested habitat - especially lithosols (scablands) and rock outcroppings - likely continue to provide suitable habitat.
- Suitable habitat that has been surveyed since 1990 for sensitive plants were not identified as suitable habitat for this project.
- Most riparian dependent sensitive plant habitat was not included the habitat map because project design features state harvest activities would avoid riparian habitat conservation areas via buffers.

DEIS Appendix G-2 displays a map of sensitive plant suitable habitat types listed in Table 113 along with the locations of *Phacelia minutissima* and *Luina serpentina* within or in proximity to the project area.

3.7.3 ENVIRONMENTAL CONSEQUENCES

This section will describe the potential effects to sensitive species that are present or have suitable habitat within the project area. Project design features (See 2.2.5 - Chapter 2) are prescribed to minimize potential adverse effects to sensitive plants species and their habitat.

ALTERNATIVE 1 - NO ACTION

With Alternative 1, no actions would occur with the TFSR Project. The project would therefore have no impact to any sensitive plant species.

ALTERNATIVE 2 AND ALTERNATIVE 3

Achnatherum hendersonii (Henderson ricegrass), Achnatherum wallowensis (Wallowa ricegrass)

These two closely related grasses grow in the same habitat. Both are rare in the Blue Mountains and have not been found on the Malheur National Forest, but both species are located west of the project area on the neighboring Ochoco National Forest. These two plants grow on lithosol substrates, shallow-soiled areas of fewer than 10-inches soil depth that support scant vegetation. Plant communities supporting Achnatherum hendersonii and A. wallowensis are found in the Artemisia rigida/Poa sandbergii, Artemisia arbuscula/Poa sandbergii, and Poa sandbergii –Danthonia unispicata plant associations (Johnson and Clausnitzer 1992).

Direct and Indirect Effects

Habitats known to harbor Achnatherum hendersonii and A. wallowensis have been identified and avoided through project design features for Alternatives 2 and 3. Harvest units have eliminated these areas from entry. These design features ameliorate direct and indirect effects to sensitive plant suitable habitat and ensure that the habitats used by these plant species would not be impacted by project activities. If *Achnatherum hendersonii* or *A. wallowensis* are discovered through planned inventory of landings and rock material source areas, these areas will be avoided through a 100-foot buffer per Project Design Features. Therefore, the project would result in no impact to Achnatherum hendersonii or A. wallowensis.

Botrychium crenulatum, Botrychium minganense, Botrychium montanum

Botrychium crenulatum is known from small populations scattered across at most western states and Canadian provinces (Farrar 2005). Botrychium crenulatum grows in saturated soils of fens, seeps, springs and fenlike habitat along streams, often among dense vegetation. Usually it is found in shaded sites at mid to high elevations. In the Blue Mountains, surrounding forest stands are most often comprised of Engelmann spruce, lodgepole pine or grand fir. See effects discussion below.

In the Blue Mountains, the habitat of Botrychium minganense varies from open meadow to saturated fens and seeps. It is often found on surfaces scarred by past (over 10 year old) disturbances such as logging roads and road shoulders. It is the most frequently located moonwort in basaltic soils in the Blue Mts. In the planning area, these habitats would most frequently be found in along streams, but also moist meadows. See effects discussion below.

Botrychium montanum grows in fens, seeps, and meadows along streams where the soils are saturated, in shaded or sunny exposures. In the planning area, these habitats are restricted to riparian areas and moist-wet meadows.

Direct and Indirect Effects

A constant factor of moonwort habitat is the presence of moisture, which, in the Blue Mountains, is usually provided by streams, springs and seeps or areas with a relatively high water table (moist – wet meadows). These habitats have been excluded from harvest and salvage actions through buffers for Riparian Habitat Conservation Areas. Some habitat for these moonworts, seeps or fens smaller than 1 acre, would not be incorporated in RHCA Category 3 buffers. It is possible some seeps or fens smaller than one acre have been overlooked during the preparation of the sensitive plant suitable habitat map (See **DEIS Appendix G-2**) and thereby have inadvertently not been excluded from project activities. In this event, some individuals or small sites of these moonworts, if present, may be impacted. However, the vast majority of these species' habitats are expected to fall within RHCA buffers.

Conifer and hardwood planting in riparian areas would have only a benign effect on sensitive plant suitable habitat.

Therefore, this project 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 to Botrychium crenulatum, Botrychium minganense, or Botrychium montanum.

Cumulative Effects

The list of potential cumulative actions (**DEIS Appendix N**) was reviewed for those actions which may cause additional effects to sensitive plant species or their habitats. Of these, ongoing and future livestock grazing pose the only risk of additional effects to *Botrychium crenulatum*, *Botrychium minganense* and *Botrychium montanum* or their habitats. Because the fire resulted in increased access for the Murderer's Creek Wildhorse herd to the project area, it is possible wild horses may use the some areas that have been designated as suitable habitat, but I do not expect a measurable effect to result. The habitat for these moonworts would be expected to consist of small green islands amidst vast acres of severely burned forest with near complete mortality to plant life). Because of the moisture present, seep, fen and wet meadow-like riparian vegetation, even in severely burned areas, may not have suffered complete mortality during the blaze. These areas may continue to provide habitat for these sensitive species. The surrounding landscapes of moderately and severely burned areas are expected to be devoid of much plant life, and in turn, livestock forage. If grazing were to resume in these areas by 2007 or 2008, livestock would be concentrated to the few remaining islands of forage: riparian areas, including seeps, springs, fens and moist-wet meadows. These habitats might receive heavy grazing impacts.

Livestock grazing has been temporarily halted in pastures that were burned during the Shake Table Fire Complex. According to **DEIS Appendix N**, Grazing is expected to resume within 3-5 years in most pastures of the Aldrich Allotment (Cabin-Todd Pasture: 2-3 years); grazing in the burned portion of Fields Peak would resume following 1-2 years rest; grazing in Martin Corrals, Murderers Creek Allotment, where less than 1 percent burned moderately and none burned severely, is expected to resume the summer or fall 2008. Grazing is expected to resume in the Red Rock Pasture (75 percent burned, 11 percent moderate, <10 acres high severity) in 2008 or 2009, depending on the recovery of moderately burned areas with bunchgrass cover. In addition, the TFSR Project incorporates project design features to facilitate the recovery of vegetation and mitigate grazing impacts. These project design features are designed to allow vegetation to recover. When vegetation recovered to the point where grazing could resume, there should be sufficient forage to help reduce pressure on sensitive habitats such as seeps, fens, and moist-wet meadows. Once grazing resumed these habitats would be impacted, but these effects, in addition to direct and indirect effects, are not expected to rise to the level where species or population viability would be a concern.

Botrychium ascendens, Botrychium lanceolatum ssp. Lanceolatum, Botrychium pinnatum

The upswept moonwort (Botrychium ascendens) may be found in alpine meadows, avalanche meadows, pastured meadows and grassy roadsides (Farrar 2005). The project planning area contains no alpine or avalanche meadows and very little of pastured moist meadow or moist grassy roadside habitat. Botrychium ascendens is least likely of the moonworts to be found in the planning area.

Botrychium lanceolatum ssp. lanceolatum is broadly distributed in western North America from northern New Mexico to Alaska. It grows in moist open woodlands, meadows and roadsides throughout most of its range. In the project area, habitat for Botrychium lanceolatum ssp. lanceolatum would be confined to riparian terraces and meadows, and forested meadow fringes.

Botrychium pinnatum occurs in moist grassy sites in open forests and meadows, but where soil moisture provided by streams or springs is constant. In the planning area, these habitats are restricted to riparian areas.

Direct and Indirect Effects

Botrychium ascendens, B. lanceolatum ssp. lanceolatum and B. pinnatum require a perennial source of moisture, although not to the degree needed by B. crenulatum, B. minganense and B. montanum. Usually a nearby stream or spring and moist to wet meadows provide the conditions necessary for these moonworts to grow. Riparian Habitats Conservation Areas, which provide these characteristics, have been mapped and excluded from project design for both action alternatives and other project design features have been incorporated to eliminate or reduce impacts to these species. Conifer and hardwood planting in riparian areas would have only a benign effect on sensitive plant suitable habitat.

These measures ensure that the habitats used by these plant species would not be impacted by project activities. If the species is discovered through later inventory of landings or rock material source areas, these areas would then be avoided. Therefore, the project will result in no impact to Botrychium ascendens, Botrychium lanceolatum ssp. lanceolatum or Botrychium pinnatum.

Carex backii Boott (Back Sedge) (syn. C. cordillerana Saarela & B. A. Ford)

In the southern Blue Mountains Carex backii is infrequently found on stream terraces populated with ponderosa pine or Douglas-fir with an understory of snowberry. It is associated with dry forests (Douglas-fir to pine) to riparian woods and shrub thickets at mid elevations. It is fairly palatable to livestock.

Direct and Indirect Effects

Carex backii habitat is restricted to areas included in Riparian Habitat Conservation Areas (RHCAs). Furthermore, only areas that burned least intensively probably continue to support Carex backii. These habitats have been excluded from harvest and salvage actions through buffers to riparian habitat conservation areas. Conifer and hardwood planting in riparian areas would have only a benign effect on sensitive plant suitable habitat. Therefore, this project would result in no impact to Carex backii.

Carex interior (Inland Sedge)

Carex interior is restricted to very saturated soils in wet meadows, fens, springs, and along streambanks at moderate to higher elevations (Hurd 1998).

Direct and Indirect Effects

Carex interior habitat is mostly restricted to areas included in Riparian Habitat Conservation Areas (RHCA). These habitats have been excluded from harvest and salvage actions through buffers to riparian habitat conservation areas. Some habitat for Carex interior, seeps or fens smaller than 1 acre, would not be included in RHCA Category 3. It is possible some seeps or fens smaller than one acre have been overlooked during the preparation of the sensitive plant suitable habitat map (See **DEIS Appendix G-2**) and thereby have not been excluded from project actions. In this event, some individuals or small sites of Carex interior, if present, may be impacted. However, the vast majority of Carex interior habitat is expected to fall within RHCA buffers. Conifer and hardwood planting in riparian areas would have only a benign effect on sensitive plant suitable habitat.

Therefore, this project 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 to Carex interior.

Cumulative Effects

The list of potential cumulative actions (**DEIS Appendix N**) was reviewed for those actions which may cause additional effects to sensitive plant species or their habitats. Of these, ongoing and future livestock grazing pose the only risk of additional effects to *Carex interior* or its habitat. Because of the moisture present, seep, fen and wet meadow-like riparian vegetation, even in areas burned severely, may not have suffered complete mortality during the blaze. These areas may continue to provide habitat for this sensitive species. The surrounding landscapes of moderately and severely burned areas are expected to be devoid of much plant life, and in turn, livestock forage. If grazing were to resume in these areas by 2007 or 2008, livestock would be concentrated to the few remaining islands of forage: riparian areas, including seeps, springs, fens and moist-wet meadows. These habitats might receive heavy grazing impacts.

Livestock grazing has been temporarily halted in pastures that were burned during the Shake Table Fire Complex. According to **DEIS Appendix N**, grazing is expected to resume within 3-5 years in most pastures of the Aldrich Allotment (Cabin-Todd Pasture: 2-3 years); grazing in the burned portion of Fields Peak would resume following 1-2 years rest; grazing in Martin Corrals, Murderers Creek Allotment, where less than 1 percent burned moderately and none burned severely, is expected to resume the summer or fall 2008. Grazing is expected to resume in the Red Rock Pasture (75 percent burned, 11 percent moderate, <10 acres high severity) in 2008 or 2009, depending on the recovery of moderately burned areas with bunchgrass cover.

In addition, the TFSR Project incorporates the following project design features to facilitate the recovery of vegetation and mitigate grazing impacts.
These project design features are designed to allow vegetation to recover. When vegetation recovered to the point where grazing could resume, there should be sufficient forage to help reduce pressure on sensitive habitats such as seeps, fens, and moist-wet meadows. Once grazing resumed these habitats would be impacted, but these effects, in addition to direct and indirect effects, are not expected to rise to the level where species or population viability would be a concern.

Cypripedium fasciculatum (Clustered Lady-Slipper)

Cypripedium fasciculatum usually grows in filtered light to shady areas of moist mixed conifer forest and is rarely found growing in the open. It is most often found in areas with 60 to 100 percent shade provided by canopy cover. In the Wenatchee NF, average canopy closure is 62 percent. One site on the Umatilla National Forest is in a valley bottom surrounded by Douglas-fir forest. The nearest recorded occurrence is from a collection taken of this plant in 1959 in northern Baker County in the Wallowa Mountains at an elevation of 5600 feet (OSU Herbarium 2007). The specimen was growing in grand fir forest with boxwood on a shaded northerly slope. On the Malheur National Forest, Cypripedium fasciculatum is most likely to occur in shaded wet forest communities of valley bottoms. In this project area, unburned forested riparian areas in Riparian Habitat Conservation Areas provide the likeliest suitable habitat for this plant. Very little habitat of this type in this condition is present in the project area.

Direct and Indirect Effects

Cypripedium fasciculatum habitat is restricted to areas included in Riparian Habitat Conservation Areas (RHCA). These habitats have been excluded from harvest and salvage actions with buffers described in the project design features. Conifer and hardwood planting in riparian areas would have only a benign effect on sensitive plant suitable habitat. Therefore, this project would result in no impact to Cypripedium fasciculatum.

Listera borealis (Northern Twayblade)

Listera borealis, the northern twayblade, grows in moist spots of cold air drainages usually near streams or springs in mature and old growth forest. Common forest types are Engelmann spruce or subalpine fir and often mixed with lodgepole pine. In the project area, habitat for Listera borealis would be found near streams at higher elevations on the northern slope of the Aldrich Mountains axis. Most of this habitat burned intensively and no longer is likely to provide habitat for Listera borealis.

Direct and Indirect Effects

Any suitable habitat for Listera borealis that may be intact would be included in the Riparian Habitat Conservation Areas, which have been excluded from harvest actions with buffers as outlined in the project design features. Conifer and hardwood planting in riparian areas would have only a benign effect on sensitive plant suitable habitat. Therefore, this project would result in no impact to Listera borealis.

Lomatium ravenii (Raven Lomatium)

Lomatium ravenii grows on very arid, shallow-soiled plant communities supporting scant vegetation. These communities are often within the Artemisia rigida/Poa sandbergii plant association, but the species has also been found in association with Artemisia arbuscula. In the Blue Mountains it grows on a substrate of basalt or basalt-andesite. Its habitat is strikingly similar to Achnatherum wallowensis, though these two have not been reported in association.

Direct and Indirect Effects

Habitats known to harbor Lomatium ravenii have been identified and avoided through project design features listed for Alternatives 2 and 3. Harvest units have eliminated these areas from entry. These project design features would ensure that the habitats used by these plant species would not be impacted by project activities. If Lomatium ravenii is discovered through planned inventory of landings or rock material source areas, these areas would be relocated or the plant site would protected with a 100-foot buffer. Therefore, the project would result in no impact to Lomatium ravenii.

Luina serpentina (Colonial Luina)

Luina serpentina is a plant narrowly endemic to a small range in the Aldrich Mountains. The western portion of this sensitive species' range falls within the eastern portion of the TFSR Project area boundary. Luina serpentina grows most often in exposed open slopes, talus slopes, and rock outcrops with little competition from other species, although these habitats may be small inclusions within otherwise forest dominated landscapes. The western range of Luina serpentina is dominated by sites in these niche habitats.

Direct and Indirect Effects

Three patches of Luina serpentina (site ID nos. 010004, 010074, 010307) lie entirely within and one patch (010011) slightly overlaps the project area boundary. Sites 010307 and 010004 sit above an open road. Site 010011 lies below road 2140-068 and site 010074 lies below road 2140-074. These four sites have been buffered from harvest units by at least 100 feet. The two sites that lie below roads, 010011 and 010074, may be at risk from road maintenance actions associated with the project. Road surface treatments and maintenance, primarily "blading," may result in surface materials (native surface or crushed rock) being cast from the road surface onto the downslope portion of the road prism or beyond which could cover Luina serpentina plants growing just below the road. This action could bury Luina serpentina plants to a depth from which they may not recover. The TFSR incorporates Project Design Feature to avoid side-cast of road surface materials off down-slope portion of road prism along Luina serpentina locations within and en route to the project area. This design feature would ensure that populations of Luina serpentina growing near roads would not be impacted by road maintenance activities.

Suitable habitat for Luina serpentina is present in the eastern portion of the planning area. This habitat has been excluded from harvest actions. Furthermore, these habitats would be protected and would not be impacted.

Some proposed landings may fall within Luina serpentina suitable habitat. These locations would be inventoried prior to project implementation. If Luina serpentina is located, the landing would be relocated to accommodate a minimum 100-foot buffer around the sensitive plant site per project design features.

The known sites of Luina serpentina would be avoided by salvage actions. Suitable habitat for Luina serpentina would be avoided through project design features as discussed above. Suitable habitat that may be present at landings would be inventoried prior to project implementation and avoided where plants are found. For these reasons, the TFSR Project would result in no impact to Luina serpentina.

Phacelia minutissima (Least Phacelia)

Phacelia minutissima is a widely scattered ephemeral annual plant known from the northern Intermountain Region and Blue Mountains. This diminutive plant is most often found on vernally wet slopes of ephemeral drainages or mountain meadow complexes and meadow edges. These habitats are often within a larger matrix of bunchgrass or snowberry stands. The plant is dependant upon spring and summer moisture. Soil conditions are usually well drained but comprised of fine silts and the parent material is often basalt. Most sites are at least partially exposed; elevations range from 5000 to 8200 feet. In the vicinity of the planning area, Phacelia minutissima is associated with moist meadow complexes dominated by corn lily (Veratrum californicum). These areas are adjacent ponderosa pine forest.

Direct and Indirect Effects

Although not known to occur within the project area boundary, Phacelia minutissima is found at two sites in proximity to the project area boundary (**See DEIS Appendix G-2**). The edge of one site is approximately 100 meters south of unit 88, a ground based logging system harvest unit. The second site is approximately 600 east of unit 13, a helicopter logging system harvest unit. Both sites are satisfactorily distant from these harvest operations such that that neither would be impacted.

Suitable habitat for Phacelia minutissima is also located within and adjacent to the project area boundary, mainly in spots along Forest Service road 2150. Habitat for Phacelia minutissima probably is not found north of the Aldrich Mountains divide. Although suitable habitat has been excluded from harvest units, some proposed landing sites along road 2150 are proposed to be constructed in suitable habitat. These harvest landing sites would be inventoried for the presence of Phacelia minutissima prior to project implementation. If Phacelia minutissima is located, the landing would be relocated to accommodate a minimum 100-foot buffer around the sensitive plant site in accordance with project design features.

PDF features to avoid known sensitive plant sites with a minimum 100-foot buffer would result in no impact to Phacelia minutissima. Plus harvest landings in *Phacelia minutissima* suitable habitat will be relocated if this plant is located during inventories. These design features would result in no impact to Phacelia minutissima.

Thelypodium eucosmum (Arrow-Leaved Thelypody)

Thelypodium eucosmum grows mainly in open sagebrush at lower elevations. This plant also grows in a few patches on steep ephemeral draws and slopes in the eastern Aldrich Mountains and in one patch near Little Canyon Mountain near Canyon City, Oregon. Habitat for this plant would exist at lower elevations in the northern and eastern portions of the planning area. These areas are included in the suitable habitat map (**DEIS Appendix G-2**) prepared for this project.

Direct and Indirect Effects

Habitats that may support Thelypodium eucosmum have been identified and avoided through project design features for Alternatives 2 and 3. Harvest units have eliminated these areas from entry.

These measures ensure that the habitats used by Thelypodium eucosmum would not be impacted by project activities. If the species is discovered through later inventory of landings or rock material source areas, these areas would be avoided. Therefore, the project would result in no impact to Thelypodium eucosmum.

3.7.4 CUMULATIVE EFFECTS SUMMARY

The direct and indirect effects to the sensitive plant resource area are limited (see prior discussions for those species with MIIH determination effects calls) due to the project design features incorporated into the project. In addition, field surveys would be accomplished on those species where there are concerns of direct and indirect effects, and if found those species and habitats would be protected. Therefore, there would not be any cumulative effects on sensitive plants or habitats

3.7.5 SUMMARY

This section will summarize the “determination statements” for each sensitive plant species as described in the previous discussions.

Table 114. Sensitive Plant Species: Summary of Effects Determination Statements

SENSITIVE SPECIES	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3
Achnatherum hendersonii	NI	NI	NI
Achnatherum wallowaensis	NI	NI	NI
Botrychium ascendens	NI	NI	NI
Botrychium crenulatum	NI	MIIH	MIIH
Botrychium lanceolatum	NI	NI	NI
Botrychium minganense	NI	MIIH	MIIH
Botrychium montanum	NI	MIIH	MIIH
Botrychium pinnatum	NI	NI	NI
Carex backii	NI	NI	NI
Carex interior	NI	MIIH	MIIH
Cypripedium fasciculatum	NI	NI	NI
Listera borealis	NI	NI	NI
Lomatium ravenii	NI	NI	NI
Luina serpentina	NI	NI	NI
Phacelia minutissima	NI	NI	NI
Thelypodium eucosmum	NI	NI	NI

FOREST PLAN CONSISTENCY

Table 115 below displays the relevant Forest Plan direction guiding management of sensitive plant resources. The Thorn Fire Salvage Recovery Project is consistent with the Forest Plan standards and Forest Service Manual direction for threatened, endangered and sensitive species. Forest Plan Direction for Unique and Sensitive Habitats requires buffers of “approximately 100 feet” Much of the suitable habitat for sensitive plants falls into the habitat types described below for Unique and

Sensitive Habitats (Forest Plan Standard #56). Project design features did not include an "approximate 100-foot" buffer for sensitive plant suitable habitat. However, project design features did "utilize additional mitigation/enhancement measures," e.g., direction falling, to avoid direct impacts to the sensitive plant resources that may dwell in these habitats. These design features were incorporated into project design, as specified in Forest Plan Standard #65.

Table 115. Forest Plan Direction (Forest-Wide Standards)

Unique and Sensitive Habitats
#56. Maintain the integrity of unique habitats including meadows, rimrock, talus slopes, cliffs, animal dens, wallows, bogs, seeps and springs by incorporating cover buffers of approximately 100 feet in width. Utilize additional mitigation/enhancement measures identified through project analysis.
Threatened, Endangered and Sensitive Species
#65. Specify all protection or mitigation requirements (36 CFR 219.27(a)(8)) before project implementation begins
#66. Perform a biological (field) evaluation for use in planning of proposed projects when sensitive species are present or suspected. Conduct surveys in cooperation with other agencies and groups to document the locations of sensitive species populations and to provide more specific information on habitat requirements and relative management guidelines.

IRRETRIEVABLE AND IRREVERSIBLE COMMITMENT OF RESOURCES

This analysis has shown that the Thorn Fire Salvage Recovery Project may impact individuals of some sensitive plant species, but would not result in the loss of population or species viability nor cause a trend toward federal listing under the Endangered Species Act. For these reasons, the Thorn Fire Salvage Recovery Project should not result in an irretrievable and irreversible commitment of resources.

3.8 RANGE / NOXIOUS WEEDS

3.8.1 INTRODUCTON

The project area is located within three grazing allotments. The proposed activities have the potential to impact range resources such as forage availability, livestock distribution, existing range improvements, and permittee access.

Additionally, noxious weed populations could be affected or introduced as a result of project activities. Invasive species Executive Order 13112 (1999) combined with the USDA Forest Service National Strategic Plan directs the Forest Service to: (1) determine factors that favor establishment and spread of noxious weeds, (2) analyze weed risks in resource management projects, and (3) design management practices to reduce these risks.

This range resource and noxious weed report would discuss management direction, current conditions, and environmental consequences of proposed alternatives. The range resource evaluation would include the entire TFSR project area and the Murderer's Creek, Fields Peak and Aldrich grazing allotments. The noxious weed evaluation would consist of the TFSR project and associated roads that serve as corridors for transport of noxious weed seed or propagules.

MANAGEMENT DIRECTION

Malheur LRMP management direction and goals related to range and noxious weeds are summarized below.

Range

Forest wide rangeland management goals are:

- to provide a sustained production of palatable forage for grazing and dependent wildlife species
- to manage rangelands to meet the needs of other resources and uses at a level which is responsive to site-specific objectives
- to permit livestock use on suitable range when the permittee manages livestock using prescribed practices (LRMP, Chapter 4, p. 2)

Forest wide range standards are:

- to manage big game and livestock numbers at a level which utilizes available forage while maintaining plant vigor, composition and density
- to inventory and analyze forage resource production, condition and trend

Management Area 1 standards are:

- to manage allotments to utilize available forage while maintaining vegetation and site productivity
- to create and utilize transitory forage resulting from timber harvest if restocking of cutover areas within planned regeneration period is assured
- to design structures which facilitate livestock distribution

- to protect tree regeneration, and to plan and implement range forage seeding that are not detrimental to tree restocking of harvest area within planned regeneration periods

Management Area 2 standards, (which consist primarily of nonforested grasslands and low-site ponderosa pine lands that are unsuitable for timber production) are to emphasize forage production on the nonforested areas on a sustained yield basis while providing for other resources and values.

Management Area 3B standards are

- Grazing allotments with riparian areas in less than desirable condition have been identified and would be updated according to the schedule shown in the LRMP Appendix A (Activity Schedule A-10).
- Include in allotment management plans (AMPs) a strategy for managing riparian areas for a mix of resource uses. Establish a measurable desired future riparian condition based on existing and potential vegetative conditions. When the current riparian condition is less than that desired, objectives would include a schedule for improvement. AMPs would identify management actions needed to meet riparian objectives with specific time frames. Measurable objectives would be set for key parameters, such as amount of stream surface shaded, stream bank stability, sedimentation, cover provided by trees, shrubs, forbs, grasses and grasslike vegetation. This process is described in "managing Riparian Ecosystems (Zones) for Fish and Wildlife in Eastern Oregon and Eastern Washington" (1979). The AMP would specify the monitoring needed to determine if the desired rate of improvement is occurring. AMPs currently not consistent with this direction would be developed or revised on a priority basis as shown in the LRMP Appendix A (Activity Schedule A-10).
- Using Activity Schedule A-10 and available funding, prepare AMPs for every grazing allotment on the Malheur National Forest as soon as possible. This process would use information gathered through the range allotment analysis activity, including the analysis of the management situation. Prepare an AMP for each allotment that provides the techniques to reach an agreed upon interdisciplinary desired future condition. Establish resource value ratings and the range resource management level needed to reach the desired future condition. Use LRMP Table IV-5 to establish utilization levels for grass/grasslike and shrubs by range resource management level. Inventory existing conditions to determine if the riparian area is satisfactory or unsatisfactory.
- Establish annual forage utilization requirements for each grazing allotment as a tool to achieve or maintain the desired condition. Use the forage utilization standards shown in LRMP Table IV-5, except where site-specific monitoring information shows that a higher level of utilization would achieve the desired future condition without delaying the rate of improvement. As a minimum, the desired condition must be "satisfactory."
- Employ all available methods to achieve the desired levels of utilization by permitted livestock and big game. In cooperation with Oregon Department of Fish and Wildlife establish riparian area carrying capacity of big-game. Limit game populations to the level necessary to achieve riparian objectives for all riparian resources. Special emphasis needs to be placed on big game riparian winter range management.
- Design the methods selected for controlled livestock use to fit the site-specific requirements for improving the riparian area to desirable condition. Any one or a combination of methods may be used to treat less than desirable riparian areas such as corridor fencing, herding, additional water developments, salting, nonuse for resource protection, early and late season use, short term grazing rather than season long, reduced livestock numbers,

control of degree of use, and/or creating additional pastures through fencing.

- Manage allotments to protect or enhance riparian-dependent resources.
- Manage livestock grazing so that water quality meets Oregon State standards and fish populations are maintained at an acceptable condition or in an upward trend.
- Maintain sufficient streamside vegetation to maintain stream bank stability and fish habitat capability.
- Restrict season long grazing, unless specifically evaluated and approved through the environmental analysis process.

Management Area 4A standards are

- to prioritize forage utilization to provide for big game species at levels derived in consultation with the Oregon Department of Fish and Wildlife for each area.
- to include the forage needs of big game in late fall when preparing or updating allotment management plans and when considering seasonal extensions of livestock grazing.

Management Area 10 standards are

- to permit livestock grazing in accordance with forest-wide standards
- to restrict livestock improvements to those compatible with the semi primitive nonmotorized recreation opportunity spectrum class. All improvements would be cost efficient.
- Allow the occasional use of motorized equipment for facility maintenance and other range activities when approved by the Forest Supervisor.

Management Area 13 standard is to permit livestock grazing in accordance with Forest-wide Standards.

Management Area 14 standards are to permit livestock grazing in accordance with forest-wide standards and design both structural and non-structural improvements to meet visual quality objectives of the area

Management Area 20A standards are

- Prioritize forage utilization to provide for big game species at levels derived in consultation with the Oregon Department of Fish and Wildlife.
- Structural improvements would be designed to not detract from the existing natural condition of the landscape.
- Allow the occasional use of motorized equipment for facility maintenance and other range activities when approved by the Forest Supervisor.

Management Area 21 standards are

- To prioritize forage utilization to provide for big game species at levels derived in consultation with the Oregon Department of Fish and Wildlife.
- To schedule cost efficient range improvements to improve range condition when and where needed and consistent with management area objectives.

- To design improvements to protect wildlife habitat and distribute livestock use.

The Malheur National Forest Post Fire Grazing Guidelines (2003) is an interim providing direction that establishes minimum timeframes an area would be rested from grazing following a wildfire and prescribed fires. Other resource concerns may require resting the burned area from grazing for longer periods to allow the area to recover sufficiently. Some factors that should be considered when making the decision to resume grazing include, but are not limited to: burned acres of suitable and non-suitable range, amount and spatial arrangement of the different burn intensities on the landscape, grazing history, vegetation community type and condition prior to burn, amount of available ground cover needed to resume grazing, aquatic resource values, and condition of range improvements. Resumption of grazing following prescribed fire or wildfire is dependent upon the length of time it takes the vegetation to recover sufficiently to withstand grazing (Sanders 2000). See **DEIS Appendix H-5** for the entire document.

Noxious Weeds

Forest wide standards are to implement a weed control program to confine present infestations and prevent establishment of noxious weeds in new areas. The Malheur National Forest strives to implement the Pacific Northwest (PNW) Regional Strategy for Noxious Weeds and Non-native Invasive Plant Management that is tiered to the National Forest Service Strategic Plan. The Malheur National Forest conducts annual noxious weed surveys. Noxious weed control measures on the forest presently consist of mechanical and hand pulling of weeds in affected areas.

This EA 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 Malheur National Forest Plan by adding management direction relative to invasive plants. This project is intended to comply with the new management direction. This project would also be in compliance with the 1988 Record of Decision for Managing Competing and Unwanted Vegetation (1988 ROD) and the 1989 Mediated Agreement.

- All heavy equipment would be cleaned prior to entering National Forest System Lands.
- Seed, straw, and other materials used for road decommission and erosion control would be certified to be free of noxious weed seed.
- Use only gravel, fill, sand, and rock that are judged to be weed free by District weed specialists if needed for project.
- Native plant materials are required for revegetation unless accepted extenuating circumstances are identified.

ANALYSIS METHODS

Range vegetation monitoring has been conducted on an annual basis on the grazing allotments located within the TFSR Project area. Range administration is conducted yearly by both the Forest Service and the permittees to meet the terms and conditions of the grazing permit.

The Shake Table Fire Complex BAER report provided post fire vegetation information related to the range resource. (BAER 2006) See the report in the project files for detailed information.

Noxious weed surveys have been conducted throughout the Malheur Forest. All documented weed sites from these surveys are recorded in a National data base, Natural Resources Information System (NRIS). The data base includes individual site records indicating the location, size of infestation, plant numbers and density, type of treatment implemented, follow-up treatments and effectiveness. The NRIS data base was used as a source to identify known weed sites within the TFSR Project area. The Shake Table Fire Complex BAER report (Noxious Weed Spread/Establishment Assessment) provided additional noxious weed information. (BAER 2006)

Other sources of information used in this analysis include:

- Allotment Management Plans
- Aldrich, Fields Peak, and Murderers Creek Grazing Permits
- Malheur National Forest GIS data base
- Malheur National Forest Land and Resource Management Plan
- Pacific Northwest Region Final Environmental Impact Statement for the Invasive Plant Program, 2005.
- 1988 Record of Decision for Managing Competing and Unwanted Vegetation (1988 ROD) and the 1989 Mediated Agreement.

3.8.2 AFFECTED ENVIRONMENT

RANGE

Part of three grazing allotments are within the project area (**See DEIS Appendix H-1**); Aldrich Allotment, Fields Peak Allotment, and Murderers Creek Allotment. Table 116 displays the allotments, total acres and project area acres.

Table 116. Allotment acreages within the TFSR Project

Allotment	Project Area Acres*	Total Acres*
Aldrich	3,875.82	20,572.32
Fields Peak	3,438.99	30,730.38
Murderers Creek	467.37	66,947.57
Total acres:	7,782.18	118,250.26

*Acreage determined by GIS coverage’s

Below is a discussion of the allotments and their pastures located within the project area. Under each allotment heading is a description of the pasture/unit grazing information followed by pre-fire and post fire vegetative conditions. Only those pastures within each allotment located in the project area are discussed. For a full description of all pastures located within each allotment with area in the project area see **DEIS Appendix H-3 and H-4**. Approximate timelines for grazing to resume on burned allotments is located in **DEIS Appendix H-5**.

Aldrich Allotment:

- Widows Creek Basin Pasture
    - Not Grazed
- Widows Creek Burn Pasture
    - 100 cow calf pairs
    - Grazed from July 20 to August 30
- Aldrich Ridge Pasture

  - Not Grazed

- Pre-Fire Condition: Widows Creek Burn Unit was made up of approximately 75 percent Elk Sedge.
- Post-Fire Condition: Widows Creek Burn Unit, pasture was burned at a high severity

Fields Peak Allotment:

- Fields Peak Pasture
  - 240 cow calf pairs
  - Grazed from August 30 to September 25
- Pre-Fire Condition: Vegetation cover for the allotment consists of Douglas-fir / white fir communities and ponderosa pine with elk sedge, pine grass and fescue. Open hillsides consist of bunch grass communities with a few small, scattered shrub communities. Riparian areas vary from closed canopy of fir and pines, to streams lined with hardwoods, to more open bluegrass meadows and hardwoods. Fields Peak Pasture consists of approximately 58 percent elk sedge and 17 percent pinegrass.
- Post-Fire Condition: Fields Peak Unit was moderately burned.

Murderers Creek Allotment

- Martin Corrals Pasture and Oregon Mine Pasture (both part of the North Herd*)
  - North Herd, 175 cow calf pairs
  - North Herd, Grazed from May 16 to October 15
- Pre-Fire Condition: The North Herd consists of gently rolling topography that is bisected by very steep rocky canyons. Much of the area is rocky and covered with Juniper, sage, bunchgrass and ponderosa pine. The Martin Corrals Pasture consists of approximately 35 percent bunchgrass and 32 percent elk sedge. The Oregon Mine Pasture consists of approximately 50 percent elk sedge and 50 percent pinegrass.
- Post-Fire Condition: Martin Corrals, and Oregon Mine Units were partially burned at predominately a low severity..

** Note: The North Herd encompasses the Martin Corrals Pasture, Oregon Mine Pasture, Red Rock Pasture, and Dan's Creek Pasture.*

NOXIOUS WEEDS

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 (R6 FEIS 2005). After a fire, a site is often more susceptible to exotic plant invasions (R5 FEIS 2005). The most important environmental requirements for successful establishment of many invasive plants are increased light, open ground, available water and nutrients. Fire provides these conditions, thus providing an ideal place for invasive plant to establish in natural areas (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 (Milberg and Lamont 1995).

Weed seed is present at four sites within the burn and numerous sites adjacent to the burn and additional disturbance of the soil surface is the only factor that could further enhance the opportunity for infestation.

Blue Mountain Ranger District personnel continually identify new noxious weed infestations and report occurrences to the District weed specialist for inclusion into the national/forest/district database, Natural Resources Information System (NRIS). This database includes individual species site records that include location and size of infestation, plant numbers and density, type of treatment implemented, follow-up treatments and effectiveness of treatments. Noxious weed species occurring within the three allotments (Aldrich, Fields Peak, and Murderers Creek) affected by the TFSR Project (**See DEIS Appendix H-2**) are summarized in Table 117 below. These areas can be vectors for the spread of weeds into other areas in the Malheur National Forest.

Table 117. Noxious weed list and status in and adjacent to the project area.

Noxious Weed Common Name	Noxious Weed Scientific Name	Location to Project Area	OR Noxious Weed List Status*
dalmation toadflax	Linaria genistifolia	In	B
diffuse knapweed	Centaurea diffusa	Adjacent	B
medusahead rye	Taeniatherum caput-medusae	Adjacent	B
musk thistle	Carduus nutans	Adjacent	B
perennial pepperweed	Lepidium latifolium	Adjacent	B
Russian knapweed	Centaurea repens	Adjacent	B
spotted knapweed	Centaurea maculosa	In	T
St Johnswort	Hypericum perforatum	Adjacent	B
sulfur cinquefoil	Potentilla recta	In	B
tansy ragwort	Senecio jacobaea	In	T
whitetop	Cardaria draba	Adjacent	B
yellow starthistle	Centaurea solstitialis	Adjacent	T
yellow toadflax	Linaria vulgaris	Adjacent	B

* Status designation explanation (OR Dept of Ag 2007):
"B" Classified Weed – a weed of economic importance which is regionally abundant, but which may have limited distribution in some counties.
"T" Classified Weed – a priority noxious weed designated by the Oregon State Weed Board as a target on which the Oregon Department of Agriculture would develop and implement a statewide management plan. "T" designated noxious weeds are species selected from either the "A" or "B" list.

WILD HORSES

A small portion of the southern end of the TFSR Project is within the Murderers Creek Wild Horse Territory. The Murderers Creek Wild Horse Territory (MCWHT) is the only designated wild horse territory on the Malheur National Forest and encompasses a total of 143,000 acres of Forest Service, BLM, state, and private lands. The actual range of the herd adds an additional 37,000 acres of Forest ground. Horses within the herd generally live in heavily timbered areas of ponderosa pine and mixed conifer. The TFSR Project area receives incidental use by the herd. Management goals for the herd, prescribed in Forest Plan Forest wide standards (FP IV-34) are to conduct livestock management on the MCWHT to ensure that resource conditions meet management goals and standards. Resolve conflicts between livestock, big game, and wild horses in accordance with the maintenance of a wild horse herd averaging 100 head. The number of wild horses within this territory is generally higher than the average therefore a wild horse gather is planned for fall of 2007.

PROJECT DESIGN FEATURES

Project Design features for the range and noxious weeds resource areas are noted in DEIS section 0.

3.8.3 ENVIRONMENTAL CONSEQUENCES

ALTERNATIVE 1 - NO ACTION

Range

Pre-fire grazing practices would only continue on unburned allotments in the project area. The No Action alternative would have no overall short-term impact to the range resource and would not decrease the time before grazing could occur in burned areas. In unburned areas there could be some short term impacts to the Murderers Creek Allotment pastures Frenchy, Maggot Springs, Deer Creek, John Young Meadows, Horse Mountain, Lucera/Blue Ridge and Timber Mountain Units. However, long-term effects of the no action alternative may result in a reduction in forage availability and distribution of livestock due to increased down timber causing the herbaceous component of the plant community to be inaccessible.

Forage Availability and Distribution of Livestock

All burned pastures would be unavailable for grazing until the forage requirements under the Malheur Post-Fire Grazing Guidelines (See **DEIS Appendix H-5**) are met. After the rest period, short term effects (up to 10-15 years) would be an increase in forage availability as grasses and forbs would have little competition from shrubs and trees for a number of years. In the long term (after 10-15 years), there would be decreased forage availability as burnt trees fall and material accumulates on the forest floor, inhibiting the growth of ground vegetation. Forage availability under the No Action alternative would be less than under Alternatives 1 or 2.

Livestock distribution in the long term (after 10-15 years) would increase in difficulty as a large quantity of burnt trees fall to the ground. With decreased distribution of cattle through units, there would be an increased possibility of overuse of forage in some areas and no use of forage in other areas. As debris accumulates, access to water sources could be impaired, which would further disrupt livestock distribution patterns. Forage availability and livestock distribution within the allotments would be adversely affected by the burned timber falling down over time.

Range Improvements

Existing spring developments and fence lines would require repair and maintenance based on fire damage and regular maintenance needs. Over the long term, falling trees and accumulating debris would likely cause increased and continuous maintenance to damaged fences and improvements which could also impede access to water sources.

Permittee/Range Management Access

The long-term accumulation of fallen trees may impede horseback riders moving cattle, inspecting fences and maintenance of developments away from open roads.

Noxious Weeds

The spread of invasive plants from currently existing populations and off-forest seed sources could potentially increase due to the exposure of bare ground by the fire itself. While there is low potential for spread of noxious weed under the No Action Alternative, foreseeable uses of the forest for hunting, grazing, and firewood cutting, could contribute to a spread of weeds. Present monitoring and control measures combined with the relatively small populations should not cause a major increase in noxious weeds in the project area for the short or long term.

Wild Horses

The use of this area by wild horses would continue to be incidental in both the short term and the long term since the area within the TFSR project is at the eastern edge of their territory. Forage and distribution effects to wild horses would be similar as mentioned above for livestock. In addition, wild horse gathers planned for the future would concentrate on the removal of wild horses outside their territory.

PROPOSED ACTION (ALTERNATIVE 2), AND ALTERNATIVE 3

The affects of Alternatives 2 and 3 would be the essentially the same. There would be fewer acres treated in Alternative 3 than Alternative 2.

Range

The salvage of dead and dying trees including danger tree removal would positively affect both the short- and long-term range conditions by reducing the amount of dead and dying timber that would be falling down in the short term, the down timber would restrict livestock movement and decrease forage availability. All proposed action treatments would have a positive effect on short and long term range conditions and would increase forage availability for livestock. We do not anticipate additional impact on grazing permittee operations, other than the already established burned area limitations.

Grazing management adjustments would be developed independent of this project and would conform to the Malheur National Forest Post-Fire Guidelines.

Forage Availability

Alternatives 2 and 3 would promote increased forage availability in the short term (following rest) as grasses and forbs will have little competition from shrubs and trees for water, sunlight and soil nutrients for a number of years. Forage would be more readily available in the long term (15 years or more) as salvage harvest removes dead and dying trees and reduces the number of burnt trees that would fall and accumulate on the forest floor.

Distribution of Livestock

Salvage tree removal would reduce and eliminate dead and dying trees and would enable increased livestock distribution resulting in improved utilization of forage, water, and salt. With the projected increase in the quantity of available forage there is increased potential to reduce impacts on riparian herbaceous and hardwood species, as well as aspen.

Range Improvements

Maintenance needs have already increased due to fire damage. There may be an initial increase in maintenance to repair improvements damaged by project activities; however long-term maintenance costs would be reduced due to removal of dead and dying trees.

Permittee/Range Management Access

All burned pastures would be unavailable for grazing until the forage requirements under the Post-Fire Grazing Guidelines (See **DEIS Appendix H-5**) are met. Grazing management adjustments would be developed in coordination with the allotment permittee and incorporated into the annual allotment instructions to insure the goals and objectives of the project are met. Overall, long-term access to the area by the permittee and the ability to move livestock would be improved as the result of the salvage activities.

Noxious Weeds

Activities associated with timber cutting, site preparation for planting, and road maintenance all disturb the soil to some degree. Ground-disturbing activity increases the risk for spread of non-native, invasive plants because if seeds are introduced they can germinate more readily than if the soil surface was intact (Gelbard & Belnap 2003; Silveri et al. 2001). This weed seed could come from a nearby weed patch, be carried in soil clinging to equipment, or be introduced from some other source (birds, animals, recreation). Contractors mobilizing equipment from other areas have the potential to introduce new noxious weeds into the area, and noxious weeds may increase in harvest areas due to the transport of weed propagules along existing access roads. With only six small known noxious weed occurrences, design features and monitoring protocols incorporated into this project to reduce noxious weed spread the potential for noxious weed spread is expected to be limited. Burned areas do provide nutrients and space for noxious weeds to establish. A monitoring study done in the Malheur National Forest noted that an increase in noxious weeds was closely related to the intensity of a fire. Lower intensity fires had fewer weeds develop on the site (Kerns et al. 2006). Areas burned at a higher intensity have a greater chance of weed establishment therefore; the high intensity burn areas are more likely to have an increase in weed populations than in lower intensity burn areas.

SUMMARY OF EFFECTS

Table 118 summarizes the direct/indirect effects of the Alternatives on the range resources, noxious weeds.

Table 118. Summary of effect of alternatives on range and noxious weeds

Resource	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3
Range Resource	• Minimal effect in the short term. • Long-term loss of range due to increased down timber.	Slight effects to forage availability in the short term. Deferment or rest is anticipated based on the Malheur Post-Fire interim Guidelines. Beneficial short and long-term effects to range condition.	Slight effects to forage availability in the short term. Deferment or rest is anticipated based on the Malheur Post-Fire interim Guidelines. Beneficial short and long-term effects to range condition.
Forage Availability	• No effect in the short term. • Long-term loss due to increased downed woody debris on forest floor.	Forage availability is not expected to be impacted in the short-term. Beneficial long-term impacts due to the removal of dead and dying timber thus increasing access to grazing areas.	Forage availability is not expected to be impacted in the short-term. Beneficial long-term impacts due to the removal of dead and dying timber thus increasing access to grazing areas.
Distribution of Livestock	• Minimal effect in the short term. • Decreased distribution of livestock due to increased down timber limiting access in the long term.	Beneficial impacts due to the reduction or elimination of dead and down woody material resulting in more even distribution and utilization of forage, water, and salt resources.	Beneficial impacts due to the reduction or elimination of dead and down woody material resulting in more even distribution and utilization of forage, water, and salt resources. However, distribution in MA 10 would be limited due to no activities in that area in this Alternative.

Resource	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3
Range Improvements	• No effect in the short term. • Long-term, improvements would be impacted. Increases in maintenance may be required to maintain improvement damage caused by dead timber falling on fence lines.	Initial costs may increase to repair or maintain existing improvements. Long-term maintenance costs would be reduced due to easier access to improvement areas and the removal of timber killed by the fire.	Initial costs may increase to repair or maintain existing improvements. Long-term maintenance costs would be reduced due to easier access to improvement areas and the removal of timber killed by the fire. Due to no tree harvest in MA 10, there could be long-term costs associated with dead falling timber destroying range improvements.
Permittee/Range Management Access	o Minimal effect in the short term. o Long-term, accumulation of down timber may impede cattle movement and permittee access.	Grazing management adjustments would primarily be developed by following the Post-Fire Interim Guidelines and in coordination with the allotment permittee. Overall, long-term access and ability to move livestock would be improved as a result of the salvage timber removal.	Grazing management adjustments would primarily be developed by following the Post-Fire Interim Guidelines and in coordination with the allotment permittee. Overall, long-term access and ability to move livestock would be improved as a result of the salvage timber removal, except in MA 10.
Wild Horse Management	Minimal effect in the short term. Long-term, accumulation of down timber may impede wild horse movement and permittee access.	Beneficial impacts due to the reduction or elimination of dead and down woody material resulting in expanded distribution and usage of forage, water, and salt resources.	Beneficial impacts due to the reduction or elimination of dead and down woody material resulting in expanded distribution and usage of forage, water, and salt resources
Noxious Weeds	• Low potential for spread of noxious weeds. Current levels of infestation would be treated as directed by Malheur weed management practices. • Short- and long-term levels of noxious weeds are expected to vary with methods of control, species-specific methods of infestation, and introduction of new species to the area by other users of the forest.	It is not anticipated that the proposed action would result in a short or long-term increase in noxious weeds species to the area. Implementation of the design features during project implementation will reduce the potential for introduction of any new noxious weeds, or spread of existing sites within the project area. Monitoring and control methods should limit any new infestations.	It is not anticipated that the proposed action would result in a short or long-term increase in noxious weeds species to the area. Implementation of the design features during project implementation will reduce the potential for introduction of any new noxious weeds, or spread of existing sites within the project area. Monitoring and control methods should limit any new infestations.

3.8.4 CUMULATIVE IMPACTS

SCOPE OF THE CUMULATIVE EFFECTS ANALYSIS

This section will present cumulative effects analysis for range and noxious weed resources. The analysis area would be defined, a list of past, ongoing and reasonably foreseeable future actions would be disclosed, and cumulative effects would be estimated.

The cumulative effects analysis boundary for this project consists of Dry Creek, Fields Creek, Murderers Creek/Duncan Creek, and Todd Creek subwatersheds. These subwatersheds are located entirely or partially within the Shake Table Fire Complex. The project area comprises only a small portion of this area yet effects from the past, present, and proposed project activities have the potential to affect the allotment and administration of these allotments as a whole. The cumulative effects analysis area is comprised of approximately 52,864 acres. The temporal scale selected for this project is from 1989 to 2015. The reasoning for this time scale is supported by:

- Harvest activity records indicate these areas have experienced timber harvest since 1983 and more than likely have experienced harvest activity prior to 1983.
- Two recent wildfires occurred in 2005 and 2006 in this area. The only fire recorded previous to this was in 1939.
- The future planned activities proposed by the Malheur National Forest are, in general, on a ten-year planning cycle.

A comprehensive list of potentially cumulative actions considered for this project is presented in **DEIS Appendix N**.

PAST, PRESENT AND REASONABLY FORESEEABLE FUTURE ACTIONS

Past actions in or near the project area include timber management, wildland fuel management, fire suppression, grazing, recreation, firewood cutting, big-game management, and road and facilities construction and maintenance. All activities have influenced the current forest composition and structure, and the management infrastructure of the area. Thus, these activities are still reflected, with individual variance, in the current condition of the area's natural resources and human environmental values. The following list identifies past, present, and future projects within the analysis area:

Past Activities

- Past harvest activities (consisting of various harvesting methods) in the analysis area indicate that the majority of harvest was conducted between 1989 and 1997. A total of 2,531 acres from six projects have been harvested (See Table 119). These projects had a beneficial impact on range resources.
- Past Fires in the analysis area include the Dry Cabin Fire in 2005 and the Thorn Creek Fire (part of the Shake Table Fire Complex) in 2006. The Dry Cabin Fire burned 270 acres, 46 of these acres were also burned in the Shake Table Fire Complex. The Thorn Creek Fire burned 13,536 acres; 13,452 acres were also burned in the Shake Table Fire Complex. These wildfires may have initially had negative direct and indirect effects. However, long-term effects would be positive for range resources by increasing forage quality and quantity and distribution of livestock within allotments.

Table 119. Acres harvested (using various methods) in Cumulative Effects Analysis Area, 1989 - present

Project Name	Year	Subwatershed	Acres Harvested	Acres in TFSR Project
Billy	1997	Fields Creek	298	75.48
Fields	1989 – 1991	Fields Creek	236	0
Fields Hazard SSTS	1994	Fields Creek	46	0
Hattie	1993	Fields Creek	351	0
RC	1990-1992	Fields Creek	700	573.56
Thorn	1991-1993	Murderers Cr/ Duncan Cr	900	1.38
Total Acres			2,531	650.42

Present/Ongoing Activities:

- The Present/ongoing activities are projected to continue on into the future. These activities include, but are not limited to: firewood cutting, grazing, recreation, fire suppression, travel management, outfitter Guide permits, noxious weed assessment and control, road and facilities construction and maintenance, and wild horse grazing.

Future Activities

- Future planned projects in the analysis area consist primarily of the Shake Table Roadside Danger tree Removal Project and the Shake Table Fire Complex Reforestation Activities. These projects are examples of reasonably foreseeable projects that may affect the management on these allotments, and are not exclusive. These types of treatments should have a positive effect on all range resources.
- Future weed control treatments.
- Wild horse territory is located in Murderers Creek/Duncan Creek subwatershed and in Todd Creek subwatershed. Due to easier access in the Shake Table Fire Complex burn area there is a chance that the horses could migrate into these newly burned areas. A large gather is scheduled for October of 2007. Air and ground operations may require road closures and temporary changes in travel routes.

SUMMARY OF CUMULATIVE EFFECTS

Range and Livestock

Cumulative effects of past, present and foreseeable projects in association with the proposed action would have a positive effect on range availability and livestock distribution in the affected allotments. This project would treat burned timber stands, which would increase forage availability, improve livestock distribution, and provide long-term protection of range improvements. There are no expected negative cumulative effects.

Noxious Weeds

Past and ongoing actions have more than likely increased noxious weed populations within the project area. The Malheur National Forest has a weed management program consisting of annual surveys combined with mechanical and hand pulling treatments. Weed control treatments are anticipated in the future in the project area and grazing allotment. The most common treatment is expected to be manual removal. Noxious weeds are not expected to increase in the short term due to the proposed project activities. Post-project surveys of the area annually for 3 to 5 years would provide for early detection and treatment if weeds do establish in the project area.

Foreseeable future projects in the allotments consisting of danger tree removal and reforestation activities allow for the spread of noxious weeds. Similar weed control design features are expected to be included with future projects to reduce increases in noxious weed spread.

CONSISTENCY WITH DIRECTION AND REGULATIONS

All alternatives are consistent with Forest wide standards for rangeland resources and noxious weeds, including Forest plan modifications made by the Pacific Northwest Region Invasive Plant Program FEIS.

IRREVERSIBLE / IRRETRIEVABLE EFFECTS

There are no irreversible and irretrievable commitments of resources that may result from the alternatives with respect to rangeland management.

3.9 RECREATION

3.9.1 INTRODUCTON

This analysis describes the existing condition of the recreation setting and recreation opportunities within the TFSR project area and evaluates the potential effects of the alternatives on recreation resources.

REGULATORY FRAMEWORK

The Forest Service uses a nationally recognized classification system called the Recreation Opportunity Spectrum (ROS) to describe different recreation settings, opportunities, and experiences to help guide recreation management activities (USDA Forest Service 1986).

The Malheur National Forest Land and Resource Management Plan has recognized the importance of recreation by providing management direction for recreation in the Malheur Land and Resource Management Plan. The desired ROS is the direction recreation management actions take to achieve the desired recreation settings. Each Management Area (MA) is assigned a desired ROS. The Forest Plan direction listed below pertains to the project area.

FOREST PLAN DIRECTION

Forest Goals - Recreation Resources

1. Provide a range of opportunities and settings which are consistent with public demand for a variety of activities, both motorized and nonmotorized.

Desired Future Condition – the forest in 1999

There would continue to be a variety of recreation settings in which activities and experiences can be enjoyed. Dispersed recreation opportunities would be emphasized on approximately 5 percent of the Forest outside the wilderness. Of this, 14,578 acres would be managed for semprimitive motorized recreation opportunities and 62,392 acres would be managed with emphasis on semiprimitive nonmotorized recreation opportunities.

Desired Future Condition – the forest in 2039

A variety of recreation opportunities would still exist on the Forest. Roadless recreation outside wilderness would still be available at the same level it was at the end of the first decade.

The Forest would continue to provide areas where semiprimitive recreation opportunities both motorized and nonmotorized can be experienced. These areas would be sought after by recreationists in attempt to deviate from the swift pace of urban living.

Forest-side Standards

1. Recognize undeveloped campsites, hunter camps, or areas where concentrated recreation use occurs as being significant in providing dispersed recreation opportunities in a roaded setting. Manage these areas for partial retention. Inventory, evaluate, and develop management objectives for these sites.

2. Construct, relocate, or protect designated system trails and facilities during management activities.

Management Area Direction

Management Area 1 – General Forest

Recreation Standard
- Manage dispersed recreation for roaded modified conditions.

Management Area 2 – General Rangeland

Recreation Standard
- Manage for dispersed recreation ranging from semiprimitive to roaded modified.

Management Area 4A – Big-Game Winter Range Maintenance

Recreation Standard
- Manage for recreation ranging from semiprimitive to roaded modified, depending on ROS objective of adjacent land.

Within the project area, this MA is mostly adjacent to MAs 10 and 14 with semiprimitive nonmotorized and roaded natural recreation. Roaded natural recreation has been assigned to MA 4A within the project area.

Management Area 10 – Semiprimitive Nonmotorized Recreation Areas

Goals
- Protect, enhance, and maintain the natural beauty and character of the undeveloped areas through effective visitor-use and resource management. Manage to provide a wide range of semiprimitive nonmotorized recreation opportunities while protecting existing environmental quality. Manage to provide a high probability of experiencing tranquility and isolation from sights of human use and to test one's self reliance and independence in an environment offering challenge and risk.

Recreation Standard
- Manage dispersed recreation for goals of semiprimitive nonmotorized recreation. Ensure that the Recreation Opportunity Spectrum (ROS) setting criteria for social encounters and remoteness are met.

Management Area 13 – Old Growth

Recreation Standard
- Provide dispersed recreation setting consistent with adjacent lands.

Within the project area, this MA is mostly adjacent to MA 14 with roaded natural recreation. Roaded natural recreation has been assigned to MA 13 within the project area.

Management Area 14 – Visual Corridors

Recreation Standard
- Manage for roaded natural recreation.

Management Area 20A – Dry Cabin Wildlife Emphasis Area (with scheduled timber harvest)

Goals

- Maintain the natural beauty and character of the area through effective visitor-use and resource management. Provide opportunities for high quality semiprimitive dispersed recreation with emphasis on big game hunting.

Recreation Standard

- Manage dispersed recreation for goals of semiprimitive nonmotorized recreation in a naturally appearing environment with emphasis on quality big game hunting. Permit motorized use only on the Aldrich Ridge Road (2150) and Thorn Ridge Road (2170).

Management Area 21 – Wildlife Emphasis Area (with non-scheduled timber harvest)

Goals

- Provide opportunities for high quality semiprimitive dispersed recreation. Although road maintenance is allowed, overall objectives are to manage the area in an unroaded condition.

Recreation Standard

- Manage for semiprimitive motorized recreation on designated roads and trails. Manage for semiprimitive nonmotorized recreation on the remainder of the area (USDA Forest Service 1990)

METHODOLOGY FOR ANALYSIS

ArcMap geographic information system (GIS) was used to analyze the proposed activities in regards to recreation use and facilities, dispersed recreation sites, and the recreation opportunity spectrum (ROS) classes assigned to the area. The recreation analysis considered the area within the project area boundary, unless otherwise noted.

3.9.2 AFFECTED ENVIRONMENT

The project area provides a range of recreation opportunities for the public. The area is accessed by Fields Creek Road #21 on the east side of the project area and Aldrich Ridge Road #2150 through the center and southern portions of the project area. Road 2150 winds along Aldrich Ridge and provides access to various recreation activities and opportunities including views of roadless and semiprimitive areas. Road 2150 is also the primary access route to Aldrich Lookout and Aldrich Ponds, which is located on state owned lands. Both of these sites are located outside the Shake Table Fire Complex area and the project area.

The primary recreation activities occurring in the project area include hunting, hiking, horn gathering, dispersed camping, personal-use firewood cutting, and driving for pleasure on roads. Dispersed campsites are used heavily during hunting seasons and are mostly located on Aldrich Ridge, near Road 2150 and along Chrome Ridge.

The Cedar Grove Trailhead and most of the Cedar Grove National Scenic Trail are located outside of the project area, but are connected recreation resources. A small portion, about 0.1 miles, of the Cedar Grove National Scenic Trail is located within the project area, and this designated system trail is the only existing recreation infrastructure. There are no developed recreation facilities within the project area.

Forest Plan FEIS Appendix C Inventoried Dry Cabin, Cedar Grove, and Shake Table Roadless Areas are adjacent to the project area, but there are no Inventoried Roadless Areas located within the project area.

Recreational activities occur in lands with a variety of management area designations. The Recreation Opportunity Spectrum (ROS) for the project area includes Roaded Modified, Roaded Natural, Semiprimitive Nonmotorized, and Semiprimitive Motorized roads and trails, with most of the project area in Roaded Natural and Semiprimitive Nonmotorized ROS designations. Refer to **DEIS Appendix I-1** for a map showing the ROS designation for the project area. Generally, a predominately natural to naturally appearing environment characterizes most of the ROS categories in the project area with low to dominant evidence of the sights and sounds of humans. Remoteness refers to the extent to which individuals perceive themselves removed from the sights and sounds of human activity (USDA Forest Service 1986). Changes in crown cover and vegetation density in the high and very high burn severity may have changed remoteness by potentially increasing the sights and sounds of humans from within semiprimitive nonmotorized areas.

Most travel corridors that provide access to recreation activities are gravel-surfaced, one-lane, and native surface routes. Mushroom gathering is expected to greatly increase this year and then taper off in the following years. Viewing scenery is a component of all the recreation activities occurring in the area. A large portion of the project area is mostly unmodified by human activity. People value this place for its natural character and opportunities for solitude and remoteness.

Currently there are two annual temporary Special Use Permits for Big Game Hunting in the Murderer's Creek Hunt Unit from archery to elk season which includes the TFSR project area. In the past, temporary Outfitter Guide Permits have been issued for Bighorn Sheep.

A study by Vaux, Gardner, and Mills (1984) on the impact of fire on forest recreation suggests higher intensity fires had negative effects on recreation values but also caution that the impact of fire was not always negative among their respondents, and preferences of recreationists change over time. Taylor and Daniel (1984) found that camping was the recreational activity most affected by severe fire while hiking and nature study were less affected by severe fire. In studying the effects of fire on recreation demand, Hesseln, Loomis and Gonzalez-Caban (2004) found a slight decrease in hikers' demand in areas recovering from crown fire and also found that as burned area increased and the amount of burned area viewed increased, recreation demand decreased suggesting size and extent of burns affect visitation.

Due to the very high burn severity of the fire, the landscape and recreational experiences have changed and the fire area likely would not meet visitors' expectations over the next decade until grasses and shrubs begin to return and the landscape returns to a more forested, vegetated condition. Some isolated dispersed campsites may have been destroyed by the Shake Table Fire Complex.

The desired condition of recreation resources, as described in the Forest Plan over the next 30 years, is to provide a variety of recreation opportunities and continue to provide areas where semiprimitive recreation opportunities both motorized and nonmotorized can be experienced. Management Area goals specific to the project area also provide more information on the desired condition of recreation resources.

PROJECT DESIGN FEATURES

Project design features for the recreation resource area are noted in DEIS section 0.

3.9.3 ENVIRONMENTAL CONSEQUENCES

ALTERNATIVE 1 – NO ACTION

The No Action Alternative may result in some changes to the recreation opportunities that exist after the fire. Although recreational visits within the analysis area would remain near the same levels as previous years, some impacts to traditional use patterns and recreational opportunities may occur.

Since no danger tree removal occurs in Alternative 1, open roads would need to be assessed immediately to determine if a public hazard exists. Forest Service Road 2150 has traditionally provided access to dispersed campsites and hunting opportunities. Activities such as for pleasure on roads would decrease due to the danger trees. Danger trees along roads, trailheads, and dispersed campsites would increase public safety risks from falling dead trees. With the increased risk of danger trees and little road improvement, hunting and other recreation uses would likely decrease. If the existing danger trees present a public hazard, open roads would need to be closed until a decision is made to remove the danger trees.

Large, very high burn severity fires tend to be dangerous for forest visitors and modify the quality of the recreation setting. These changes often cause recreation use patterns to decline or shift to other areas with little evidence of human use that have not been impacted by the fire. Standing dead trees eventually fall to the ground resulting in recreationists having to maneuver over more downed material. As more dead and damaged trees fall, cross country travel would be more difficult. Safety concerns increase as people would have to crawl over downed material to get from one place to another and as people may step into deep holes created by burned out tree root wads.

The ROS classification did not change as a result of the fire, so it would not change as a result of this alternative.

EFFECTS COMMON TO ACTION ALTERNATIVES (2 AND 3)

Most effects to recreation resources would be similar in each action alternative. The differences would be in the location of salvage harvest units. Alternative 3 excludes Management Area 10 from harvest treatment which precludes the need for some landings and road maintenance. All other design features in Alternative 3 would be the same as those in Alternative 2, the proposed action.

These alternatives would most likely have an effect for three to five years as a result of salvage activities. Effects to recreation settings, primarily naturalness would also occur for about five years until the growth of new grasses, shrubs, and planted trees begin to soften the effects of salvage operations.

Logging Removal Methods and Associated Facilities

The removal methods for salvage harvest include helicopter and ground-based systems throughout the project area. Refer to **DEIS Appendix I-2** for a map showing the location of each removal method in Alternative 2, and refer to **DEIS Appendix I-3** for a map showing the location of each removal method in Alternative 3. The log hauling routes for the majority of the timber removal includes Fields Creek Road #21, Aldrich Ridge Road #2150, and other Forest Roads: 2140, 2170, 2150042 and 2150070. Forest Roads 21 and 2150 provide the major access to the area. Due to the large volume of salvage material and numerous trucks and equipment, there would be some longer-term closures of Road 2140 and its arterial roads and Road 2150. Forest Road 2140 and its arterial roads are currently closed to motorized use and would be closed until reforestation activities are complete.

During harvest activities, Road 2150 within the Shake Table Fire Complex area would be closed to all public use for public safety during harvest operations. Helicopter activity over the road would be unsafe for the public and raises concerns for people being in the area at that time. This would prevent access to the Aldrich Lookout and Aldrich Ponds and other areas west of the project area. These road closures would greatly affect the hunting opportunities during fall hunting seasons in the area and would have a short-term direct effect to all recreationists. Cedar Grove Trailhead and Cedar Grove National Scenic Trail would also be closed during harvest activities due to safety concerns of helicopters flying overhead with logs. The public would be given as much advanced notice as possible as to when these closures would be taking place. Some delays of 30 to 60 minutes on other main system roads are possible during harvest activities.

Some roads were opened during fire suppression activities. Some of these roads would be maintained to provide access during harvest and reforestation activities. Once reforestation activities are complete, these roads would be returned to their pre-fire condition. No additional roads would be closed that were previously open before the fire.

Ground-based Removal Methods

Ground-based removal methods would take place along Road 2150 and in the eastern portion of the project area near Roads 2140038 and 2140074 and in the far southern portions of the project area in the Duncan Creek drainage. Landings associated with ground-based logging systems would be located adjacent to existing roads and would be located at existing landings where possible. Ground-based landings would range in size from 1/10 to two acres. The project proposes about 40 ground-based landings in Alternative 2 and about 34 ground-based landings in Alternative 3.

Where ground-based logging would be used to salvage trees, evidence of logging would be apparent and would modify the recreation setting from natural and naturally appearing to modified for three to five years until grasses and shrubs in the understory re-establish and lessen the effects of ground-based equipment. Approximately 258 acres of ground-based removal is planned in semiprimitive nonmotorized areas in Alternative 2 and 185 acres of ground-based removal is planned in semiprimitive nonmotorized areas in Alternative 3.

Helicopter Removal Methods

Helicopter removal methods would occur throughout the area over approximately 87 percent of the harvest area. Landings associated with the helicopter logging systems would be located adjacent to existing roads and would be located at existing landings where possible. Helicopter landing size would range from one to four acres, depending on topography. The project proposes 24 helicopter landings in Alternative 2 and 23 helicopter landings in Alternative 3.

Changes to the recreation setting due to the effects of helicopter logging would be minor. Once project activities are complete or area closures are no longer in effect, the existing recreation patterns would continue. The physical setting resulting from helicopter logging would be similar to that of the existing condition. The effects of helicopter logging are expected to be natural appearing. It is possible when helicopter activity is complete in portions of the project area, and there are no longer concerns for people being in that particular area, portions of the project area may be reopened while harvest continues in other parts of the project area. If this occurs, helicopter harvest may result in short-term effects on remoteness of the area due to the increased sights and sounds of helicopters. Approximately 1,348 acres of helicopter removal is planned in semiprimitive nonmotorized areas in Alternative 2 and 288 acres of helicopter removal is planned in semiprimitive nonmotorized areas in Alternative 3. The following table summarizes acres of logging system removal type in each of the action alternatives.

Table 120. Acres of treatment in each Recreation Opportunity Spectrum by alternative

ROS	Logging System	Acres	
		Alternative 2	Alternative 3
Semiprimitive Nonmotorized (SPNM)	Ground-based	258	185
	Helicopter	1,348	288
Total in SPNM		1,606	473
Roaded Natural (RN)	Ground-based	123	123
	Helicopter	1,651	1,650
	Total in RN	1,774	1,773
Roaded Modified (RM)	Ground-based	115	115
	Helicopter	412	408
	Total in RM	527	523
Total Salvage		3,907	2,769

Treatments

Salvage Harvest

Salvage harvest would cut and remove merchantable dead and dying trees 9 inches diameter at breast height (DBH) and greater. Trees within areas of very high burn severity with any green foliage would remain uncut and only trees with no remaining green foliage would be harvested. Within low, moderate, and high burn severity areas, trees with no remaining green foliage and trees with low probability of survival would be salvaged.

The recreational experiences may be changed by harvest activities. Certain recreation experience needs may not be satisfied, based on the extent to which the natural environment has been modified, the degree of outdoor skills needed, and the relative density of recreation use. Possible effects in the short term include increased sights and sounds of equipment, people, and helicopters within and adjacent to the project area during harvest activities. The visual character experienced as one wanders through semiprimitive areas would also be changed by management activities. The result of helicopter harvest activities would be marginally noticeable, while the ground disturbance typically associated with ground-based harvest activities would be more noticeable to forest visitors.

The very high burn severity fire may have already affected remoteness as the loss of crown cover, understory vegetative screening, and density may result in more evident sights and sounds of human activity from within semiprimitive nonmotorized areas. Remoteness would only be slightly more affected as the sights and sounds of humans may become slightly more evident with the removal of dead trees. The topographic screening from the main ridge road would help increase feelings of remoteness and solitude in the future until grasses and shrubs re-establish. As trees reach a height of 15 to 20 feet, the setting would return more fully to semiprimitive indicators. The greatest effects on remoteness would occur in the short term during harvest activities with the increased sights and sounds of helicopters, people, and equipment in the area and would reduce once harvest activities are complete.

Naturalness may also be affected by salvage harvest activities as stumps, slash and harvest areas would be evident to observers wandering through semiprimitive nonmotorized areas for several years. The environment would appear slightly altered by the salvage harvest operations, but would return to a naturally appearing state in about five years as grasses and shrubs re-establish and soften the appearance of stumps and slash.

Alternative 3 removes the Aldrich Mountain Semiprimitive Nonmotorized Area from salvage harvest. If after some time there are no longer concerns for people being this particular area, the area closure may lifted for this particular area while harvest continues in other parts of the project area. If this occurs in Alternative 3, helicopter harvest of units adjacent to the Aldrich Mountain Semiprimitive Nonmotorized Area may result in indirect, short-term effects on remoteness of the area with the possibility of increased sights and sounds of helicopters, people, and equipment adjacent to portions of the Semiprimitive Nonmotorized Area during harvest activities. In Alternative 3 the naturalness of the Aldrich Mountain Semiprimitive Nonmotorized Area would be retained in the short term and long term. Since no dead trees are removed in the Semiprimitive Nonmotorized Area in Alternative 3, and cross country travel would be more hazardous as more dead and damaged trees fall and people have to maneuver over the downed material.

The reduced level of standing dead trees in Alternative 2 may reduce safety concerns for people who enjoy dispersed recreation activities throughout the area such as hunting and hiking. By reducing the amount of standing dead trees that will eventually fall to the ground, Alternative 2 also makes traveling cross-country by foot easier for recreationists in the long term.

Helicopter harvest of units adjacent to the Dry Cabin Inventoried Roadless Area may result in indirect, short-term effects on remoteness of the area. Possible effects include increased sights and sounds of helicopters, people, and equipment adjacent to portions of the Roadless Area during harvest activities.

Some improvements to roads would be noticed. Improvement of road access would increase opportunities for those visitors who prefer an easily accessed setting. Management activities associated with the project would improve access for hunting and other recreational use of the area in the future. Hunting may be less desirable for some people until new understory vegetation is established.

Dispersed recreation opportunities may result in some change from the existing condition. Three dispersed campsites are located within the project area. In Alternative 2, three existing dispersed campsites are located within harvest units in the project area. The salvage activities around these sites may change the recreation setting by altering the visual character around the campsite. In Alternative 3, one dispersed recreation site would remain in the same condition and location, while two existing dispersed campsites would be located within harvest units in the project area. In both action alternatives, two existing dispersed campsites are planned for use as helicopter landings. The visual character of these sites may change, but after logging operations are complete, these sites would be rehabbed and left in a condition to allow continued use as dispersed recreation campsites

Under these alternatives, five dispersed campsites adjacent to and within the project area as well as an additional eight dispersed campsites along Road 2150 west of the project area will not be available for camping in the short term due to the temporary closure of Road 2150 and other roads in the project area. Numerous dispersed recreation sites are located outside of the project area along log hauling routes. These sites will be affected in the short term by increased traffic and noise associated with the harvest activities and associated logging traffic. Hazards to recreationists dispersing throughout the area, such as falling snags, will be present into the next decade. These hazards will be lessened where salvage harvest occurs in each action alternative.

Danger Tree Removal

Danger trees would be removed along haul routes used for timber sale activity and maintenance level 3, 4, and 5 Forest roads. Danger tree removal would improve access by decreasing the risk of falling dead trees. In danger tree removal areas, a change in the visual appearance would be most noticeable in high and very high burn severity areas and may produce wide strips with not much standing material remaining along driving corridors. The removal of danger trees would be less noticeable in moderate to low burn severity areas and would allow for greater visual access into the project area from system roads. Danger trees would be removed along an estimated 43.4 miles of roads in Alternative 2 and approximately 43.2 miles of roads in Alternative 3.

Reforestation

Burned areas would be reforested through site preparation and hand planting or prescribed natural regeneration. Site preparation would consist of hand scalping a two-foot square to remove surface vegetation and prepare a planting spot. Planting is planned along Road 2150 in the burned area, but outside salvage units, to accelerate the visual recovery along this popular route. Planting is also planned for Alaska yellow cedar stands to reestablish seedlings in this unique area. Only those stands outside of the Cedar Grove Botanical Area are planned for planting. Effects to recreation opportunities and settings by reforestation are positive in the long term by reestablishing the area to desired recreation settings.

3.9.4 CUMULATIVE IMPACTS

The cumulative effects analysis area for recreation resources is the TFSR Project Area. The following past, present, and reasonably foreseeable future activities were considered in this analysis.

Past activities in the project area include: management of Murders Creek Wildhorse Territory, livestock grazing, an abandoned mine, noxious weeds sites and control, fire suppression rehabilitation, and past timber sales. Past timber sales include harvesting from 1983 to 1997 using a variety of harvest prescriptions in Dry Creek and Fields Creek drainages. Other additional activities include: road building and maintenance, firewood cutting, outfitter guide permits issuance, and summer and fall recreation including hunting, hiking, and dispersed camping. The past activities have formed the current recreation settings and opportunities in the area.

Present activities in the project area include: firewood cutting, livestock grazing, use and maintenance of forest roads, fire suppression, management of Murders Creek Wildhorse Territory, noxious weed assessment and control, summer and fall recreation including hunting, hiking and dispersed camping, and outfitter guide permits.

Reasonably foreseeable future activities in the project area include: firewood cutting, livestock grazing, use and maintenance of forest roads, fire suppression, summer and fall recreation including hunting, hiking and dispersed camping, outfitter guide permits, noxious weed assessment and control, and possible removal of wild horses.

ALTERNATIVE 1

Recreation values in the area have changed due to the fire, but recreation activities would continue. Some forest visitors may find that the area is not as visually appealing due to the loss of vegetation cover and density. The loss of vegetation is not anticipated to deter use of driving for pleasure on roads. The fire area is currently under an area closure for motorized recreation on all roads except Forest Road 2150 due to hazards associated with the fire. During this area closure, hunting opportunities may be reduced. Majority of personal-use products, such as firewood, huckleberry, and mushroom picking, would still be available. Mushrooms and firewood should be plentiful, but huckleberry bushes that burned may take several seasons to re-establish.

ALTERNATIVES 2 AND 3

Recreation activities would continue in the project area. The harvest activities along with the projects listed above would result in some short-term effects of noise and traffic associated with salvage activities. Some temporary and short-term displacement of recreationists during the time when harvest activities take place is anticipated. Some longer-term displacement, up to five seasons, during the time reforestation activities take place is anticipated in parts of the project area. During area closures associated with harvest activities, hunting opportunities would be greatly reduced due to the limited access to the area.

Majority of personal-use products, such as firewood, huckleberry, and mushroom picking, would still be available. Mushrooms and firewood should be plentiful, but huckleberry bushes that burned may take several seasons to re-establish.

Design features are in place to minimize the effects of the project on recreation resources. Harvest and reforestation activities, associated with these alternatives, along with the projects and activities listed above would have no long-term cumulative effects to recreation resources including recreation settings and overall recreation opportunities. There are no irreversible or irretrievable commitments related to recreation resources from this project.

3.9.5 SUMMARY

The majority of effects to recreation resources are short-term in duration. Some temporary and short-term displacement of recreationists during the time when harvest activities take place is anticipated. Some longer-term displacement, up to five seasons, during the time reforestation activities take place is anticipated in parts of the project area.

The significant issue for the Thorn Fire Salvage Recovery Project is salvage harvest in MA 10, a semi-primitive non-motorized recreation area. Recreation indicators used include opportunities for solitude and natural integrity. In semi-primitive non-motorized areas, opportunities for solitude are measured with the ROS remoteness indicator, and natural integrity is measured using the ROS naturalness indicator.

The very high burn severity fire may have already affected remoteness and opportunities for solitude as the loss of crown cover, understory vegetative screening, and density may result in more evident sights and sounds of human activity from within semi-primitive areas. Remoteness would only be slightly more affected by harvest activities as the sights and sounds of humans may become slightly more evident with the removal of dead trees. Opportunities for solitude as a result of either action alternative would be similar to the existing condition.

Salvage harvest would modify the recreation naturalness setting in the short term from naturally appearing settings to a slightly modified setting, but would not detract from the overall recreation experience. ROS classification would remain the same. All alternatives would be consistent with Forest Plan standards and guidelines except the following management area specific standards.

- Forest Plan standard direction for MA 10 is to “manage dispersed recreation for goals of semiprimitive nonmotorized recreation. Ensure that the Recreation Opportunity Spectrum (ROS) setting criteria for social encounters and remoteness are met.” (USDA Forest Service 1990, IV-97). Alternative 2 would not meet recreation standard direction in MA 10 for about five years as it is anticipated that proposed salvage activities in Alternative 2 may result in changes from a naturally appearing environment to a modified setting, especially in areas with ground-based removal. The setting would be changed for about five years as grasses and shrubs re-establish and soften the effects of salvage. Alternative 3 meets recreation standard direction for MA 10.

- Forest Plan standard direction for MA 20A is to “manage dispersed recreation for goals of semiprimitive nonmotorized recreation in a naturally appearing environment with emphasis on quality big game hunting” (USDA Forest Service 1990, IV-121). Forest Plan direction for MA 21 is to “manage for semiprimitive motorized recreation on designated roads and trails. Manage for semiprimitive nonmotorized recreation on the remainder of the area.” (USDA Forest Service 1990, IV-131). Alternatives 2 and 3 would not meet recreation standard direction in MAs 20A and 21 for about five years as it is anticipated that harvest activities may result in changes from a naturally appearing environment to a modified setting, especially in areas with ground-based removal. The setting would be changed for about five years as grasses and shrubs re-establish and soften the effects of salvage.

Table 121. Comparison of the Alternatives and Forest Plan consistency

Management Area	Alternative 1	Alternative 2	Alternative 3
MAs 1, 2, 3B, 4A, 13 and 14 – roaded natural and roaded modified recreation standards	Meets standards	Meets standards	Meets standards
MA 10 – semi-primitive non-motorized recreation standard	Meets standard	Does not meet standard	Meets standard
MA 20A – semi-primitive non-motorized recreation standard	Meets standard	Does not meet standard	Does not meet standard
MA 21– semi-primitive motorized recreation on designated roads and trails; semi-primitive non-motorized recreation on remainder of area standard	Meets standard	Does not meet standard	Does not meet standard

Where project activities do not meet MA specific standards for recreation resources in MAs 10, 20A, and 21, Forest Plan amendments are needed that would allow the lands in the Thorn Fire Salvage Recovery Project area to deviate from the goals of semi-primitive non-motorized recreation to roaded modified recreation for approximately five years. The naturalness indicator of a naturally appearing environment would deviate to a modified setting for approximately five years after project activities are complete.

No long-term direct, indirect, or cumulative effects to recreation settings or overall recreation opportunities are expected from harvest activities. There are no irreversible or irretrievable commitments related to recreation from this project.

3.10 VISUAL RESOURCES

3.10.1 INTRODUCTON

Scenery, just as any other resource, must be cared for and managed for future generations. Visual resources vary by location and existing natural features including vegetation, water features, landform and geology, and human-made elements. All activities experienced by forest visitors occur in a scenic environment which is defined by the arrangement of the natural character of the landscape along with components of the built environment.

This analysis describes the existing condition of the scenic resources within the project area and evaluates the potential effects of the alternatives on scenic resources.

REGULATORY FRAMEWORK

The National Environmental Policy Act of 1969 (NEPA) states that it is the "continuing responsibility of the Federal Government to use all practicable means to assure for all Americans, aesthetically and culturally pleasing surroundings." NEPA also requires "A systematic and interdisciplinary approach which would insure the integrated use of the natural and social sciences and the environmental design arts into planning and decision-making which may have an impact on man's environment." To accomplish this, numerous federal laws require all Federal land management agencies to consider scenery and aesthetic resources in land management planning, resource planning, project design, implementation, and monitoring.

Several USDA handbooks have been developed to establish a framework for management of visual resources including but not limited to: National Forest Landscape Management Volume 2, Chapter 1 the Visual Management System; Agriculture Handbook 462 (USDA Forest Service 1974) and Landscape Aesthetics, A Handbook for Scenery Management; Agriculture Handbook 701 (USDA Forest Service 1995).

The Malheur National Forest Land and Resource Management Plan has recognized the importance of visual quality and scenery by providing management direction for visuals in the Malheur Land and Resource Management Plan. Management Area (MA) specific standards in MA 14, which are referenced in MAs 10 and 20A, for created openings and maximum percent of area treated in foreground retention and foreground partial retention areas are not applicable to this project because salvage harvests are not considered created openings. Created openings are "openings in the Forest created by the silvicultural practices of shelterwood regeneration cutting at the final harvest, clearcutting, seed tree cutting, or group selection cutting" (USDA Forest Service 1990, VI-9). The Forest Plan direction listed below pertains to the project area.

FOREST PLAN DIRECTION

Forest Goals - Visual Resources

- Maintain and enhance the scenic character of the Forest through integration of the principles of landscape architecture and environmental design arts into forest land management practices.
- Provide and maintain pleasant visual experiences for Forest visitors consistent with public demand and natural landscape capabilities.

Desired Future Condition – the forest in 1999

The managed forest outside the viewshed corridors would have an altered appearance. A mosaic of cutting patterns of varying shapes, sizes and arrangement would become more evident and the average tree size would be reduced.

Vegetative manipulation which would alter the character of the landscape would have begun within visually sensitive areas (viewshed corridors). These alterations would vary from not being evident to being obvious, while still borrowing from the natural character of the landscape.

Desired Future Condition – the forest in 2039

Vegetative manipulation would have created more stand diversity within the visually sensitive areas. These changes would continue to be designed to maintain a natural appearance and to accentuate large diameter trees. Changes in landscape character within the most sensitive viewshed corridors would be subtle; changes within the less sensitive viewshed corridors would be more obvious.

The managed forest outside the viewshed corridors would have an altered appearance. The evidence of logging activity would be very obvious. A mosaic of cutting patterns of varying shapes, sizes and arrangement would be very evident and the appearance would be that of an intensively managed younger forest.

Objectives – Visuals

Emphasize visual quality along all of the State and Federal highway corridor viewsheds (sensitivity level 1). Manage lands within view of these scenic routes under foreground retention and middleground partial retention VQOs.

Manage unroaded areas and wilderness with sensitivity for the visual resource. Manage semiprimitive nonmotorized areas to meet the retention visual quality objective, and semiprimitive motorized areas to meet the partial retention visual quality objective.

Manage 1,104,564 acres under modification and maximum modification visual quality objectives. The appearance of these lands as viewed from forest roads would be altered to heavily-altered. Even though management activities may dominate the landscape, they are still to be designed to borrow from the natural character of the land utilizing the principles contained in National Forest Landscape Management volumes 1 and 2, and the Visual Management System handbooks.

Forest-wide Standards – Recreation

Recognize undeveloped campsites, hunter camps, or areas where concentrated recreation use occurs as being significant in providing dispersed recreation opportunities in a roaded setting. Manage these areas for partial retention. Inventory, evaluate, and develop management objectives for these sites.

Forest-wide Standards – Visuals

The minimum visual quality objective for the Forest is maximum modification. This visual quality objective would apply unless otherwise specified. Modifications to the established visual quality objectives shall be considered an amendment to this Forest Plan.

Forest Service Manual 2380 and Agricultural Handbooks 462, 434, 378, 484, 559, and 608 provide the details on how to meet specific visual quality objectives under various conditions and vegetative types.

Maintain a current inventory of visual conditions on the Forest.

Rehabilitate landscapes containing negative visual elements.

Management Area Direction

Management Area 1 – General Forest

Visuals Standard
- Manage for maximum modification visual quality objective.

Management Area 2 – General Rangeland

No specific standards for visuals are listed in this MA. See forest-wide direction.

Management Area 4A – Big-Game Winter Range Maintenance

Visuals Standard
- Meet visual quality objectives ranging from retention to modification depending on the visual quality objective of adjacent lands.

Within the project area, this MA is mostly adjacent to MAs 10 and 14 with retention and partial retention VQOs. Partial retention VQO has been assigned to MA 4A within the project area as viewed from Highway 26.

Management Area 10 – Semiprimitive Nonmotorized Recreation Areas

Goals
- Protect, enhance, and maintain the natural beauty and character of the undeveloped areas through effective visitor-use and resource management.

Visuals Standard
- Meet visual quality objective of foreground retention.

Management Area 13 – Old Growth

Goals
- Provide “suitable” habitat for old growth dependent wildlife species, ecosystem diversity, and preservation of aesthetic qualities.

Visuals Standard
- Manage for visual quality objective consistent with adjacent lands

Within the project area, this MA is mostly adjacent to MA 14 with partial retention VQO. Partial retention VQO has been assigned to MA 13 within the project area as viewed from Highway 26.

Management Area 14 – Visual Corridors

Goals
- Manage corridor viewsheds with primary consideration given to their scenic quality and the growth of large diameter trees. Visual quality objectives of retention, partial retention and modification would be applied while providing for other uses and resources.

Visuals Standards
- Meet a visual quality objective of retention, partial retention, or modification for the visible and potentially visible area (see Appendix L). Site specific visual quality objectives would be identified and recorded in the corridor viewshed plans and the TRI data base.

Highway 26 is identified as a sensitivity level one route for the project area. The VQO assigned to this viewing distance in this corridor is Partial Retention (USDA Forest Service 1990, L-1).

- Manage residues to provide a natural-appearing landscape in visual corridors.
- Manage residues in middleground and background distance zones to meet visual resource objectives which are compatible with reforestation and wildlife objectives.

Management Area 20A – Dry Cabin Wildlife Emphasis Area (with scheduled timber harvest)

Goals

- Maintain the natural beauty and character of the area through effective visitor-use and resource management.

Visuals Standard

- Meet visual quality objective of foreground partial retention along the Aldrich Ridge Road (2150) and Thorn Ridge Road (2170).

Management Area 21 – Wildlife Emphasis Area (with non-scheduled timber harvest)

Visuals Standard

- Meet visual quality objectives ranging from retention to modification depending on the visual quality objective of adjacent lands.

Within the project area, this MA is adjacent to MA 20A with partial retention VQO, MA 10 with retention VQO, and MAs 1 and 2 with maximum modification VQO. Partial retention VQO has been assigned to MA 21 within this project area.

METHODOLOGY FOR ANALYSIS

This analysis was completed using the framework outlined in USDA Forest Service handbook, The Visual Management System. USDA Forest Service handbook, Landscape Aesthetics, A Handbook for Scenery Management, was also consulted.

ArcMap geographic information system (GIS) was used to analyze the proposed activities in regards to recreation use, sensitive travel corridor locations, and potential viewsheds from sensitive travel corridors, and visual quality objectives assigned to the area. The potential impacts to scenic resources from this project were determined based on review of photos of the project area, use and interpretation of GIS data and review of analysis of similar projects. Evaluations made in this analysis are based on the amount of changes potentially seen on the landscape from a given viewshed and identified viewpoints and the level of acceptable change for the project area. The Malheur Land and Resource Management Plan direction for visual resources were reviewed to determine the level of acceptable change for this project area.

This analysis would use visual quality objectives (VQOs) to determine if the alternatives meet Forest Plan standards and guidelines by comparing the degree of alterations to the existing landscape. Landscape Aesthetics, A Handbook for Scenery Management uses scenic integrity objectives (SIOs) to describe the level of acceptable alteration of the natural landscape and its valued scenic attributes. Scenic integrity objective definitions are also provided to understand the subtle differences between visual quality objectives and scenic integrity objectives. Visual quality objectives are established in the Malheur Land and Resource Management Plan. The visual quality objectives found in the project area include:

Retention VQO – This VQO provides for management activities that are not visually evident. Management activities are permitted, but the results of those activities on the natural landscape must not be evident to the average viewer (USDA Forest Service 1990). Under retention, activities may only repeat form, line, color, and texture which are frequently found in the characteristic landscape (USDA Forest Service 1974).

> High SIO – The valued landscape character "appears" intact or unaltered. Deviations may be present but must repeat the form, line, color, texture, and pattern common to the landscape character so completely and at such scale that they are not evident (USDA Forest Service 1995).

Partial Retention VQO – Management activities may be evident to the viewer but must remain visually subordinate to the surrounding landscape (USDA Forest Service 1990).
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 (USDA Forest Service 1974).

> Moderate SIO – The valued landscape character appears slightly altered. Noticeable deviations must remain visually subordinate to the landscape character being viewed (USDA Forest Service 1995).

Maximum Modification VQO – Land management activities can dominate the natural landscape to greater extent than in the modification objective, except as viewed from background when visual characteristics must be those of natural occurrences within the surrounding area (USDA Forest Service 1990).

> Very Low SIO – The valued landscape character appears heavily altered. Deviations may strongly dominate the valued landscape character. They may not borrow from valued attributes such as size, shape, edge effect and pattern of natural openings within or outside of the landscape being viewed. However deviations must be shaped and blended with natural terrains so that elements such as unnatural edges, roads, landings, and structures do not dominate the composition (USDA Forest Service 1995).

The Forest Plan states to rehabilitate landscapes containing negative visual elements. The Visual Management System defines rehabilitation as a short-term management alternative used to return existing visual impacts in the natural landscape to a desired visual quality (USDA Forest Service 1974).

The effects analysis would consider how each alternative meets these visual quality objectives from the identified viewpoints (**See DEIS- Appendix J-1** for map showing VQOs).

3.10.2 AFFECTED ENVIRONMENT

The project area is located in the Blue Mountains Ecological Section M332G, which is characterized in the eastern half by moderately dissected mountains (McNab and Avers 1994). Aldrich Ridge, located in the east-west running Aldrich Mountains, is the most prominent landform in the project area. Inherently the forest patterns are characterized by mostly contiguous vegetation composed of medium to dense stands of grand fir and Douglas-fir with some ponderosa pine at lower elevations and in the southern portion of the project area. Open meadows and rocky areas tend to be located along ridge tops and some south and west facing slopes.

EXISTING CONDITION

Currently the scenic resources in the project area have been affected by a fire that burned with very high severity. In August 2006, the Shake Table Fire Complex burned much of the project area, about 48 percent, with very high severity resulting in 96 to 100 percent estimated mortality. An additional 9 percent of the project area burned with high severity resulting in 76 to 95 percent estimated mortality. The scenery has undergone a fire that burned with higher severity than would historically have occurred in these vegetation types. Many of the places that had a continuous conifer canopy experienced stand replacing fire leaving nothing but large areas of visible black tree stems and burned ground surfaces. Patches of trees that did not burn entirely are seen as small patches of red-needled trees. Some other areas did not burn as intensely leaving patches of green trees interspersed with the dead and severely scorched trees.

While the mortality on much of Aldrich Ridge and Widows Creek and West Dry Creek drainages is almost 100 percent, most riparian zones and lands around Wickiup, Buck Cabin, and Duncan Creeks, on the eastern side of the fire area, are less severely burned with the landscape character attributes mostly intact. The landscape character attributes of form, texture, and color have been greatly affected in the high and very high burn severity areas.

Figure 3. View from Aldrich Ridge Road #2150 looking north toward Widows drainage

Proposed activities are scattered throughout MAs 1, 2, 3B, 4A, 10, 13, 14, 20A, and 21, with majority of the activities located on the steep north facing slopes north of Aldrich Ridge. The area is accessed by Fields Creek Road #21 along the east of the project area, Aldrich Ridge Road #2150 through the center of the project area, and Roads 2150042 and 2150070 to the south of the project area. Activities are proposed west of Fields Creek Road and to the north and south of Aldrich Ridge Road. The primary viewpoints for the project area are Highway 26 and Aldrich Ridge Road. The Aldrich Mountain Semiprimitive Nonmotorized Area, located in MA 10, is another important area for viewing scenery resources and is highly valued for its remoteness, natural character, and high scenic quality. The Aldrich Mountain Semiprimitive Nonmotorized Area viewpoints include Aldrich Ridge Road, dispersed campsites, and views experienced as one wanders through the area.

The northern part of the project area is part of the Highway 26 viewshed corridor in the middleground viewing distance. Highway 26 is identified as a sensitivity level one route. The viewshed of Highway 26 has retained a similar landscape aesthetic as that before the fire. The topographic elements and patterns of timber and open slopes are still intact from this sensitive route. Some textural and color changes resulting from black, burned trees are evident from Highway 26 for short durations of view.

Figure 4. View of project area from Highway 26 near Fields Creek Road

Aldrich Ridge Road is not listed in Appendix L of the Forest Plan as a sensitive viewshed corridor, but direction for MA 20A places emphasis on this viewshed. Aldrich Ridge Road is heavily used in the fall by hunters and in other seasons for driving for pleasure as the access road to Aldrich Lookout. The viewshed of Aldrich Ridge Road is more affected by the very high severity burn since the road passes through the area of the fire with the most extreme burn severity. Along some portions of the road, the landscape retains a similar landscape aesthetic as that before the fire. In other areas, views from Aldrich Ridge Road are currently dominated by a forest of blackened trees and scorched earth, where few of the dominant valued attributes of the landscape character are still intact. The color and form of the landscape in these areas is often what is most affected. The vertical form of tree trunks and landforms resemble the form of the area that existed prior the fire, but with the loss of foliage, only the blackened, skeletal frames of tree trunks remain.

Figure 5. View of very high burn severity from Aldrich Ridge Road #2150

The existing scenic condition is one of a changing landscape, with views and scenic attributes different from those of the past. Immediately after a stand replacing, very high severity fire, the changes viewed on the landscape are often abrupt, leaving some viewers with a feeling of loss. This landscape would visibly appear to be in transition over the next ten to fifteen years, with some changes occurring within the next few growing seasons. The scenic resources of this landscape would continue to change rapidly as trees lose needles, debark, and fall to the ground. Over the next few years, visitors may feel that the landscape is very stark until new grasses and shrubs re-establish and begin to soften the effects of the fire. Even though the effects would be softened in the next few years, the form and line of the landscape would be dominated by the vertical line of tree trunks until the trees have fallen and new growth sprouts around them. As trees continue to loose needles, more of the forest floor would become visible under those trees when viewed from a distance. The color of the landscape would change as trees lose needles and debark. Many of the grassy openings would green up during the next growing season and blackened tree trunks would fade to a silver, gray color in the next few years. The landscape aesthetics would improve as these changes occur and the effects of the fire would fade with time.

LAND USE PATTERNS

People are drawn to this area for its remoteness and natural character. These lands are used for hiking, hunting, horn gathering, and dispersed camping. Popular areas for hiking include Cedar Grove Botanical Area, Cedar Grove National Scenic Trail, and Aldrich Mountain Semiprimitive Nonmotorized Area. Aldrich Ridge Road is used heavily in the fall and in other seasons for driving for pleasure as the access road to Aldrich Ridge Lookout. A large portion of the project area is mostly unmodified by human activity. People value this place for it natural character and opportunities for solitude and remoteness, which give this area its sense of place.

Most of the project area has a natural appearance with management activities not readily evident. Past timber harvest and salvage operations have occurred in the project area mostly in the northern and eastern parts of the area. These activities are not apparent to the average viewer in the viewsheds of Highway 26 and Aldrich Ridge Road.

PROJECT DESIGN FEATURES

Project design features for the visual resource area are noted in DEIS section 0.

3.10.3 ENVIRONMENTAL CONSEQUENCES

ALTERNATIVE 1 – NO ACTION

Alternative 1 proposes no action and initiates no human caused changes to the visual quality of the project area. However, the Shake Table Fire Complex has caused conditions that would create effects to scenery resources in the future. In very high burn severity, where probably mortality exceeds 95 percent, the visual condition is not preferred and many areas would not regenerate in a preferable manner due to lack of seed source or dense areas creating “dead shade.” Standing dead trees eventually fall to the ground resulting in increased downed fuel with a jack straw appearance on the forest floor. High amounts of standing and down fuels may prevent regeneration and do not create visually preferred open stands with high visual access and a clear forest floor.

Alternative 1 does not utilize tree removal or planting and does not move the area toward re-establishing the valued landscape character. The natural evolution of the vegetative component of the landscape would continue to change the scenic qualities of the area over time. For example, wind storms or snow and ice storms may cause more portions of the project area to blow down or contain areas of broken topped trees. Insect infestation or disease outbreaks may cause mortality in live trees adjacent to the fire area. In this alternative, fuels loads that exist due to the fire may also become higher than historic levels which would be an additional risk to the stability of the scenery resources in the future.

Alternative 1 would meet the visual quality objectives throughout the project area as it does not create any unnaturally appearing elements of form, line, color, or texture. Large amounts of dead trees in very high burn severity areas would continue to dominate the landscape being viewed. This alternative would accept changes to the scenic quality initiated by natural processes only.

EFFECTS COMMON TO ACTION ALTERNATIVES (2 AND 3)

The action alternatives propose salvage treatments and tree removal that may have an impact on scenery resources. This section discloses the effects in a general manner unrelated to visibility from identified viewpoints, unless otherwise stated. Visual effects generated by vegetative management activities vary in duration and intensity depending on the treatment prescribed and the logging method used. Effects caused by action alternatives were considered in relation to the existing appearance and desired landscape character.

Effects to Existing Appearance

Public attitudes and beliefs regarding aesthetics and forest management have been studied. “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)” (cited in Ryan 2005, 17). Large scale disturbances tend to change the landscape character of an area by altering the physical appearance of the landscape that contributed to the area’s identity and sense of place. However, less severe natural disturbances, such as low burn severity areas where understory burned but most mature trees were not killed, result in preferred forests over time (Taylor and Daniel 1984).

Effects to Desired Landscape Character

Desired landscape character is defined as the appearance of the landscape to be retained or created over time (USDA Forest Service 1995). The action alternatives begin to the move the landscape to the desired landscape character. Effects that would move the vegetation toward the desired landscape character are beneficial to scenery resources. These effects are often realized over a long period of time but lead to the lasting sustainability of valued scenery attributes. The desired landscape character is closely related to the appearance of a forest in which species composition and stand structure are within historic range of variability often resulting in vibrant, healthy and diverse landscapes. Conditions within the historic range of variability generally create an environment in which scenery attributes are highly sustainable.

Desired landscape character often includes and is linked to preferred visual settings. Gobster (1994) summarizes visually preferred settings as having four common attributes: large trees, smooth, herbaceous ground cover, an open midstory canopy with high visual penetration, and vistas with distant views and high topographic relief.

Visual access, or how far one can see into a forest, is also a preferred scenic setting (Ryan 2005). Many areas of this landscape now have a great degree of visual access due to the loss of foliage and understory vegetation. In the long term, the visual resource would have higher scenic quality if visual access is achieved and enhanced. These aspects are most consistent with the warm dry upland forest plant association group (PAG), which makes up most of the project area. Other PAGs are more densely vegetated, such as the warm moist forest PAG, and do not provide high visual access into forests.

DIRECT AND INDIRECT EFFECTS – ALTERNATIVES 2 AND 3

Most effects to scenery resources would be similar in each action alternative. The differences would be in the location of salvage units. Short-term visual effects of salvage harvesting are often the most noticeable until the growth of new grasses, shrubs, and planted trees begin to soften the effects of salvage operations. Short-term for this analysis refers to a 3 to 5 year period after all harvesting and slash treatment activities in an area are complete. Short-term effects are especially noticeable when the viewer has an up close view of the logging site usually in the foreground viewing distance which is up to ½-mile from the viewer. Long-term effects, which for this analysis is considered beyond 5 years, vary by the treatment and the logging method used.

Logging Removal Methods and Associated Facilities

The removal methods for salvage harvest include helicopter and ground-based systems throughout the project area. Refer to **DEIS Appendix J-2** for a map showing the location of each removal method in Alternative 2, and refer to **DEIS Appendix J-3** for the location of each removal method in Alternative 3. The log hauling routes for the majority of the timber removal includes Fields Creek Road 21, Aldrich Ridge Road 2150, and other Forest Roads: 2140, 2170, 2150042 and 2150070. No new or temporary roads would be built.

Ground-based Removal Methods

Ground-based removal methods would take place along Aldrich Ridge Road and in the eastern portion of the project area near Roads 2140038 and 2140074 and in the far southern portions of the project area in the Duncan Creek drainage. Landings associated with the ground-based systems would be located adjacent to existing roads and would be located at existing landings where possible. Ground-based landings would range in size from 1/10 to two acres. The project proposes about 40 ground-based landings in Alternative 2 and about 34 ground-based landings in Alternative 3.

Where ground-based logging would be used to salvage trees, evidence of logging would be apparent primarily in foreground views. Possible effects include skid trails which often create lines of exposed soils across the forest floor. These effects would last for about 3 to 5 years until grasses and shrubs in the understory reestablish and lessen the effects of ground-based equipment. In Alternative 2, retention VQO would be achieved in about 3 to 5 years. In Alternative 3, no ground-based harvest removal is planned in retention VQO. With the reduced impacts from the design features, it is anticipated that partial retention VQO would be met in both alternatives one growing season after project activities are complete. The following table summarizes acres of ground-based logging system removal type in each of the action alternatives.

Table 122. Acres of ground-based logging removal in each visual quality objective by alternative

Visual Quality Objective	Acres	
	Alternative 2	Alternative 3
Retention	73	0
Partial Retention	308	308
Maximum Modification	115	115
Total Ground-based Removal	496	423

Helicopter Removal Methods

Helicopter removal methods would occur over approximately 87 percent of the harvest area. Landings associated with the helicopter logging system would be located adjacent to existing roads and would be located at existing landings where possible. Helicopter landing size would range from one to four acres, depending on topography. The project proposes 24 helicopter landings in Alternative 2 and 23 helicopter landings in Alternative 3. In both alternatives, 5 landings would be located adjacent to Aldrich Ridge Road, but design features are in place to minimize their visual effects.

Helicopter logging causes the least amount of effects to scenery. Effects of tree removal by helicopter are naturally appearing and would not be noticeable to the average viewer. Tree removal by this method would meet retention and partial retention VQO after project activities are complete. The following table summarizes acres of helicopter logging system removal type in each of the action alternatives.

Table 123. Acres of helicopter logging removal in each visual quality objective by alternative

Visual Quality Objective	Acres	
	Alternative 2	**Alternative 3**
Retention	1,061	0
Partial Retention	1,938	1,938
Maximum Modification	412	408
Total Helicopter Removal	3,411	2,346

Treatments

Salvage Harvest

Salvage harvest would cut and remove merchantable dead and dying trees 9 inches diameter at breast height (DBH) and greater. Trees within areas of very high burn severity with any green foliage would remain uncut and only trees with no remaining green foliage would be harvested. Within low, moderate, and high burn severity areas, trees with no remaining green foliage and trees with low probability of survival would be salvaged.

The visual effects of tree removal can vary depending on the intensity of the treatment. Stumps, slash, and edge effects of freshly logged areas or units, depending on the intensity of the treatment, can result in a forest that appears moderately altered in the short term. The contrast between harvest and unharvested areas in the short term is often quite noticeable.

In high and very high burn severity areas with estimated mortality 76 percent or greater, removing the trees from the landscape would change the visual structure and texture creating a more open landscape. In middleground and background views, the appearance of an open grassy slope and expanses of dead, burned trees both appear natural, but perceptions of forest health or wastefulness of forest products often affect the viewer's preference. A mosaic of openings and clumps of trees is more naturally appearing and provides a greater degree of interest and diversity than views of all dead trees or no trees at all.

Tree stumps have impacts to visual resources in the short term and would be most noticeable in the foreground of Aldrich Ridge Road. Stumps would become less visible within one to two growing seasons as grasses, forbs, and shrubs begin to re-establish.

Salvage harvest would also reduce future fuel loads, helping to reduce the potential for "reburn." By reducing the potential of "reburn," the long-term risk to scenery resources would be decreased. The following table summarizes acres of salvage harvest in each of the action alternatives.

Table 124. Acres of salvage harvest in each visual quality objective by alternative

Visual Quality Objective	Acres	
	Alternative 2	Alternative 3
Retention	1,134	0
Partial Retention	2,246	2,246
Maximum Modification	527	523
Total Salvage Removal	3,907	2,769

Danger Tree Removal

Danger trees would be removed along haul routes used for timber sale activity and maintenance level 3, 4, and 5 Forest roads within immediate foreground viewing areas. In danger tree removal areas, a change in the visual structure would be most noticeable in high and very high burn severity areas along Aldrich Ridge Road. A landscape currently dominated by blackened tree trunks has a vertical structure in foreground views. The removal of danger trees in these areas would likely produce wide strips with not much standing material remaining along the driving corridor allowing for more views into the project area.

The removal of danger trees would be less noticeable in moderate to low burn severity areas and would allow for greater visual access into the project area from system roads. Stumps would become less visible within one to two growing seasons as grasses, forbs, and shrubs begin to re-establish. Danger trees would be removed along an estimated 43.4 miles of roads in Alternative 2 and approximately 43.2 miles of roads in Alternative 3. With the project design features applied, the removal of danger trees would meet the allocated VQOs of retention, partial retention, and maximum modification throughout the project area.

Reforestation

Burned areas would be reforested through site preparation and hand planting or prescribed natural regeneration. Site preparation would consist of hand scalping a two-foot square to remove surface vegetation and prepare a planting spot. Effects to scenery resources by reforestation are minimal and help in the long term to move the area toward the desired landscape character. Planting along Aldrich Ridge Road would help rehabilitate the immediate foreground and foreground views and aid the visual recovery of this viewshed.

Slash Treatment

Trees to be salvaged would be limbed and topped on-site within areas designated for helicopter removal and areas of high or very high burn severity designated for ground-based removal. Tree tops would be removed within areas of low and moderate burn severity designated for ground-based removal. Limbs would remain on site.

The visual impacts of slash are usually temporary and depend on the amount of woody debris left on the ground. Large amounts of slash often initially have negative impacts on scenery (Ryan 2005). For this reason, concentrations of slash within immediate foreground (300 feet) of Aldrich Ridge Road, Cedar Grove National Scenic Trail, dispersed campsites, and Fields Creek Road would be hand-piled and burned or chipped. Outside of this distance, slash would become less apparent over the next 3 to 5 years as grasses, forbs, and shrubs re-establish.

ALTERNATIVE 2 – PROPOSED ACTION

Alternative 2 proposes to harvest dead and dying trees from about 50 percent of the project area on a total of 3,907 acres. All proposed harvest units are located in warm dry upland sites that mostly support grand fir and Douglas-fir forests with some pine forests at lower elevations. The treatment in this alternative would reduce conditions that pose risk to scenery attributes, but harvest efforts would create some short-term effects to scenery.

Views from US Highway 26

Highway 26 is a designated sensitivity level one route with partial retention VQO in the middleground viewing distance. The Visual Management System defines middleground as being from one-half up to five miles from the viewer (USDA Forest Service 1974). Within this zone, individual trees and stems are generally not discernable, only form, line, color, and some textural changes can be seen. Background views of the project area have VQOs ranging from retention to maximum modification. Proposed activities are potentially visible in the middleground and background views from Highway 26 for short durations of view.

In middleground views, about 395 acres of salvage treatment is potentially visible. Treatment would remove dead and dying trees from 12 visible units. In most cases, only portions of each of these units are visible. In background views, about 491 acres of salvage treatment is potentially visible across portions of 16 units.

The salvage harvest activities potentially seen from Highway 26 are mostly helicopter removal in very high burn severity areas and are located in far middleground (3 or more miles from the viewer) and background views. The visual effects of this treatment and removal type in these distance zones primarily include changes to the texture and color of the area being viewed. The textures and colors resulting from harvest activities would be less dominated by the black, dead trees in the very high burn severity areas and have a more open appearance as grasses, shrubs and new trees re-establish. The more open areas created by harvest are not expected to appear unnatural in shape. With the design features applied, it is expected the salvage harvest would meet partial retention VQO when viewed from Highway 26. Some changes to the landscape may be evident, but these changes would remain subordinate to the surrounding landscape. Harvest activities are expected to be naturally appearing in background views. The following table summarizes the amount of salvage harvest potentially visible from Highway 26.

Table 125. Acres of salvage harvest potentially visible from Highway 26 in Alternative 2

Highway 26 viewing distance	Acres
Middleground	395
Background	491
Total Visible	886

Note: No salvage activities are planned in the Highway 26 foreground viewing distance. Visible acres are based on GIS seen area mapping. Only the topographical/elevation information was used to determine seen areas.

Portions of the fire not being treated are also visible from Highway 26 in middleground and background views. Untreated, very high burn severity portions, primarily in the West Fork Dry Creek area and the moist forest types along Aldrich Ridge, would result in views of blackened slopes and burned trees. These areas would allow for the changes to the scenic quality primarily by natural processes. Slopes would green up in one growing season and standing dead trees would fade to a silver, gray color and eventually fall to the ground. The mixture of treated and untreated areas would create a mosaic of textures viewed from Highway 26.

Views from Aldrich Ridge Road #2150

Direction for MA 20A places emphasis on this viewshed by assigning partial retention to the foreground of Aldrich Ridge Road. This route also travels adjacent to the Aldrich Mountain Semiprimitive Nonmotorized Area which has retention VQO. Also within foreground views are lands with maximum modification VQO. In foreground views, about 618 acres of salvage treatment is potentially visible. Treatment would remove dead and dying trees from 20 visible units.

Ground-based logging activity would be most evident in foreground views with stumps and ground disturbance dominating the view for the first season. As grasses, forbs, and shrubs re-establish over the next three to five years these effects would be softened. About 282 acres of ground-based removal is potentially visible in foreground views of Aldrich Ridge Road. Of the ground-based logging activity potentially visible in foreground views, 28 acres is in retention VQO, 171 acres is in partial retention VQO, and 83 acres is in maximum modification VQO.

The foreground views of Aldrich Ridge Road would not have continuous views of logging or burned areas. Live trees and less severely burned areas would break up views of treated areas and views of blackened, scorched trees in untreated areas. Removal of trees in areas with low or moderate burn severity would result in greater visual access into the forest. Tree stumps may be noticeable in the immediate foreground (300 feet) viewing distance. With the design features applied, stumps would become less visible within one growing season as grasses and forbs re-establish and grow taller than the stumps. Ground-based harvest activities are expected to achieve retention VQO in 3 to 5 years and partial retention VQO about one growing season after all project activities are complete, as activities may be noticeable would remain visually subordinate to the surrounding landscape.

Salvage harvest is also located in middleground views of Aldrich Ridge Road which have VQOs of retention, partial retention, and maximum modification. Salvage harvest is potentially visible on about 1,183 acres in the middleground viewing distance with treatment on 25 visible units. Effects include the possibility of pattern openings and associated changes in texture, but these openings, with the project design features applied, are not expected to be unnatural and would repeat the form, line, color and texture common to the landscape. In the middleground viewing distance, it is expected these changes would meet the designated VQOs one year after project activities are complete.

Views experienced in Aldrich Mountain Semiprimitive Nonmotorized Area

The Aldrich Mountain Semiprimitive Nonmotorized Area is designated as retention VQO with views experienced from dispersed campsites within the area and views experienced as one wanders through the area. The visual effects of salvage harvest include views of soil disturbance associated with skid trails and ground-based removal systems, fresh cut stumps and slash throughout the area. These effects are expected to be short-term and would lessen as grasses, forbs, and shrubs re-establish throughout the area. In high and very high burn severity areas, tree removal would change the visual structure experienced as one wanders through the area. Currently the area is dominated by the vertical structure of tree trunks. As dead trees are removed, the visual structure would change with some areas appearing quite large and feeling very open for several years. In low to moderate burn severity areas, tree removal would allow more visual access with opportunities to view greater distances across the otherwise forested-appearing landscape. It is expected the salvage activities in this area would meet retention VQO about 5 years after project activities are complete and new vegetation begins to soften the effects of salvage operations.

Summary of Direct/Indirect Effects – Alternative 2

This alternative would create short-term effects to scenery resources. The scenic quality of the area would still be dominated by the high severity burn especially as viewed from Aldrich Ridge Road and views experienced from within the Aldrich Mountain Semiprimitive Nonmotorized Area. Over the next ten to fifteen years, the landscape would begin to re-establish scenic qualities that move the area to the desired landscape character. This alternative would improve scenic stability by planting with species that are more adapted to fire and by reducing fuel loads.

Retention VQO would not be met in the short term, for 3 to 5 years until understory vegetation re-establishes and begins to lessen the effects of project activities. Partial retention and maximum modification VQOs assigned to other portions of the project area would be met either at project completion or about one growing season after project activities are complete. The project has been designed to meet the long-term VQOs assigned to the project area.

ALTERNATIVE 3

Alternative 3 excludes MA 10, the Aldrich Mountain Semiprimitive Nonmotorized Area, from harvest treatment which precludes the need for some landings and road maintenance. All other design features in Alternative 3 would be the same as those in Alternative 2. Alternative 3 proposes to harvest dead and dying trees from about 35 percent of the project area on a total of 2,769 acres.

Alternative 3 removes the Aldrich Mountain Semi-primitive Non-Motorized Area from salvage harvest. No dead or damaged trees would be removed in this area. Under this alternative, changes to the scenic quality of the Aldrich Mountain area would primarily be initiated by natural processes. Eventually, the standing dead trees will fall to the ground resulting in a jackstraw appearance as trees become crisscrossed on the forest floor and create an appearance generally not preferred by viewers. In Alternative 3, retention VQO would be met in this area as the scenic quality is not affected by salvage harvest, but large amounts of downed material, even if the cause is natural, is not a preferred visual setting (Ryan 2005). Also large amounts of downed wood can create conditions conducive to fire, which would put the scenery resources at risk in the future.

Views from Highway 26

The visual effects to views from Highway 26 would be similar to effects described in Alternative 2 but at a lesser scale. In middleground views, about 364 acres of salvage treatment is potentially visible across 9 visible units. In background views, about 104 acres of salvage treatment is potentially visible across 6 visible units. In most cases, only portions of each of these units are visible.

As in Alternative 2, the salvage harvest activities potentially seen from Highway 26 are mostly helicopter removal in very high burn severity areas. Potentially visible salvage activities are primarily located in far middleground (3 or more miles from the viewer) views with little harvest activity in background views.

The visual effects of salvage harvest in middleground views would be the same as those described in Alternative 2 at a lesser scale. Visible portions of the fire not being treated would increase under Alternative 3 in middleground and background views. Untreated, very high burn severity portions, primarily in the West Fork Dry Creek area and Aldrich Mountain Semiprimitive Nonmotorized Area, would result in more views of blackened slopes and burned trees. These areas would allow for the changes to the scenic quality primarily by natural processes. Slopes would green up in one growing season and standing dead trees would fade to silver, gray color and eventually fall to the ground. The mixture of treated and untreated areas would create a mosaic of textures as viewed from Highway 26. The following table summarizes the amount of salvage harvest potentially visible from Highway 26.

Table 126. Acres of salvage harvest potentially visible from Highway 26 in Alternative 3

Highway 26 viewing distance	Acres
Middleground	364
Background	104
Total Visible	468

Note: No salvage activities are planned in the Highway 26 foreground viewing distance. Visible acres are based on GIS seen area mapping. Only the topographical/elevation information was used to determine seen areas.

In Alternative 3, with the design features applied, it is expected the salvage harvest activities would meet partial retention VQO when viewed from Highway 26. Some changes to the landscape may be evident, but these changes would remain subordinate to the surrounding landscape.

Views from Aldrich Ridge Road #2150

The visual effects to views from Aldrich Ridge Road would be similar to effects described in Alternative 2, but at a lesser scale. This alternative proposes ground-based and helicopter logging removal in the foreground views in areas with partial retention and maximum modification VQOs. As this route travels adjacent to the Aldrich Mountain Semiprimitive Nonmotorized Area, the views of the Aldrich Mountain area outside the danger tree removal area would be dominated by views of blackened slopes and burned trees. Slopes would green up within a year and blackened trees would fade to silver, gray color in time. In foreground views, about 377 acres of salvage treatment is potentially visible. Treatment would remove dead and dying trees from 10 visible units.

Salvage harvest is also located in middleground views of Aldrich Ridge Road which have VQOs of partial retention and maximum modification. Salvage harvest is potentially visible on about 756 acres in the middleground viewing distance with treatment on 20 visible units. Effects would be the same as those described in Alternative 2 at a lesser scale.

Summary of Direct/Indirect Effects – Alternative 3

This alternative would create short-term effects to scenery resources. The scenic quality of the area would still be dominated by the very high severity burn especially as viewed from Aldrich Ridge

Road and views experienced from within the Aldrich Mountain Semiprimitive Nonmotorized Area. Over the next ten to fifteen years, the landscape would begin to re-establish scenic qualities that move the area to the desired landscape character. More of the project area in this alternative would experience changes to the scenic quality initiated primarily by natural processes. This alternative would improve scenic stability by planting with species that are more adapted to fire and by reducing fuel loads. However, fewer acres would be harvested and fuel loads may be higher than in Alternative 2, therefore this alternative does less to reduce the potential for "reburn."

Retention, partial retention, and maximum modification VQOs assigned to the project area would be met in the short term either at project completion or about one growing season after project activities are complete. This alternative has been designed to meet the VQOs assigned to the project area in the short term and long term.

COMPARISON OF DIRECT/INDIRECT EFFECTS BY ALTERNATIVE

The table below compares the alternatives by visible treatment acres in the viewing distances associated with Highway 26 and Aldrich Ridge Road corridors.

Table 127. Comparison of visible treatment acres by alternative

Viewshed and Viewing Distance	Acres		
	Alternative 1	Alternative 2	Alternative 3
Highway 26 - Middleground	None	395	364
Background	None	491	104
Total visible from Hwy 26	None	886	468
Aldrich Ridge Road 2150 - Foreground	None	618	377
Middleground	None	1,183	756
Total visible from 2150	None	1,801	1,133

Note: No salvage activities are planned in the Highway 26 foreground viewing distance. Visible acres are based on GIS seen area mapping. Only the topographical/elevation information was used to determine seen areas.

3.10.4 CUMULATIVE IMPACTS

The cumulative effects analysis area for scenery resources is the TFSR Project area.

PAST ACTIVITIES

Fire Suppression Rehabilitation

The fire suppression activities have created some short-term effects including control lines and dozer lines which create wide swaths through vegetation and ground disturbance which may be visible in foreground, middleground, and background views. Ground disturbance has been seeded and recontoured and effects are expected to be rehabilitated within 3 years. Wider swaths in vegetation would take longer to rehabilitate and may be noticeable until trees reach a height of 20 feet. Burned Area Emergency Response (BAER) activities include aerial seeding, about 8 miles of tree felling in riparian areas to capture sediment, straw mulching, and road drainage and culvert removals addressing spring runoff and safety concerns. Effects to visual resources by BAER activities are minimal.

Timber Harvest

Past timber harvest and salvage operations have occurred in the project area mostly to the northern and eastern parts of the area. Activities occurred in Dry Creek in 1983 and Fields Creek from 1989 through 1997 using a variety of harvest prescriptions. These activities are not apparent to the casual observer in the viewsheds of Highway 26 and Aldrich Ridge Road.

Wildfire

Effects from past wildfire events are minimal.

Livestock Grazing

Effects from livestock grazing on scenery resources are negligible.

Mining

One abandoned mine is located in the project area. Effects to scenery resources are negligible.

Noxious weeds sites and control

Effects to scenery resources from the control of noxious weeds are minimal.

Other activities

Other additional activities include: management of Murders Creek Wildhorse Territory, road building and maintenance, firewood cutting, outfitter guide permits issuance, and summer and fall recreation including hunting, hiking, and dispersed camping. The effect to scenery resources from these activities is negligible. Most of these past activities have formed the current recreation opportunities in the area and most often form the viewing platform and opportunities for viewing scenery.

ON-GOING / PRESENT ACTIVITIES

Present activities in the project area include: firewood cutting, livestock grazing, use and maintenance of forest roads, fire suppression, noxious weed assessment and control, management of Murders Creek Wildhorse Territory, summer and fall recreation including hunting, hiking and dispersed camping, and outfitter guide permits. These activities have minimal effects to scenery resources.

REASONABLY FORESEEABLE ACTIVITIES

Reasonably foreseeable future activities include: firewood cutting, livestock grazing, use and maintenance of forest roads, fire suppression, summer and fall recreation including hunting, hiking and dispersed camping, outfitter guide permits, noxious weed assessment and control, and possible removal of wild horses. It is anticipated that these activities would have minimal effects to scenery resources.

SUMMARY OF CUMULATIVE EFFECTS – ALTERNATIVE 1

Cumulative effects to scenery resources in the TFSR Project area are expected to meet the visual quality objectives of the Forest Plan. In retention or high scenic integrity areas, any cumulative deviations present are expected to repeat natural form, line, color and texture so that they are naturally appearing and not evident to the average viewer. In partial retention areas, any deviations present are expected to be subordinate to the natural landscape character.

The scenery resources of this area have been affected by the Shake Table Fire Complex. Valued scenic attributes have been altered due to the large amounts of very high burn severity within the fire. Views of the area would continue to be dominated by large amounts of dead trees, which is not part of the desired landscape character. This alternative likely results in conditions and trends that put valued scenery attributes at risk with cumulative effects that reduce scenic stability.

SUMMARY OF CUMULATIVE EFFECTS – ALTERNATIVE 2

Cumulative effects to scenery resources in the TFSR Project are not expected to meet the retention VQO in the short term, but would meet partial retention and maximum modification VQOs in the short term.

The proposed harvest activities along with the projects listed above would result in some short-term effects to scenery resources in order to create long-term positive effects to scenic integrity and scenic stability. Design features are in place to minimize the effects of the project on scenery resources. These short-term effects are expected to last 3 to 5 years until grasses, forbs, and shrubs begin to re-establish and soften the effects of the salvage operations. Alternative 2 has been designed to meet the long term visual quality objectives set for this area by the Malheur National Forest Land and Resource Management Plan. Alternative 2 begins to move the area toward re-establishing the valued landscape character.

Harvest and reforestation activities, associated with these alternatives, along with the projects and activities listed above would have no long-term cumulative effects to scenery resources. There are no irreversible or irretrievable commitments related to scenery resources from this alternative.

SUMMARY OF CUMULATIVE EFFECTS – ALTERNATIVE 3

Cumulative effects to scenery resources in the TFSR Project are expected to meet the visual quality objectives of the Forest Plan in the short term.

The proposed harvest activities along with the projects listed above would result in some short-term effects to scenery resources, but would meet the designated VQOs of partial retention and maximum modification about one growing season after project activities are complete. Design features are in place to minimize the effects of the project on scenery resources. These short-term effects are expected until grasses, forbs, and shrubs begin to re-establish and soften the effects of the salvage operations so that activities may be evident but be visually subordinate to the surrounding landscape. Alternative 3 has been designed to meet the long term visual quality objectives set for this area by the Malheur National Forest Land and Resource Management Plan and create long-term positive effects to scenic integrity and scenic stability. Alternative 3 also begins to move the area toward re-establishing the valued landscape character.

Harvest and reforestation activities, associated with these alternatives, along with the projects and activities listed above would have no long-term cumulative effects to scenery resources. There are no irreversible or irretrievable commitments related to scenery resources from this alternative.

3.10.5 SUMMARY

The majority of effects to scenery resources are short term in duration with long term benefits to scenic integrity and scenic stability. Short-term visual effects of salvage harvesting are often most noticeable in foreground views until the growth of new grasses, shrubs, and planted trees begin to soften the effects of salvage operations.

The significant issue for the Thorn Fire Salvage Recovery Project is salvage harvest in MA 10, a semi-primitive non-motorized recreation area. The scenery indicator used is foreground retention in the visual landscape. Salvage harvest activities in MA 10 would not meet retention VQO for approximately five years after project activities are complete as it is anticipated that salvage activities would be evident to the average viewer during this time. The following table summarizes the acres of salvage harvest in MA 10 by alternative.

Table 128 Acres of salvage harvest in MA 10 by alternative

	Acres of Salvage Harvest		
	Alternative 1	**Alternative 2**	**Alternative 3**
Management Area 10	0	1,134	0

Alternative 2 would not meet visuals standard direction of retention VQO in MA 10 in the short term as salvage activities would be noticeable for about 3 to 5 years until grasses, forbs, and shrubs re-establish and begin to soften the effects of salvage activities. In all other management areas, Alternative 2 would be consistent with Forest Plan standards and guidelines for visuals. Effects from salvage activities in partial retention and maximum modification VQOs, assigned to other parts of the project area, would be met in the short term either at project completion or about one growing season after project activities are complete. The duration of impact allowed for partial retention VQO is as soon after project completion as possible or at a minimum within the first year (USDA Forest Service 1974). All project activities in Alternative 2 have been designed to meet the long-term VQOs of retention, partial retention, and maximum modification assigned to the project area. Alternative 2 helps rehabilitate scenery resources in the landscape by beginning to re-establish scenic qualities that move the area to the desired landscape character.

Alternative 3 would meet the retention, partial retention, and maximum modification VQOs assigned to the project area in the short term either at project completion or about one growing season after project activities are complete. The project has also been designed to meet the long-term VQOs assigned to the project area. More of the project area in this alternative would experience changes to the scenic quality initiated primarily by natural processes. Natural processes that occur after a very high severity fire would continue to change the landscape character of the area. Alternative 3 would be consistent with Forest Plan standards and guidelines for visuals.

Table 129. Comparison of the alternatives and visual quality consistency

Visual Quality Objective	Alternative 1	Alternative 2	Alternative 3
Retention	Meets VQO	Does not meet VQO	Meets VQO
Partial Retention	Meets VQO	Meets VQO	Meets VQO
Maximum Modification	Meets VQO	Meets VQO	Meets VQO

Where project activities do not meet MA specific standards for scenery resources in MA 10, a Forest Plan amendment is needed that would allow the lands in the Thorn Fire Salvage Recovery Project area to deviate from retention VQO to partial retention VQO for approximately five years after project activities are complete.

With the implementation of the visual project design features, the proposed activities would meet the long-term retention, partial retention and maximum modification VQOs as outlined in the Forest Plan.

No long-term direct, indirect, or cumulative effects to scenery resources are expected from harvest activities. There are no irreversible or irretrievable commitments related to scenery resources from this project.

3.11 HERITAGE RESOURCES

3.11.1 INTRODUCTON

This section would disclose the effects of fire recovery activities proposed under the TFSR Project on cultural resources. Cultural resources are fragile and irreplaceable resources that chronicle the history of people utilizing the forested environment. Cultural resources, or heritage resources, include:

- Historic properties, places which are eligible for inclusion to the National Register of Historic Places (NHRP) by virtue of their historic, archaeological, architectural, engineering, or cultural significance. Buildings, structures, sites, and non-portable objects (e.g. signs, heavy equipment) may be considered historic properties. Traditional Cultural Properties (TCPs), localities that are considered significant in light of the role they play in a community's historically rooted beliefs, customs, and practices, are also considered historic properties. Historic properties are subject to the National Historic Preservation Act's Section 106 review process.

- American Indian sacred sites located on federal lands. These may or may not be historic properties.

- Cultural uses of the natural environment (e.g., subsistence use of plants or animals), which must be considered under the National Environmental Policy Act (NEPA) of 1969.

REGULATORY FRAMEWORK

The legal framework that mandates the Forest to consider the effects of its actions on cultural resources is wide-ranging. In this case, Section 106 of the National Historic Preservation Act (NHPA) of 1966 (amended in 1976, 1980, and 1992) is the foremost legislation that governs the treatment of cultural resources during project planning and implementation. Implementing regulations that clarify and expand upon the NHPA include 36 CFR 800 (Protection of Historic Properties), 36 CFR 63 (Determination of Eligibility to the National Register of Historic Places), and 36 CFR 296 (Protection of Archaeological Resources). The Pacific Northwest Region (Region 6) of the Forest Service Advisory Council on Historic Preservation (ACHP) and the Oregon State Historic Preservation Office (SHPO) signed a programmatic agreement (PA) regarding the management of cultural resources on National Forest system lands in 2004. The 2004 PA outlines specific procedures for the identification, evaluation, and protection of cultural resources during activities or projects sponsored by the Forest Service. It also establishes the process that the SHPO utilizes to review Forest Service undertakings for NHPA compliance.

The National Environmental Policy Act (NEPA) is also a cultural resource management directive, as it calls for agencies to analyze the effects of their action on socio-cultural elements of the environment. Laws such as the National Forest Management Act (NFMA) of 1976, the Archaeological Resources Protection Act (ARPA) of 1979, the Native American Graves Protection and Repatriation Act (NAGPRA) of 1990, and Executive Order 13007 (Indian Sacred Sites) also guide Forest Service decision making as it relates to heritage resources. The American Indian Religious Freedom Act (AIRFA) of 1978 requires that federal agencies consider the impacts of their projects on the free exercise of traditional Indian religions.

CONSULTATION WITH OTHERS

Many of the previously described laws, regulations, and directives instruct the Forest Service to consult with American Indian tribes, the state, and other interested parties on cultural resource management issues. This consultation has been conducted through the NEPA process and under the terms of existing agreements with American Indian Tribes. To date, there have been no concerns raised during scoping regarding the effects of fires recovery proposals on cultural resources. Documentation of compliance with the NHPA is currently being prepared for referral to the Oregon SHPO in accordance with the 2004 PA, and consultation with that agency would be completed prior to the publication of the TFSR Final Environment Impact Statement (FEIS).

Tribal consultation on a government-to-government basis is ongoing with the Burns Paiute Tribe, the Confederated Tribes of the Umatilla Indian Reservation, and the Confederated Tribes of Warm Springs. At this point in the consultation process no concerns regarding the effects of fire recovery proposals on cultural resources have been identified.

3.11.2 AFFECTED ENVIRONMENT

Cultural resource identification efforts in the vicinity of the TFSR project area have focused on three primary types of resources: prehistoric archaeological sites, historic archaeological sites, and places that support resources of contemporary tribal interest.

Three cultural resource inventories were conducted in the TFSR project area prior to the burn (Aldrich Timber Sale 641/92-147, Billy Timber Sale 641/91-143, Todd Timber Sale 641/91-140). Additionally, an ongoing post-fire survey was started in the 2006 field season, with approximately an additional 300 acres to be completed in the early part of the 2007 field season. These surveys have thus far resulted in the discovery of 9 heritage sites within or adjacent to the project area boundary. Of these, there are 5 prehistoric sites and 4 historic sites (See Table 130). Four of these sites are considered eligible for inclusion on the National Register of Historic Places (NRHP), two sites are ineligible, and the eligibility of three sites is undetermined. Eight additional sites are located near potential haul roads and landings outside the project area, but would not be impacted by project activities.

Table 130. Cultural resource sites located within the TFSR project area

Site Number	Description	NRHP eligibility	Protection measures
641-0105	Prehistoric lithic scatter	Eligible	Avoid
641-0106	Prehistoric lithic scatter	Eligible	Avoid
641-0502	Historic stock driveway	Not eligible	Avoid
641-1133	Prehistoric lithic scatter	Eligible	Avoid
641-1617	Prehistoric lithic scatter	Eligible	Avoid
641-1619	Historic telephone insulators	Not eligible	Avoid
641-1700	Prehistoric lithic scatter	Undetermined	Avoid or use existing road and landings and avoidance of artifact concentrations
641-2004	Historic mine test pits	Undetermined	Avoid
641-2007	Historic mine test pits	Undetermined	Avoid

The TFSR project area is predominantly located on the steep, north facing slope of Aldrich Mountain although approximately 500 acres are located on the southern slope. The primary NE-SW trending ridge is the dominant topographic feature of the project area. Water sources in and adjacent to the project area include several springs and steeply incised tributaries of the John Day River. Elevations vary from about 4000 feet to 6500 feet. Culturally important plant species, such as biscuitroot, wild onion, balsamroot, are present in the project area although generally in sparse patches.

The Southern Blue Mountains were home to people representing the adaptive traditions of both the northern Great Basin and the southern Columbia Plateau (Burtchard 1998). Known prehistoric sites in the project area consist primarily of waste flakes associated with the manufacture of stone tools and occasional tool fragments (See Table 131). Sites are mostly very small, and represent expedient tool manufacture or reworking, most likely associated with modest seasonal use of the area for hunting and gathering. The mano, a food-grinding implement, recovered at site 641-0105 is a fairly rare artifact type for the Malheur National Forest and suggests processing of seeds. No large sites with heavy lithic concentrations or stratified deposits of cultural materials, which might suggest heavy and long-term use, are known within the project area. Dates associated with age diagnostic projectile points indicate at least light use of the area throughout much of the Holocene Epoch. The relatively flat ridge top of Aldrich Mountain could have served as a seasonal travel route between the John Day River valley and the productive upland meadows of Bear Valley. General Land Office survey maps from the late 1880’s document an American Indian trail heading to the ridge top from the South Fork John Day River, southwest of the project area. The archaeological evidence located in the project area suggests this may have been the case with limited hunting and plant gathering occurring while in route.

Table 131. Prehistoric artifacts recovered in the project area. Age estimates (from Justice 2002).

Site Number	Artifact Number	Artifact Type	Material	Age, years before present (BP)
641-0105	1	rosegate arrow point	obsidian	1250-650
641-0105	2	mano	basalt	
641-0105	na	biface fragment	obsidian	
641-0105	na	biface fragment	obsidian	
641-0105	na	biface fragment	obsidian	
641-0105	na	biface fragment	obsidian	
641-0105	na	projectile point fragment	obsidian	
641-0105	na	projectile point fragment	obsidian	
641-0106	1	large stemmed dart point	obsidian	11000-8000
641-1133	1	scraper	obsidian	
641-1133	2	biface fragment	obsidian	
641-1617	1a	elko dart point	obsidian	3500-1250
641-1617	2a	elko dart point	obsidian	3500-1250
641-1617	3a	biface fragment	basalt	
641-1617	1b	elko dart point	obsidian	3500-1250
641-1700	na	scraper	obsidian	
641-1700	na	projectile point fragment	obsidian	

Historic uses of the project area are reflected in the form of sites related to chrome mining, stock grazing, and Forest Service administration. Neither the stock driveway nor the telephone lines are eligible for listing on the National Register of Historic Places (NRHP). Historic horse trails used for forest administration have been identified on maps from the 1930’s but no physical evidence of the trails has been identified. A small number of test pits associated with chrome mining have been identified at two sites located near each other on the same secondary ridge. Overall, historic use of the area has been of limited intensity and, like the prehistoric use, has been predominantly seasonal in nature.

PROJECT DESIGN FEATURES

Project design features for the heritage resource area are noted in DEIS section 0.

3.11.3 ENVIRONMENTAL CONSEQUENCES

DIRECT EFFECTS

Common to all alternatives

All alternatives are expected to have no, or extremely minor, direct effects on all known heritage sites within the project area. In most cases sites would be avoided throughout the lifetime of any of the proposed actions. The small number and size of known heritage sites within the project area make avoidance a practical alternative in most cases. The only potential exception may be the use of a helicopter landing within the boundary of site 641-1700. If this option is used, all three artifact concentration areas within the site would be avoided and a mitigation plan would be developed in consultation with the Oregon State Historic Preservation Office SHPO.

Alternative 1

Alternative 1, the No Action alternative, would cause no direct effects to known or unknown cultural resources.

Alternatives 2 and 3

Alternatives 2 and 3 could possibly cause direct effects on undiscovered heritage resources. This possibility is addressed in the project design criteria that state that if cultural resources are located during implementation, work would be halted and the District Archaeologist would be notified. The cultural resource would be evaluated, and a mitigation plan developed in consultation with the Oregon State Historic Preservation Office (SHPO) if necessary. In most cases these effects, should they occur, would be minor and unlikely to cause a significant impact.

INDIRECT EFFECTS

Common to all alternatives

The primary indirect effect of all alternatives on heritage resources would be the potential for increased erosion of the site matrix for those sites with intact buried components. None of the known sites have identified intact buried components and most are situated in topographic settings with shallow soils that suggest intact buried components are extremely unlikely. The only possible exception is site 641-1133 that is located at a small meadow with associated seeps and springs. This setting would be conducive to an intact buried component but the extremely sparse nature of the surface component, ten waste flakes and two tool fragments, suggests that any buried component would be of limited significance.

Since all known sites would be avoided, with the possible exception of site 641-1700 discussed above, and extensive soil protection project design features are in place, no or minimal indirect effects on known and unknown heritage resources are expected under all alternatives.

3.11.4 CUMULATIVE IMPACTS

Past, ongoing and foreseeable actions that have effected and may continue to effect heritage resources in the project area include livestock grazing, timber harvest, road construction and dispersed recreational use. Historic high levels of cattle and sheep grazing, particularly before the middle twentieth century, likely caused directed effects through trampling of artifacts and indirect effects through soil erosion. Some level of artifact removal by workers and recreational visitors has most certainly occurred, and likely continues at a reduced rate. Past road construction has caused the most significant direct effects to those sites where a road passed through. Timber harvest has mostly occurred relatively recently and to a limited extent. Direct and indirect effects to heritage sites by timer harvest activities have been minimal.

Alternative 1

Alternative 1, the No Action alternative, would cause no cumulative impacts to known or unknown cultural resources.

Alternatives 2 and 3

Alternatives 2 and 3 could possibly cause limited cumulative impacts on known and unknown heritage resources. These could include unintentional direct effects to unknown sites and potential for artifact removal. Overall these potential cumulative impacts, should they occur, would only result in a minimal effect to heritage site integrity.

3.11.5 SUMMARY

CONSISTENCY WITH MALHEUR NF FOREST PLAN

The Malheur National Forest Land and Resource Management Plan tiers to the previously discussed laws and corresponding Forest Service direction as it sets forth resource management goals, objectives, and standards (U.S. Department of Agriculture, Forest Service 1990). This Heritage Resources analysis, and the associated cultural resources inventory report prepared for submission to the Oregon State Historic Preservation Office (SHPO), are consistent with Forest-wide standards 13-24. These standards include:

- Conduct a professionally supervised cultural resource survey on National Forest lands to identify cultural resource properties. Use sound survey strategies and the Malheur National Forest Cultural Resource Inventory Survey Design.
- Evaluate the significance of sites by applying the criteria for eligibility to the NRHP.
- Consider the effects of all Forest Service undertakings on cultural resources. Coordinate the formulation and evaluation of alternatives with the Oregon State cultural resource plan, the Oregon SHPO and State Archaeologist, other State and Federal agencies, and with traditional and religious leaders of Native American Indian groups and tribes with historic ties to the project planning area.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS

There are no anticipated irreversible or irretrievable commitments of cultural resources.

3.12 ECONOMICS / SOCIAL

3.12.1 INTRODUCTON

The goal of this analysis is to provide economic analysis and social assessment to facilitate comparison of alternatives and decision-making regarding the proposed action.

MANAGEMENT DIRECTION

The Malheur Forest Plan (USDA Forest Service, 1990) includes forest-wide management goals related to economics:

- Provide a sustained flow of timber for lumber, fiber, and/or associated wood products at a level that would contribute to economic stability, while providing for regional and national forest management.
- Contribute to the social/economic health of communities, which are significantly affected by national forest management.
- Provide an economic return to the public.
- Provide and utilize wood fiber in the form of sawtimber, fiber, and/or associated wood products, while minimizing losses and maximizing outputs in a cost-effective manner, consistent with the various resource objectives and environmental standards.

"Economic stability" is referred to as one of the key issues which guided the development of the Forest Plan, and present net value (PNV) is listed as a benchmark that serves as a basis for an economic comparison between alternatives (USDA Forest Service, 1990).

Goals and standards related to economics are not specifically noted under descriptions for the specific individual management areas affected by this proposed action. See other specialist reports for best management practices (BMPs) and design criteria adopted for the proposed action to satisfy the standards for resource elements (e.g., recreation, visuals, fish and wildlife (including habitat effectiveness indices), range, timber, facilities, and residue management) established to meet the goals of individual management area designations. BMPs and design criteria help insure that intended direct and indirect economic and social effects derived from resource elements are maintained to the extent possible in accordance with the goals of designated management areas.

SOCIAL AND ECONOMIC ISSUES FROM PUBLIC INVOLVMENT

Scoping comments discuss a number of issues related to social and economic conditions. Supporters of salvage efforts note the desire to help local mills, the need to act quickly to minimize losses due to decay and staining, and the effects of snag retention and harvest schedule constraints (e.g., minimize overlap with hunting season) on sales viability. One respondent suggests that small business interests have the opportunity to participate in salvage in areas not logged by helicopter.

Those not in favor of salvage recovery cite ecological damages from harvest activities, cumulative effects on adjacent roadless and/or ecologically sensitive areas, fragmentation of wilderness, visual, and recreational attributes, and the assertion that salvage is not needed for recovery. Comments from environmental groups include recommendations to consider a 'restoration-only/no commercial harvest' alternative, commercial thinning as an economical alternative to clear-cutting, designing alternatives without a pre-determined bias toward commercial harvest, and less optimistic estimates of harvestable volumes. Specific recommendations include preserving the roadless conditions and a 95 percent wildlife habitat integrity score of the north side of Aldrich Mountain area. Other requests include the need to avoid excessive spending of public funds on sales that are not financially efficient and improved use of sound science and consideration of tradeoffs between short-term economic gains and long-term restoration benefits.

Environmental groups, as well as US Environmental Protection Agency emphasize that project goals should accurately reflect the objectives of salvage, namely recovery of economic value.

The Confederated Tribes of the Warm Springs Reservation of Oregon recognize economic arguments for salvage, but also emphasize mitigation of environmental effects, particularly steelhead and Chinook habitat. They stress the importance of considering long-term health of environmental attributes in relation to short-term payoffs (also noted by environmental groups) and note that the John Day (watershed) is the only system within the Tribal ceded territory not supporting a subsistence fishery. EPA requests that the project 'reflect…broader public interest and need'.

ANALYSIS METHODS AND SCOPE

Due to the location of the salvage area (entirely within Grant County), the proximity of communities in Grant County to the project area, and presence of wood products facilities in Grant County that are most likely to handle timber from this salvage sale, the scale of analysis and assessments within this report would focus on Grant County. Grant County is likely to be of sufficient scale to capture and characterize social and economic effects. It is recognized that users of the area may come from outside the County and that some non-market benefits may be attributable to populations outside of Grant County; focusing on Grant County should not detract from an understanding and acknowledgement of these benefits.

For quantitative analysis, the temporal scale is assumed to equate to the duration of the project activities, recognizing, as noted above that non-market benefits can be affected beyond that point. The methods and assumptions adopted for this analysis include those generally used for characterizing the affected environment and assessing financial efficiency, economic efficiency, and regional impacts. See relevant sections for details about methods and assumptions.

3.12.2 AFFECTED ENVIRONMENT

GEOGRAPHY AND SCALE

The proposed salvage action is located on the Malheur National Forest in northeast Oregon primarily within Grant County. Grant County is a large (4,528 sq. mi.), remote county in eastern Oregon with large expanses of steep terrain, except along the river valleys. Elevations are high (valley floor is 3,194 feet) and climate overall is dry (averaging 14.3 inches), except for some of the higher mountain ranges which receive more precipitation. Growing seasons are short. All of these affect the lifestyle and social and economic conditions of the County. Travel distances are long and transportation within the county is not easy, especially in winter months. Communities within an hour or two drive of the salvage area, within Grant County include John Day, Canyon City, Prairie City, Dayville, Long Creek, Mt. Vernon, Kimberly, Monument, and Seneca. John Day/Canyon City and Prairie City are home to wood products industry facilities and services that may experience direct effects from the proposed action.

Portions of the Malheur NF are also located to the south in Harney County, also a large (10,228 sq. mi.) remote county with similar environmental and geographic conditions. However, as noted above, analysis and assessments within this report would focus on Grant County.

Larger cities and communities two or more hours drive away from John Day that may be indirectly affected include Sumpter, Austin, Unity, Greenhorn, Hereford and Baker City in adjacent Baker County; La Grande in Union County; Pendleton in Umatilla County; and Ontario in Malheur County. The nearest metropolitan areas are Bend, Oregon, the Tri-Cities (Kennewick, Pasco, and Richland) in Washington, and Boise in Idaho.

POPULATION AND DEMOGRAPHICS

Following a decline in the 1980's, Grant County's population changed little throughout the 1990s, but then experienced a significant exodus beginning in 2000, with populations declining from approximately 8200 to 7,362 by 2004 (EPS, 2007) with most residents living in the John Day Valley. Population loss is explained in part by people seeking employment outside of Grant County (OED, 2006). Population growth has been slower than the State of Oregon or for the nation. Grant County's median age increased from 36.3 to 41.7 between 1990 and 2000 with the greatest increase occurring in the 45-49 year age category. The population density in Grant County is one of the lowest in the nation, at less than 1-2 persons per square mile (USDA Forest Service, 2003).

The population of the area is predominately white, followed by American Indians. The region is sparsely populated, and contains low populations of minorities (5.5 percent of the Grant County population) (USDA Forest Service, 2004a).

The project area is located within the ceded lands of the Confederated Tribes of Warm Springs and traditional use areas for the Burns Paiute Tribe and Confederated Tribes of the Umatilla Indian Reservation. The Burns Paiute Tribe is located in close proximity to the Malheur National Forest just north of and within the larger town of Burns in Harney County. The 2000 census recorded 171 residents living at the reservation. There are over 300 enrolled members of the Burns Paiute tribe (USDA Forest Service, 2003).

Grant County higher education rate is similar that of the nation; 15.7 percent of the population 25 and older in Grant County have a college degree, compared to 14.5 percent for the nation in 2004 (EPS, 2007).

Poverty rates provide some indication of the percent of the population in surrounding communities with low-incomes. The poverty rate for Grant County is 13.7 per cent. The Oregon statewide average rate of persons living below poverty is 11.6 percent (USDA Forest Service, 2004a).

EMPLOYMENT, AND INCOME

Total employment grew from 4459 to 4567 between 2001 and 2004 for Grant County, while employment in "Forestry, fishing, and related activities" increased slightly from 389 to 406 (BEA – Table CA25N). In 2005, the unemployment rate for Grant County was 9.9 percent, compared to 6.1 percent for the State, and 5.1 for the nation (Bureau of labor statistics as cited in EPS, 2007). The unemployment rate in September 2006 was Grant County's lowest since 1994, but the labor force was approximately 12 percent greater in 1994. It should also be noted that Grant County experiences high fluctuations in season unemployment; in 2005 the rate varied from 6.3 percent (August) to 14.2 percent unemployment (February) (EPS, 2007). Grant County has one of the most extreme seasonal patterns of any local labor market in Oregon (OED, 2006).

According the Oregon Employment Department (OED, 2006), Grant County's jobless rates have been above State averages due to (1) highly seasonal employment, (2) lower degree of economic diversity, and (3) structural job losses in the County's natural-resource-based industries.

A significant portion of the economic base is concentrated in agriculture and forest products industries, with substantial employment in other traditional service and production areas (e.g., retail, health care, construction, manufacturing). There are some limited opportunities for tourism development. The 2002 index of employment specialization indicated that Grant County was slightly more specialized than the national average (903 versus median of 961 for all US counties for 2000), suggesting a small degree of economic vulnerability in the event of disruptions to those sectors in which specialization occurs (e.g., wood products) (EPS, 2007).

Wood products manufacturing, government (including local, state, and federal), farming, and agricultural services provide the basic sectors of Grant County's economy (See Table 132 and Table 133). The components of the economic base are even more pronounced when looking at the individual communities within these counties. John Day in Grant County is geographically isolated from freeways for transportation, more than 50 miles from any population centers of more than 20,000 people, and is very highly specialized in wood products and federal government employment (USDA Forest Service, 2003). John Day and Prairie City have been identified as isolated timber dependent communities with high reliance of their economy on timber products and livestock forage (USDA Forest Service, 2003).

Table 132. Distribution of Employment and Labor Income within Grant County, OR (2003)

	Employment (jobs)	Labor Income (Thousands of 2007 dollars)
Industry	Area Totals	Area Totals
Agriculture	718	$13,666.2
Mining	0	$0.0
Utilities	37	$2,395.4
Construction	240	$7,457.4
Manufacturing	230	$10,386.2
Wholesale Trade	61	$1,742.2
Transportation & Warehousing	107	$3,896.5
Retail Trade	302	$6,949.4
Information	33	$1,321.9
Finance & Insurance	65	$2,131.8
Real Estate & Rental & Leasing	30	$481.2
Prof, Scientific, & Tech Services	90	$2,713.1
Mngt of Companies	0	$0.0
Admin, Waste Mngt & Rem Serv	76	$1,471.4
Educational Services	2	$6.5
Health Care & Social Assistance	223	$4,692.4
Arts, Entertainment, and Rec	12	$162.5
Accommodation & Food Services	188	$2,301.9
Other Services	438	$7,838.8
Government	811	$32,472.2
Total	3,664	$102,087.0

Source: Aggregate 2-digit North American Industrial Classification System (NAICS) data obtained from major government sources (e.g., US Bureau of Economic Analysis) via IMPLAN (Minnesota IMPLAN Group 2003).

Total personal income (adjusted for inflation) in Grant County grew by an annual rate of 1.2 percent between 1974 and 2004, with per capita personal income at $26,163 in 2004 compared to $40,039 for the State of Oregon (BEA Table CA05N). In contrast, average earnings per job fell from $29,328 to $26,163 (2004$, adjusted for inflation) during the same period, though earnings per job have been relatively stable since the mid-1990's (EPS, 2007). Between 1974 and 2004, income growth in Grant County has been slower than Oregon and the nation. Historically (1970-2000), personal income has been less stable (greater percent change in income relative to prior year) than income for Oregon or the nation, but personal income for Grant County has become more stable as of 2001. Personal income grew from $189 million in 2001 to $192 million in 2004 (unadjusted for inflation). Income derived from people commuting out of Grant County exceeds the income of people commuting into the county (i.e., "bedroom community").

Wood Products Industry

A significant percent of Grant County employment is affiliated with the wood products industry and support sectors, as indicated in Table 133, where almost 12 percent of non-Farm employment was associated with logging services or wood products manufacturing in 2006. Substantial employment is also linked to support industries such as Agriculture and Forestry Support Services and transportation.

Table 133. Distribution of Employment within Grant County, OR (Q2, 2006)

ECONOMIC SECTOR	EMPLOYMENT	% of Non-Farm
Farm and Nonfarm (1)	3437	
Non-Farm - Industry - Total All Ownerships (2)	2638	100.0%
Total Private Coverage	1575	59.7%
Natural Resources & Mining	229	8.7%
Forestry and logging	118	4.5%
Agriculture and forestry support activity	61	2.3%
Construction	132	5.0%
Manufacturing	249	9.4%
Wood Products	192	7.3%
Trade, Transportation. & Utilities	366	13.9%
Truck transportation	18	0.7%
Information	41	1.6%
Finan Act, Prof& business serv	170	6.4%
Education & Health Services	121	4.6%
Arts, Leisure & Hospitality	195	7.4%
Other Services	70	2.7%
Total All Government	1063	40.3%

Sources: (1) Oregon Labor Market Information System (OLMIS) – Labor Force Data (http://www.econ.state.or.us/stats.htm, Second quarter, 2006, (2) OLMIS – Covered Employment (http://www.econ.state.or.us.stats.htm, (not included are self-employed, agriculture labor for small farms or 'casual' labor.

Employment associated with "Forestry and Logging" and "Agriculture and Forest Support Services" varied only slightly (109 to 136 and 61 to 66 respectively) between 2003 and 2006 (Q2), recognizing that many workers are seasonally employed. Wood products employment did not vary substantially between 2005 and 2006 (204 to 192 jobs) (OLMIS – Covered Employment).

Based on field notes from Region 6 Forest Service staff (USDA Forest Service, 2006a) as well as information from Random Lengths (2007), three sawmills (Two Type 1 and one Type 2 sawmill) located within Grant County[19] are currently producing 25 to 50 MMBF per mill with aggregate production being approximately 120 to 125 MMBF per year. All are operating at or near a single full shift capacity, implying that increases in production may require that an additional shift be added (along with the overhead expense). However, any additional volume obtained from National Forest timber likely offset higher cost supplies from other sources (see source discussion below). Employment ranges from 60 to 75 per mill, with aggregate employment being 200 to 225. No mills are located in Harney County (post processor only, with majority of supply coming from Canada).

Field survey respondents estimated that there are approximately 120 local loggers involved in forest-related activity, with an additional 80 workers employed in transportation and similar services. One company within John Day employs approximately 70 people in the summer for thinning, piling, and burning, with significant focus on fire-related events (November through February is slow time). Another company provides mechanized thinning, road construction, and hauling; they subcontract additional services (e.g., hauling), primarily from within Grant County and employ approximately 50 workers, increasing to approximately 60 or more in the summer.

A significant percent of logging would occur through the use of helicopter services for this project. Helicopter services are based outside of Grant County (e.g., Baker City, Summerville, and Prineville) and these services are likely to rely on and bring their own ground-based crew (e.g., cutters, choker/setters). As a consequence, helicopter logging will have relatively little impact on local logging sector employment and income, but timber supplies from helicopter logging will still affect local processing and hauling employment and income.

All (100%) of local timber harvest is normally processed by Grant County mills, with additional supply coming from as far as Sisters, OR (USDA Forest Service, 2006a). National Forest timber supply makes up approximately 10 percent of supply to local mills while 20 percent to 30 percent is private and 60 percent of supply is obtained from outside the County.

Volume removed from the Forest over the past twelve years has steadily declined (85%) from the early 1990s (264.5 MMBF in 1990) to around 20 MMBF (volume sold) by 2001, with some degree of stabilization between 1996 and 2001. Total volume removed from all ownerships in Grant and Harney counties has also declined since 1990. In Grant County for example, total volume removed for all ownerships declined 79 percent from 1990 (263 MMBF) to 56 MMBF (average 1999-2001) for an annual average change of 11 percent. The Malheur National Forest contributed a majority of the volume removed between 1990 to 1995 (73 percent on average) but Malheur's contribution decreased to 23 percent of the total volume between 1996 and 2001 (USDA Forest Service, 2003). The volume and supply trends experienced by the Malheur National Forest and Grant County are similar to trends experienced by Oregon as well as the nation (USDA Forest Service, 2006b).

Volumes and values have fluctuated since 2001, as shown in Figure 6 and Figure 7, with a peak occurring in 2004. The average volumes sold and cut between 1997 and 2006 are 30.1 MMBF and 29.2 MMBF respectively; these values are slightly higher than the annual volumes proposed for harvest under this action (approximately 20 MMBF). Volumes in most recent years are still well below volumes from the early 1990's and below the established ASQ of 211 MMBF average per year for the Malheur NF[20] (USDA Forest Service, 1990).

[19] Malheur Lumber, Co., John Day, OR (Type 1 – dimension/boards); Grant Western Lumber Co., John Day, OR (Type 1 0 dimension/boards); Prairie Wood Products, Prairie City, OR (Type 2 – studs).
[20] An ASQ is an upper limit for the plan period, not proposals for sale offerings or an assigned target. Actual sale levels depend on factors like: limitations of modeling, changes in law and regulations, changes in social-

Table 134. Volume Sold Since 1997 – Malheur National Forest

Volume Sold – Malheur National Forest (FY 2001-2006)	
Year (FY)	Total Volume Sold (MBF)
1997	39,782.62
1998	94,400.64
1999	27,208.08
2000	13,502.26
2001	17,491
2002	2,638
2003	4,382
2004	63,019
2005	11,463
2006	21,402

Source: Timber Cut and Sold Reports – Malheur for 2001-2006
(http://www.fs.fed.us/r6/nr/fp/FPWebPage/FP70104A/FP70104A.htm)
Lynette Sullens (Malheur NF) 1997-2000

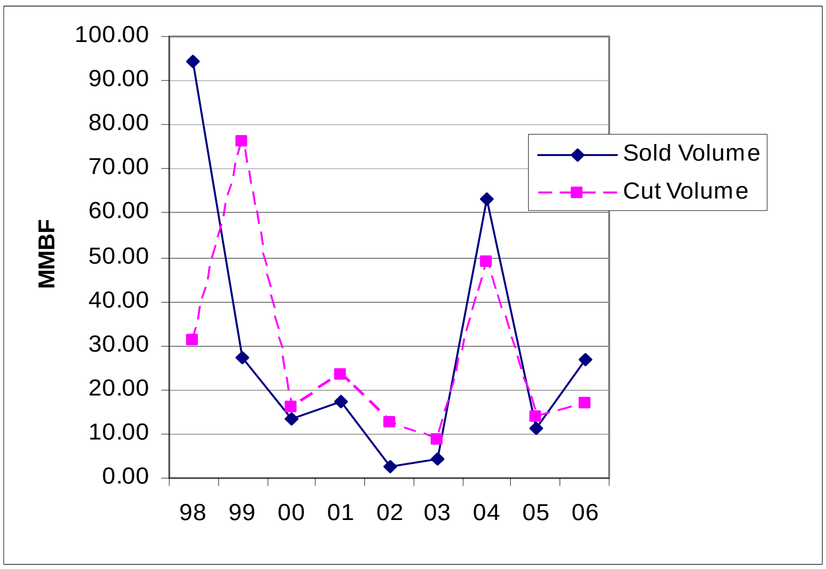


Figure 6. Trend in Volumes Sold and Cut – Malheur National Forest

Source: Timber Cut and Sold Reports – Malheur for 2001-2006
(http://www.fs.fed.us/r6/nr/fp/FPWebPage/FP70104A/FP70104A.htm)
Lynette Sullens (Malheur NF) 1997-2000

economic values, listing of threatened and endangered species, changes in budgets, and site-specific conditions. The Regional Forester amended this plan in 1994 through Amendment No. 2 (Eastside Screens), and by PACFISH and INFISH in 1995 in response to some of these changing factors.

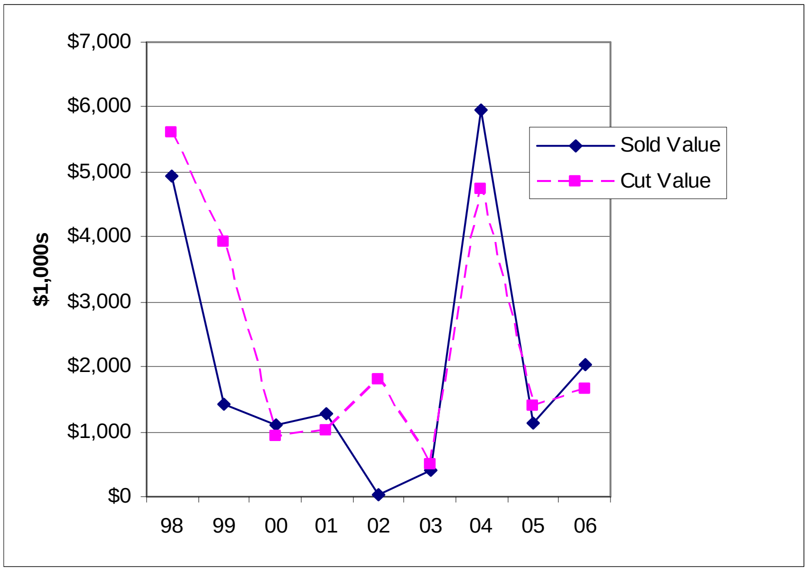


Figure 7. Trend in Timber Value Sold and Cut, Malheur National Forest

Source: Timber Cut and Sold Reports – Malheur for 2001-2006
(http://www.fs.fed.us/r6/nr/fp/FPWebPage/FP70104A/FP70104A.htm)
Lynette Sullens (Malheur NF) 1997-2000

With low interest rates and demand for housing, there was a slight resurgence in Oregon's forest products industry, beginning in 2001, as suggested by Figure 6 and Figure 7. A booming housing market continued to bolster demand for lumber in the early 2000's, leading to the highest level of lumber production by western mills since the 1990's in 2005. However, demand for lumber fell in 2006 and is expected to slow further in 2007, though lumber composite prices may be stabilizing[21].

VALUES, ATTITUDES, AND BELIEFS

The communities and economies of the Blue Mountains region in Oregon reflect a strong natural resource dependence (e.g., development of mills, ranching, and agriculture on both private and public lands).Grant County is an example of rural resource-dependent economies of northeast Oregon with a history of resource-oriented industries, and a more recent awareness of recreational and natural environment values that began in the early 1980's. The trend toward fewer workers in the wood products industry per MBF, combined with uncertainty created by efforts to address sensitive species and environmental issues, has resulted in diminished optimism about local capacity to respond to economic stress and change. While still resource and production-oriented, the rural population reflects a diversity of opinion that differs from prior decades – concerns are being expressed about the ecological health of the forest and the need to weigh short-term returns against long-term production and ecological sustainability (USDA Forest Service, 1992).

[21] Lumber demand is predicted to decline 7.2 % in 2007 (Western Wood Products Association, News Release "Declining Demand for Lumber to Continue in 2007 as Housing Slows, Dec. 28, 2006). The Framing Lumber Composite Price in March 16, 2007 ($283) had declined 24 % over the last year ($373), but some degree of stabilization has occurred since Fall 2006 (Random Lengths Lumber Market Report, as cited in USDA Forest Service Appraisal Update, Region 6, March 23, 2007).

Articles and opinions published in local and national news media have noted the ongoing debate about the scientific validity and social effects of salvage recovery in National Forests within Oregon[22]. Defenders of salvage stress that salvage activity can improve the economic and social conditions surrounding sawmills dependent on dwindling timber supply from public land, and cite evidence that salvage improves restoration and reforestation. Articles discuss claims that paperwork and lawsuits, fast-track options under the Healthy Forest Restoration Act not withstanding, continue to reduce the benefits derived from salvage activity. Articles and opinions about resistance focuses on poor science regarding tree mortality projections and the effects of logging on soils, water quality, fish and wildlife, and other ecosystem components in sensitive areas, and cite evidence that forest regeneration is more efficient when salvage does not occur. Articles present claims that “emergency situations” and fast-track project management to avoid economic loss are strategies for preventing legal challenges.

Lindenmayer (2006) notes that some people believe that salvage decisions are often made in crisis mode and the importance of other forest values and/or long-term ecological sustainability are overlooked. Highly altered forest landscapes created by salvage may result in shifts in the types and amounts of forest products, once salvage logging occurs. As a consequence, some believe that (1) restoration activities can impair regeneration of natural vegetation, and (2) there is a need for careful assessment of land use management options well beyond the initial salvage period.

Opposing values held by various groups or members of the public demonstrate the relevance of considering trade-offs between short-term economic returns and long-term production and ecological sustainability. Examples of ecological effects and issues to be weighed against the recovery of economic value from dead and dying trees are discussed in the 1997 court agreement to defer further harvest within the Aldrich Sale planning area[23]. Plaintiffs state that they value recreational activities such as hiking, fishing, camping, wildlife viewing and that “aesthetic, recreational, scientific, and religious interests…would be adversely affected and irreparably injured” if sales occur. Ecological attributes of concern included old growth dependent species and habitat, old growth connectivity, water quality, aquatic species, soils, fragmentation and biodiversity impacts. All of these attributes can be grouped into non-market benefits where it is difficult to monetize values.

3.12.3 ECONOMIC AND SOCIAL CONSEQUENCES

This section assesses financial efficiency, economic efficiency, and economic and social impacts. *Economic efficiency* addresses the usefulness of inputs (costs) to produce outputs (benefits) when all costs and benefits that can be identified and valued are included in the computations. In contrast, *financial efficiency* compares revenue and costs from the perspective of the Forest Service only (i.e., consider only revenues and expenditures recorded in Forest Service financial records). A third assessment, *economic and social impacts*, evaluates changes in conditions related to the distribution and stability of employment, income, and other characteristics of a local or regional economy. It is important to note that measures of efficiency and impacts frequently focus on subsets of economic and social conditions that can be monetized or quantified. As such, these measures contribute useful

[22] La Grande Observer (8/19/06), as cited by Associated Press Sate and Local Wire – Editorials from Oregon Newspapers; The Spokesman Review, Spokane, WA (J. Hagengruber) (8/19/06) “Burned Timber plan opposed: Forest Service accused of using shoddy science” p. B-3; The Christian Science Monitor (B. Knickerbocker – staff writer) (11/1/05) p. USA-2 “After wildfires, to log or not to log”; The Seattle Times (AP) (11/9/05), p. B5; Associated Press, State and local wire (4/9/04), State and regional section.
[23] Blue Mountains Biodiversity Project and OR Natural Resources Council vs. US Forest Service – Stipulation for Dismissal and Complaint for Declaratory and Injunctive Relief in US District Court, District of Oregon (Civil No. 97-1224-AA)

information for decision-making but are necessarily incomplete and should only be applied in combination with other indices of environmental and natural resource output, health, and sustainability.

FINANCIAL EFFICIENCY

Recoverable and Stained Timber Volumes

The steps to estimate harvest volumes for appraisal and financial efficiency are: (1) estimate total baseline volumes based on information provided by pre-cruise reports (Cruise #5 for ThornP sales, reports generated 4/11/2007), (2) estimate recoverable volumes of value by adjusting baseline volumes for decay based on assumptions regarding harvest schedule and decay rates (see Table 135), and (3) estimate recoverable volumes that are stained by assuming that 25 percent of all ponderosa pine is stained (assume no staining effects in other species). The staining rate is an estimate based on an aggregation of rates in Table 135. In actuality, stained volumes may be lower because approximately 72 percent of baseline ponderosa volume is greater than 16”in diameter and much of this volume is projected to be harvested in the Fall of 2007. The high percent of volume across all species (76 percent of total baseline MMBF is greater than 16”) and efforts to harvest in 2007 and 2008 account for the relatively low overall losses in volume across both alternatives. Rates of volume loss would be greater if harvest dates extend into 2009 and 2010. Volumes are summarized in the following tables; recoverable volumes, by species, are used to specify volumes in TEAECON for appraisal and financial efficiency analysis. For details about volume calculations, see USDA Forest Service, 2007.

Table 135. Decay and Staining Rates, by Diameter class

		Harvest Date	
Diameter (DBH)	Value Effect (1)	Fall 2007	Spring-Summer 2008
9”-12”	% Volume remaining	100%	0%
	Stained/Checking/Sap Rot	25%	
13”-16”	% Volume remaining	100%	100%
	Stained/Checking/Sap Rot	10%	25%
>16”	% Volume remaining	100%	100%
	Stained/Checking/Sap Rot	10%	20%

Source: Original information obtained from “Wood Changes in Fire-Killed Eastern Washington Tree Species, Progress Reports.” James S Hadfield and Roy Magelssen, Wenatchee Field Office, Wenatchee National Forest, Wenatchee, WA (March 1996 – March 2000). Adjustments and application made by L. Baughman (Malheur National Forest, John Day OR) based on additional area-specific timber cruise data and data obtained regarding checking and staining after harvests for past sales.
(1) *% Volume remaining* = [Volume in size class (winter ’06)]/[volume in size class (harvest date)]; *Stained*/Checking/Sap Rot = % of volume remaining at harvest date that is Blue stained/Checked/Sap Rotted. Applies to ponderosa pine only.

Table 136. Total Baseline, Recovered, and Stained Volumes (MMBF), by Alternative

	Alternative 2	Alternative 3
Total Baseline Volume (1)	41.392	26.806
Total Recoverable Volume (2)	39.927	26.426
Douglas fir/ W. Larch (3)	*15.985*	*10.477*
White fir (3)	*11.761*	*7.855*
Ponderosa pine (Stained) (3)	*3.045*	*2.024*
Ponderosa pine (Not stained) (3)	*9.135*	*6.071*

Notes: **(1)** Based on timber pre-cruise reports (cruise #5, ThornP Sale, generated 4/11/2007). **(2)** Derived assuming a harvest schedule of baseline volumes as follows: 20.696 MMBF in Fall '07 (Alt 2 and Alt 3), 20.696 MMBF in 2008 for Alt 2; 6.11 MMBF in 2008 for Alt 3. **(3)** Species-specific recoverable and stained volumes serve as input for TEAECON. Staining assumed to affect ponderosa pine only.

Base rates, predicted high bids, and gross revenues are presented in Table 137 in the following section.

Viability of Timber Harvest

The area proposed for commercial timber harvest within the TFSR Project area was analyzed to determine the economic viability of harvesting timber by determining the tentative advertised bid rates per thousand board feet ($/MBF). This estimate was based on a number of factors including: quantity, quality and species of sawtimber volume, logging costs, haul costs, specified road maintenance costs, contractual costs, erosion control and other developmental costs, and the value of timber proposed for removal. Sawlog is the only product addressed; chips, firewood, etc are not considered to be significant in volume for this project. The preliminary value of the timber was based on the prices for the same species and material of all sales actually sold within Appraisal Zone 3 (primarily Blue Mountain forests) within the last 12 months.

The tentative advertised bid rates estimated for the TFSR Project reflect the most current volume, price and cost estimates for this analysis. An initial bid rate was determined by subtracting the costs associated with logging from the base period prices adjusted for the quality of the material and current market conditions. This rate was further reduced (10%) per current appraisal methods (Transaction Evidence Appraisal) to allow for competition between bidders to determine the tentative advertised bid rate. The computer software program TEA_ECON, in conjunction with the Product Quality Adjustment spreadsheet (OR Eastside, 3-07) and the Analysis of Advertised Rates spreadsheet (June, 2004) was used for this analysis.

Both alternatives that harvest timber would produce positive bid rates indicating that the project would provide viable timber sales. Based on this analysis, alternative 3 provides the highest tentative advertised rate at $73.26/mbf. Alternative 2's advertised rate is lower at $55.43/mbf due to higher stump to truck costs. Alternative 1 would not harvest any timber and therefore, would not produce any revenue or benefits to wood products industries. See Table 137 for a breakdown of logging and associated costs by alternative.

Table 137. Logging and Associated Costs/MBF used for Appraisal, by Alternative

	Alternative 2	Alternative 3
Weighted Avg. Stump to Truck Cost	$274.12	$257.68
Log Haul	$42.63	$42.63
Road Maintenance	$0.19	$0.19
Brush Disposal and Erosion Control	$4.50	$4.50
Essential KV	$53.29 (across 3404 acres)	$55.65 (across 2353 acres)
Road Maintenance	$0.63	$0.63

FINANCIAL EFFICIENCY RESULTS

The financial efficiency analysis is specific to the timber harvest and reforestation (essential and non-essential KV planting) activities associated with the alternatives (as directed in Forest Service Manual 2400-Timber Management and guidance found in the Forest Service Handbook 2409.18). Costs for sale preparation, sale administration, reforestation, and activities to comply with design criteria are included. Costs, timing, and amounts were developed by the specialists on the project's interdisciplinary team. The expected revenue for each alternative is derived from TEAECON using assumptions noted in the appraisal section above. The PNV was calculated using TEAECON as well. A four percent real discount rate was used over the five-year project lifespan (2007-2011), which includes reforestation/planting through 2011. For more information on the values or costs, see the economic section of the project file.

Reforestation/planting is projected to occur on salvage acres (essential KV acres) and on non-salvage acres (non-essential KV acres). For the alternative 2, essential KV planting would occur on 3404 acres (3907 salvage acres minus 503 acres of low severity burn) over two years (2008 and 2009) at a rate of $625 per acre (accounts for Forest OH, stocking surveys in years 1 and 3 and certification survey in year 5). Total annual essential KV expenditures are therefore $2,127,500 ($53.29 per MBF recoverable volume – see Table 137). Nonessential planting includes 3024 acres over 2010 and 2011 ($1,890,000 total). Total acres planted for both alternatives are 6428. For Alternative 3, essential KV planting would occur on 2353 acres (2769 salvage acres minus 416 low severity burn acres) over two years (2008 and 2009; 1384 acres/year); annual essential KV expenditures are therefore $1,470,625 or $55.65 per recoverable MBF. Nonessential planting includes 4075 acres over 2010 and 2011 ($2,546,875). Other Forest Service expenditures are summarized in Table 138.

Table 138. Forest Service Expenditure Assumptions

	Alternative 2	Alternative 3
Sale Preparation	$15/MBF	$15/MBF
Sale Administration	$8/MBF	$8/MBF
Transportation Planning	$3/MBF	$3/MBF
Reforestation/planting on non-essential KV acres	$1,890,000 (3024 acres)	$2,546,875 (4075 acres)

This analysis is not intended to be a comprehensive benefit-cost or PNV analysis that incorporates a monetary expression of all known market and non-market benefits and costs that is generally used when economic efficiency is the sole or primary criterion upon which a decision is made. Many of the values associated with natural resource management are best handled apart from, but in conjunction with, a more limited benefit-cost framework. These values are discussed in the section regarding *Economic Efficiency and Nonmonetized Benefits* in this report, and in specialist reports for other resource areas.

Table 139 summarizes the project feasibility and financial efficiency, including the base rates, predicted high bid (i.e., estimated stumpage value), total revenue and PNV for each alternative. Because all costs of the project are not related to the timber sale, two PNVs were calculated. One PNV indicates the financial efficiency of the salvage sale, including all costs and revenues associated with the timber harvest and required design criteria. Required design criteria are summarized in other reports, by resource area. A second PNV includes all costs for each alternative, including other non-essential KV planting or reforestation activities occurring in 2009 to 2011.

Negative PNV for Alternative 2 indicates that this alternative is not financially efficient, even when reforestation planting is eliminated from non-essential KV acres (i.e., non-salvage acres) (PNV=-$741,000) (See Table 139). In contrast, alternative 3 is approximately break-even with PNV just below zero at -$3,000 if planting is not conducted on non-essential KV acres. Alternative 3 becomes inefficient (PNV= -$2,223,000) if planting on non-essential KV is added back in. It should be noted that the sunk costs associated with NEPA planning for this project are not included in the analysis of financial efficiency in accordance with Forest Service directives for economic analysis. However, these costs amount to $998,150 and $660,650 for alternatives 2 and 3 respectively, based on a unit cost of $25/MBF. Negative PNV results are not unexpected when reforestation is involved, given that benefits from reforestation are often non-market values and therefore not quantified within PNV analysis.

A reduction of financial PNV in any alternative as compared to the most efficient solution is a component of the economic trade-off, or opportunity cost, of achieving that alternative. The no action alternative would not harvest or take other restorative actions and, therefore, incur no costs. It should be noted that proposed salvage harvest would likely substitute for green harvest volumes during the relevant years, and, as a consequence, it cannot be argued that the net revenue estimated for this project would result in an equivalent net revenue change for the Malheur timber program as a whole. As indicated earlier, many of the values associated with natural resource management are non-market benefits. These benefits should be considered in conjunction with the financial efficiency information presented here. These non-market values are discussed in the section below.

Table 139. Project Feasibility and Financial Efficiency Summary (2007 dollars)

Category	Measure	No Action	Alternative 2	Alternative 3
Harvest Information	Recoverable Volume Harvested (adjusted for decay) (MBF)	0	39,926	26,426
	Base Rates ($/MBF)	$0	$53.54	$55.90
	Predicted High Bid ($/MBF)	$0	$61.59	$81.40
	Total Revenue (Thousands of $) (1)	$0	$2,459	$2,151
Salvage Harvest & Required design criteria (2)	PNV ($1,000)	$0	$-741	$-3
Salvage Harvest & Required Design Criteria + Non-essential KV planting (3)	PNV ($1,000)	$0	$-2,389	$-2,223

(1) Gross Timber Value in TEAECON. (2) Timber Sales and Related Projects in TEAECON – includes sale administration and preparation and transportation planning and essential KV costs. (3) Includes non-essential KV planting costs.

ECONOMIC EFFICIENCY AND NONMONETIZED BENEFITS

Present net values for the proposed salvage sale (including essential KV planting but excluding planting on non-essential KV acres), is negative for Alternative 2 (-$741,000) and approximately ‘breakeven’ for Alternative 3. However, these results do not account for various non-market benefits such as future benefits derived from reforestation planting on salvage acres. It is assumed that there would be benefits associated with future natural resource conditions and productivity derived from reforestation activities, but these benefits cannot not be monetized due to the difficulties associated with assigning values to non-market goods and services (see relevant specialist report and section within the DEIS for discussion of future conditions derived from planting).

In contrast to long-term benefits derived from reforestation, there would be some degree of adverse effects generated directly or indirectly as a result of salvage operations that may affect PNV. Many of these effects are short-term, and include the following:

- Recreation:

    - Alternative 2 - Short-term adverse effects are anticipated for about five years during which time MAs 10, 20A, and 21 would experience changes in setting appearance with potential for corresponding effects on the quality of visitor experience.
    - Alternative 3 – Short-term adverse effects are anticipated for about five years during which time MAs 20A and 21 may experience similar changes in setting appearance and quality of visitor experience.
    - There is potential for short-term temporary road closures during hunting season, however, it is expected that relevant hunting or visitor use would be displaced or diverted to other nearby locations.
    - No long-term direct, indirect, or cumulative effects to recreation settings or opportunities are expected from salvage activities.
- Livestock and Grazing Allotments:
    - The project area involves a number of grazing allotments but it is projected that the alternatives would have no significant effects on allotments relative to baseline or No Action conditions (i.e., the primary effects on allotments are associated with the fire itself, and not potential salvage activities).
- Roads:
    - No harvest is planned for inventoried roadless areas and road activities are restricted to maintenance, opening and re-closing of roads under both alternatives.
- Fisheries:
    - Neither Action Alternative is expected to significantly add to effects of the Shake Table Fire Complex and ongoing recovery processes.
- Heritage resources:
    - No effects or extremely minor effects due to site avoidance.
- Other Ecological Attributes, including old growth habitat, big game habitat, snags, and other habitat attributes:
    - Some adverse effects associated with salvage operations are expected but implementation of project design features (PDFs), best management practices (BMPs) and compliance with Forest plan standards and guidelines would minimize the effects of salvage activities on ecological components of concern (see Specialist reports and relevant resource sections within the DEIS for details).
    - Alternative 3 excludes harvesting in Management Area 10, thereby reducing the potential for adverse ecological effects on 1138 acres within that area, relative to Alternative 2.

Financial efficiency results also reveal that the discounted cost of reforestation planting on non-salvage acres (i.e., non-essential KV acres) is approximately $1.7 million for Alternative 2 and $2.2 million for Alternative 3 (the difference being due to reduced number of salvage acres under Alternative 3 and corresponding increase in need for non-essential KV expenditures). The acreages associated with these costs are 3024 and 4075 acres respectively for Alternatives 2 and 3. As noted at the beginning of this section, it is difficult to monetize these benefits associated with future conditions derived from reforestation and to assess capacity of benefits to offset discounted costs (see relevant specialist report and section within the DEIS for discussion of future conditions derived from planting).

Overall, the purpose and need of the proposed action focuses on recovery of economic value and therefore coincides with public comments emphasizing the need to clearly differentiate between project objectives associated with value recovery and forest restoration. Proposed activities under both alternatives comply with design criteria to minimize adverse ecological effects that could inhibit long-term restoration potential.

ECONOMIC AND SOCIAL IMPACTS

Regional Economic Impacts

The primary impacts from this proposed action would occur from commercial harvesting associated with the alternatives over the years of logging and sawmill processing activity, as well as planting and reforestation. Factors affecting economic impacts include:

- Projected annual salvage volumes associated with this proposed action are less than average annual volumes sold for the Malheur NF (see Section: Wood Products Industry),
- Salvage harvest would likely substitute for green harvest volumes during the years of salvage harvest (personal communication: J. Hensley, Malheur NF), and
- Depressed market conditions and understanding that local mills are already operating at full capacity for single shifts.

Based on these factors, it is concluded that there would be no substantial increase in employment or labor income associated with the timber harvested under this proposed action, relative to existing conditions. However, this proposed action can still be viewed as an important component of or contribution to timber supply to Grant County mills in 2007 and 2008 (projected years of harvest) and therefore a significant factor in helping to sustain the local resource-based economy.

Levels of harvest volume by alternative affect employment and income in several ways:

- Directly - (effects attributable to employment associated with harvesting, logging, mills and processing plants for sawtimber, pulp, chips, veneer and plywood)
- Indirectly - (effects attributable to industries that supply materials, equipment, and services to these businesses)
- Induced - (effects attributable to personal spending by the business owners, employees, and related industries).

Employment and income effects were derived from response coefficients from IMPLAN (Minnesota IMPLAN Group, 2003) and FEAST, a tool used to process IMPLAN output (USDA Forest Service, 2004). The IMPLAN model is an input-output model that estimates and uses multipliers as a means to estimate the change in direct, indirect, and induced effects as a result of an adjustment in the level of final demand for the goods or services provided by a given sector of the economy. FEAST is a spreadsheet interface tools that relies on employment and income response coefficients, derived from an IMPLAN model, and user-specified inputs regarding changes in resource utilization (e.g., timber harvest) across alternatives to estimate relative employment and labor income impacts across alternatives.

For this assessment, an IMPLAN model was derived for Grant County, using 2003 data, and adjusted to better reflect Oregon Labor Market Information System covered employment data for 2003-2006 (OLMIS, 2006)24.

[24] Baseline employment data for *Agriculture and Forestry Support Services* and *Truck Transportation* were reduced and increased by 33 jobs respectively to better reflect OLMIS data and information collected by Region 6 in 2006. Income and other attributes were adjusted as well to be consistent with employment changes.

Annual employment and labor income contributed or supported by average annual salvage volumes of 33.420 CCF (66,840 CCF total harvest) and 22.325 CCF for alternative 2 and alternative 3 respectively. Alternative 2 is estimated to contribute the equivalent of 4.2 percent of baseline employment and 5.1 percent of baseline labor income in Grant County, where baseline is assumed equal to 2006 conditions. Alternative 3 is estimated to contribute the equivalent of 2.8 percent of employment and 3.4 percent of labor income. These contributions are derived from labor associated with logging services and sawmill production in Grant County. It is assumed that only 13 percent of logging services for this sale are provided by Grant County labor to acknowledge that 87 percent of logging is projected to be conducted by helicopter services based outside of Grant County, but that 100 percent of salvage volumes are processed by local sawmills within Grant County. Job estimates include temporary and permanent full-time, part-time employment. The estimates do not include unpaid family workers or sole-proprietors.

In addition to salvage harvests, Alternatives 2 and 3 include planting/reforestation on salvage harvest (i.e., essential KV acres) and non-harvest acres (non-essential KV acres) (see Financial Efficiency for acreage amounts). This activity is assumed to cost $625/acre and employ Agriculture and Forestry support services (20 percent of cost), Logging services (75 percent of cost), and Forest Nurseries (5 percent of cost). Recognizing that 20 percent of cost per acre is attributable to government overhead and that forest nursery businesses are located outside of Grant County (and/or nursery inputs supplied by National Forest facilities), employment (15.8 jobs/$million final demand) and labor income ($503,626 income per $1million final demand)(2003$) coefficients are obtained from the Grant County IMPLAN model. Primary information has not been collected to confirm the composition of service sectors necessary for planting, but these assumptions are believed to be representative for purposes of this analysis, based on conversations with Malheur NF staff.

Based on the prior assumption that salvage volumes would be substituting for green volumes, reforestation on essential KV acres is assumed to support existing job and income base for Grant County, however, planting on non-essential acres is assumed to *create new jobs and labor income*. The job and labor income impacts to Grant County, associated with logging, mill production, and reforestation, by alternative, are summarized in Table 140.

Table 140. Summary of Annual Employment and Labor Income (2007$) Impacts in Grant County, by Alternative

	Alternative 2	Alternative 3
Annual Jobs and Labor Income Supported by Logging and Mill Production (2007 and 2008)	154 Jobs/yr (4.2% of 2006 baseline employment) $5,219,000/yr (5.1% of 2006 baseline labor income)	103 Jobs/yr (2.8% of 2006 baseline employment) $3,488,000/yr (3.4% of 2006 baseline labor income)
Annual Jobs and Labor Income Supported by Reforestation on Salvage Acres (2008 and 2009)	13 Jobs/yr $456,000/yr	10 Jobs/yr $328,000/yr
Annual Jobs and Labor Income Created by Reforestation on Non-Salvage Acres (2010 and 2011)	12 Jobs/yr $405,000/yr	16 Jobs/yr $546,000/yr

Response coefficients for sawmills are 0.00394 jobs/CCF and $0.129labor income/CCF (2003) and 0.00496jobs/CCF and $0.1331/CCF for logging services, based on Keegan Mill survey data, as cited in FEAST.

OTHER SOCIAL IMPACTS

The Malheur National Forest has satisfied small business requirements without the need for set asides in recent years; based on the characteristics of the local wood products sector this trend should not change during the period of this proposed action.

PAYMENTS TO STATES

Currently, given uncertainty about reauthorization of secure payments, a 25 percent fund is being maintained in Region 6. Given that the proposed action is a salvage sale, Malheur is required to place $0.50 per MBF into the National Forest Fund. As a consequence, $19,963 and $13,213 would be deposited under alternatives 2 and 3 respectively.

Payments in lieu of taxes (PILT) are payments to counties to help offset lost property taxes. Grant County received $354,000 in 2006 as a consequence of Malheur NF land within the County. The formula for estimating payments includes FS receipts; however, given that salvage harvest is expected to substitute for green harvest, PILT is not projected to change appreciably as a result of this proposed action.

ENVIRONMENTAL JUSTICE AND TRIBAL INTERESTS

Executive Order 12898 (February 11, 1994) on Environmental Justice directs federal agencies to consider whether proposed alternatives may have disproportionately high and adverse environmental effects on minority populations, low-income populations, or Indian tribes. The order directs federal agencies to focus attention on the human health and environment effects to ethnic minorities (American Indians, Hispanics, African Americans, and Asian and Pacific Islander Americans), disabled people, and low-income groups.

The alternatives are not expected to significantly alter opportunities for subsistence fishing (or further restrict opportunities for creating subsistence fishing), by native tribes, including that of the Confederated Tribes of Warm Springs, as supported by evidence presented in the Fisheries Section which states that neither Action Alternative is expected to significantly add to effects of the Shake Table Fire and ongoing recovery processes. It is not expected that other traditional resources or cultural practices will be negatively affected.

Logging, mill production, and reforestation under the proposed action is expected to help sustain employment and income opportunities within Grant County, including those of minority and low-income groups. Minority employment in the wood products industry is not available, but some firms contracted by the Forest Service for reforestation have traditionally hired minorities; both alternatives provide similar levels of reforestation. Alternative 2 provides slightly greater potential for sustaining opportunities. Implementation of either alternative is not expected to result in adverse impacts to minority or low-income populations.

3.12.4 CUMULATIVE IMPACTS

Some economic indicators have improved recently in Grant County such as reduced unemployment, increased stability of personal income, and short-term stabilization in timber supplies from the Malheur National Forest, but a number of other economic factors suggest continuation of trends associated economic vulnerability and reduced capacity to respond to economic disruptions. A combination of unemployment that is relatively high compared to Oregon, a decreasing work-force, a relatively large proportion of the work-force that is seasonal, a somewhat high degree of economic specialization in natural-resource-based industries (e.g., wood products), and personal income that is historically less stable all indicate that the timber supply afforded by the proposed action would help insure the sustainability of Grant County's economic base, as demonstrated by the jobs and labor income contributed and added by the alternatives (see section Regional Economic Impacts). Jobs and income supported by reforestation on salvage acres, and created by reforestation on non-salvage acres, also help insure sustainability of the local economy.

As noted earlier, volumes from salvage would likely substitute for green harvest volumes and are therefore not expected to significantly increase overall sales volume or revenue when considered in the context of total annual volume sold for the Malheur National Forest. However, in a cumulative context, Grant County may continue to experience a trend of economic instability, and the proposed action may help mitigate or off-set the effects of that trend. Falling demand for lumber and corresponding lumber prices decreases the financial value of the sale at this time and therefore tempers the cumulative beneficial effect of this sale, but the sale is projected to be viable as indicated in sections above.

There are currently a number of grazing allotments and outfitter guides permitted to use the project area, however, the cumulative effect of the proposed action on future opportunities for permitting should be reduced due to design features in place to minimize the effects of the project on recreational resources. See Section regarding Economic Efficiency and Non-Monetized benefits.

3.13 TRANSPORTATION

3.13.1 INTRODUCTON

The most current information available from the Travel Routes portion of the Forest Service Information Systems Database (INFRA) was used to determine road lengths and maintenance levels for roads within the project areas and for roads proposed as haul routes outside of the project areas. This information is compiled and displayed in **DEIS Appendix M – Road Lists**. Maps that display existing roads, roads proposed for haul routes and road maintenance for the action alternatives, and post project road closures for the action alternatives are in **DEIS Appendix A**.

REGULATORY FRAMEWORK

Several of the major roads or portions of them that are within and or adjacent to the project areas (Roads 21, 2140, 2150, 2150070, and 2170) were analyzed with the Forest Level Roads Analysis that was completed in December 2004. A project specific roads analysis for this project was not done because the Responsible Official determined it was not needed. This determination is consistent with current direction, because none of the alternatives proposes any new road construction, temporary road construction, long-term changes to motorized access, current road use, traffic patterns, road standards, or propose changes anticipated to result in any road related adverse effects on soil and water resources.

3.13.2 AFFECTED ENVIRONMENT

The project areas encompass approximately 7,783 acres, which equals approximately 12.2 square miles. The entire project areas are currently within an administrative area closure, with no public access allowed because of safety concerns.

The primary access into the project area is Forest Service Road (FSR) 21. The road surface is asphalt and starts from U.S. Highway 26 and ends at a point southeast at milepost 25.2 at its junction with County Road 63. The other main access roads in the project area include 2140 (Maintenance Level 2), 2150 (Maintenance level 3), and 2170 – which has different segments maintained at Maintenance levels 3, 2 and 1. The road surface for the maintenance level 3 roads is crushed aggregate. The road surface for maintenance level 2 roads is normally native, but there are a few roads in the project area with crushed aggregate or improved road surfaces.

Roads that are Maintenance Level 3 or 4 roads generally receive some periodic maintenance with appropriated funding. But the majority of the proposed haul roads are currently classified as either Maintenance Level 1 or 2. Maintenance Level 2 roads are typically maintained at a level to provide access for high clearance vehicles. Passenger car traffic is allowed but not encouraged. Traffic on ML 2 roads is normally low, and usually consists of administrative, recreational, or other specialized uses, which can include commercial activities. Roads that are Maintenance Level 2 typically receive only minimal maintenance except when maintenance is needed to support specific projects such as timber harvest.

Roads that are Maintenance Level 1 roads are normally closed to motorized vehicle use. Motorized use is typically authorized by permit only for specific needs. Maintenance Level 1 roads generally receive only basic custodial maintenance to prevent damage to adjacent resources; the road is basically in storage, but available when needed for future management activities. Emphasis is given to assuring functional drainage prior to closure. While these roads are closed to motorized vehicles, they remain open and to nonmotorized travel. When a Level 1 road is needed for specific project activities that extend beyond a brief period - such as timber harvest, they can be temporarily changed to Maintenance Level 2 status.

Roads that are used for timber haul normally receive road maintenance at a level commensurate with use, either maintaining or improving existing road conditions to support timber haul. Because the maintenance is commensurate with use, it is possible that if winter logging occurs, little or no road maintenance would be necessary on specific roads. Alternatively, if haul operations occur in the summer, road maintenance commensurate with use is likely to occur on all or nearly all of the roads.

Table 141. Existing Road Miles inside the TFSR project Area (Pre-Fire Conditions)

Operational Maintenance Level	Miles
OML 1 (closed roads)	11.9
OML 2	15.0
OML 3	4.3
OML 2, & 3 (Total Open Roads)	19.3
All Roads	31.2 (total miles)

Most of the roads within and adjacent to the project areas received some use during fire suppression activities, and most of them also received some type of maintenance and storm-proofing as a result of post suppression and or BAER activities. Some roads that were closed before the fire were opened for suppression activities, and most were closed again a short time later. Most of the Maintenance Level 1 or 2 roads that are proposed for timber haul routes would still require some types of maintenance to bring them up to a standard needed for commercial timber haul. All of the work needed on proposed haul roads inside and outside of the project areas is defined as maintenance on Page 3231 of the Federal Register / Volume 66, No 9 / Friday, January 12, 2001 / Notices.

Included in the maintenance requirements for these roads are the following types of work activities, which can be performed as maintenance in any contracts:

- Brushing
- Blading and shaping roads, including existing drain dips, grade sags, and waterbars.
- Placing rock in some existing drain dips and grade sags
- Spot rocking in wet areas of road
- Falling of hazard trees and removal from the road prism
- Repair damaged culverts
- Removal and replacement of culverts with same size or larger culverts up to 36 inches in diameter
- Removing debris that has sloughed into the roadway
- Minor realigning of road junctions

The following work is also classified as maintenance under the definition listed in the Federal Register, but would be listed as reconstruction in any contracts that are signed:

- Constructing new drain dips and grade sags
- Constructing new outlet ditches
- Constructing new waterbars
- Removal and replacement of culverts with same size or larger culverts greater than 36 inches in diameter
- Widening roadbed in select areas to meet standard width

ROAD DENSITIES

Road density is normally calculated on a sub-watershed or (6th field Hydrologic Unit Code –HUC) when considering wildlife and other resource concerns. The Malheur Land and Resource Management Plan objectives for open road densities are clearly intended to be monitored on a watershed or 5th field HUC basis (LRMP, Chapter IV, page 22 – Roads; also see LRMP Appendix I).

The project areas include some areas with virtually no roads, and other areas with moderately high total road densities. The project areas comprise only portions of several different subwatersheds (6th level HUC). The total road density within the combined project areas averages 2.6 miles/square mile, and the open road density within the combined project areas averages 1.6 miles/square mile.

3.13.3 ENVIRONMENTAL CONSEQUENCES

ALTERNATIVE 1 – NO ACTION

Under the No Action Alternative, once the current area closure is rescinded or removed, all assigned road maintenance levels would be the same as they were before the fire. Roads that were open would remain open, and roads that were closed would remain closed, so there would be no change in miles of open and closed roads. Since no new road construction, new road closures or road decommissioning would take place with this alternative, there would be no changes or effects to total or open road densities. No Operational Maintenance Level 1 roads would be temporarily opened to accommodate timber haul or other post fire activities. Under this alternative danger trees along open roads would be taken care of by normal maintenance as per pre-fire if there is funding. If there is no funding and the danger trees are causing a safety problem to road users, roads would be closed as per Forest Service Manual 7700-Transportation System, Chapter-30 Operations and Maintenance, Supplement No. 7730-2005-1, Dated December 12, 2005, until funding is available to fell them..

Brush and tree encroachment over time would result in decreased sight distance on most roads; a few roads may close naturally as a result of encroaching vegetation and very little use. There would be no foreseeable opportunities to improve existing road conditions through funded maintenance activities. Any road related sediment delivery into streams would continue at the current level or increase over time, along with the related effects to water quality, fish, and other riparian habitat. Recurrent maintenance costs to the Federal government to meet road maintenance standards would not change. A total of 19.3 miles of road would remain open for administrative and public motorized use once the area closure is rescinded.

DIRECT /INDIRECT EFFECTS COMMON TO BOTH ACTION ALTERNATIVES

The road miles listed in Table 142 includes all haul roads except the 3.5 miles of Road 21 beyond the Forest Boundary (north of the project areas), and approximately 1.5 miles of Road 2150 that crosses private land in T.14S, R.28E., Section 36.

Table 142. Haul Road Miles by Alternatives (Inside and Outside Project Area Boundaries)

Proposed Haul Road Miles	Alternative 2			Alternative 3		
	Inside	Outside	Total	Inside	Outside	Total
OML 1 Miles*	4.8	4.6	9.4	4.1	4.6	8.7
OML 2 Miles	11.3	6.3	17.6	10.9	6.3	17.2
OML 3	4.3	14.2	18.5	4.3	14.2	18.5
OML 4	0	10.0	10.0	0	10.0	10.0
Total Miles	20.4	35.1	55.5	19.3	35.1	54.4

* These road miles would be temporarily opened for proposed project activities, and closed after post harvest reforestation is complete.

Under both Action Alternatives, danger trees would be felled along all haul roads. This would result in increased user safety during project activities as well as increased public safety on roads that are open to public access after post fire reforestation activities are complete. Under both Action Alternatives, once the current area closure is rescinded or removed and proposed project activities are completed, all assigned road maintenance levels would be the same as they were before the fire. Roads that were open before the fire would again be open, and roads that were closed before the fire would again be closed. There would be no change in miles of open and closed roads. Since no new or temporary road construction, no new road closures, and no road decommissioning would take place with either action alternative, there would be no changes or effects to total or open road densities.

Based on road condition surveys, roads used for timber haul and harvest activities would receive pre- and post-haul maintenance commensurate with use, as needed to bring them to standard. In many cases functional road drainage and road surface conditions would be improved, reducing road related impacts to other resources. Spot rocking would be used in select areas as needed to reduce the impacts of road use. The rock would come from one or more of the following sources – the Hillman Bypass pit on road 2150020, the Oregon Mine pit located on road 2170919, an un-named road side borrow pit located on road 2140038, or the Thorn pit located on road 2150024. Water would be used for dust abatement during timber haul activities as needed to provide user safety. Haul routes would include some roads that are currently closed, which would be temporarily opened to accommodate timber haul and other post fire activities, and closed again after post-harvest reforestation activities are completed.

The condition of haul routes would be improved by maintenance activities associated with timber harvest. Direct beneficial effects from the proposed action alternatives would include improved road drainage and surface conditions. These improvements would result in a reduction in road related impacts to nearby water quality and fish habitat for an extended period on roads that are closed, and for an estimated 5 to 10 years on roads that remain open. Overall road conditions could be expected to decline gradually over time, or until appropriated funding or other projects occur that can fund future maintenance activities. Brush and tree encroachment would gradually decrease sight distance and a few roads may close naturally as a result of encroaching vegetation and very little use.

Implementation of both action alternatives would result in a temporary increase in open road densities in and adjacent to project areas, during the periods when roads are being used for timber haul and post-harvest activities. All of the closed roads that are opened for harvest activities would be re-closed long-term with the same type of closure devices that were present before the fire occurred, using either earthen berms or gates. After post harvest reforestation activities are complete, a total of 19.3 miles of road inside the project area boundaries would remain open for motorized use by the public.

ALTERNATIVE 2

This alternative proposes the highest level of road maintenance activities associated with timber harvest. A total of 55.5 miles of roads would receive road maintenance commensurate with use, including danger tree felling. This would include 20.4 miles of road inside the project areas, and 35.1 miles of road outside the project areas. A total of 9.4 miles of closed roads would be temporarily opened (4.8 miles inside the project areas, and 4.6 miles outside the project areas). After post harvest reforestation activities are completed, they would be closed with the same type of closure device that was used before the fire occurred (earthen berms or gates).

ALTERNATIVE 3

This alternative proposes a lower level of road maintenance activities associated with timber harvest compared to Alternative 2. A total of 54.4 miles of roads would receive road maintenance commensurate with use, including danger tree felling. This would include 19.3 miles of road inside the project areas, and 35.1 miles of road outside the project areas. A total of 8.7 miles of closed road would be temporarily opened (4.1 miles inside the project areas, and 4.6 miles outside the projects areas). After post harvest reforestation activities are completed, they would be closed with the same type of device used before the fire occurred (earthen berms or gates). This alternative would treat danger trees along 0.4 miles less of open road compared to Alternative 2. Danger trees along that section of road would be taken care of by normal maintenance as per pre-fire if there is funding. If there is no funding and the danger trees are causing a safety problem to the road, the road would be closed as per Forest Service Manual 7700-Transportation System, Chapter-30 Operations and Maintenance, Supplement No. 7730-2005-1, Dated December 12, 2005, until funding is available to fell them.

CONSISTENCY WITH DIRECTION AND REGULATIONS

The action alternatives would result in temporary increase in open road densities within and adjacent to the project areas, but none of the alternatives would result in changes to the project areas in terms of long-term road densities. Alternative 1 would not bring road related effects within the project areas any closer to meeting the Standards and Guidelines for fish habitat or water quality as contained in the Malheur Forest Plan. Through planned road maintenance activities, Alternatives 2 and 3 would improve drainage and surface conditions on haul routes. These improvements would result in a reduction in road related impacts to nearby water quality and fish habitat for an extended period on roads that are closed, and for an estimated 5 to 10 years on roads that remain open.

IRREVERSIBLE/IRRETRIEVABLE EFFECTS

All action alternatives could use rock on roads for spot rocking. This would be an irreversible commitment of rock material resources. The rock would come from one or more of the following sources – the Hillman Bypass pit on road 2150020, the Oregon Mine pit located on road 2170919, an un-named road side borrow pit located on road 2140038, or the Thorn pit located on road 2150024.

3.13.4 CUMULATIVE IMPACTS

CUMULATIVE EFFECTS ALTERNATIVE 1 – NO ACTION

The existing road system assigned Maintenance Levels were developed in association with past timber harvests and other activities. Past and proposed activities that affect roads and access have been analyzed under direct and indirect effects.

Considering past, ongoing and foreseeable actions, future road maintenance (or lack of maintenance) combined with administrative and recreational use could have some cumulative effects. Routine road condition surveys would provide condition information to drive future management and maintenance of roads. Once the current area closure is rescinded, use of open roads by motorized vehicles would result in gradual deterioration of road surfaces, particularly native surfaced roads. All other ongoing and future actions are not expected to affect roads and access. The cumulative effect of roads and access on other resources is discussed in each resource section of Chapter 3 of the FEIS.

CUMULATIVE EFFECTS FROM ALL ACTION ALTERNATIVES

The existing road system and assigned Maintenance Levels were developed in association with past timber harvests and other activities. Past and proposed activities that affect roads and access have been analyzed under direct and indirect effects.

Considering past, ongoing and foreseeable actions, future road maintenance (or lack of maintenance) combined with administrative and recreational use could have some cumulative effects. Routine road condition surveys would provide condition information to drive future management and maintenance of roads. Use of open roads by motorized vehicles would result in gradual deterioration road surfaces, particularly native surfaced roads. All other ongoing and future actions are not expected to affect roads and access.

No planned activities under any of the alternatives would change either total or open road densities, so there would be no cumulative effect on road densities. The cumulative effect of roads and access on other resources is discussed in each resource section of Chapter 3 of the FEIS.

3.14 OTHER DISCLOSURES

NEPA at 40 CFR 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with …other environmental review laws and executive orders." The following sections disclose those laws and executive orders.

3.14.1 AIR QUALITY

This proposal would have some short-term impacts on air quality levels for smoke; however National Ambient Air Quality Standards (NAAQS) would not be exceeded by the Proposed Action or any alternative. Air Quality impacts are addressed in detail in Chapter 3, Fuels/Air Quality Section.

3.14.2 AMERICAN INDIAN RIGHTS

This proposal would not conflict with any inherent rights or treaty provisions of any Tribal group.

3.14.3 CONGRESSIONALLY DESIGNATED AREAS

- Wilderness: There are no lands designated in the project area as wilderness; therefore, there would be no impacts on Wilderness.
- Wilderness Study Areas: There are no lands designated in the project area as Wilderness Study Areas (WSA) or recommended for wilderness classification; therefore, there would be no impacts on any WSA.
- National Recreation Areas: There are no lands designated in the project area as National Recreational Areas; therefore, there would be no impacts on any National Recreational Area.

3.14.4 ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL OF ALTERNATIVES

The potential energy consumption associated with the Proposed Action and alternatives as well as the differences between the alternatives is not measurable.

3.14.5 EVEN-AGED VEGETATION MANAGEMENT

The National Forest Management Act (NFMA) of 1976 requires the disclosure of any silviculture prescription that creates an opening larger than 40 acres, using even-aged vegetation management. The project Proposed Action and alternatives would not create opening greater than 40 acres as this standard is applied to live forested stands, not fire-killed timber stands.

3.14.6 ENVIRONMENTAL JUSTICE IN MINORITY POPULATIONS AND LOW-INCOME POPULATIONS

Executive Order 12898 (Feb. 11, 1994) requires all federal agencies to make environmental justice part of each agencies mission, by identifying and addressing, as appropriate, disproportionately high, and negative human health or environmental effects on minority populations or low-income populations. The alternatives were assessed to determine whether they would disproportionately impact minority or low-income populations, in accordance with Executive Order 12898.

The alternatives are not expected to significantly alter opportunities for subsistence fishing (or further restrict opportunities for creating subsistence fishing), by native tribes, including that of the

Confederated Tribes of Warm Springs, as supported by evidence presented in the Fisheries Section which states that neither Action Alternative is expected to significantly add to effects of the Shake Table Fire and ongoing recovery processes. It is not expected that other traditional resources or cultural practices will be negatively affected.

Logging, mill production, and reforestation under the proposed action is expected to help sustain employment and income opportunities within Grant County, including those of minority and low-income groups. Minority employment in the wood products industry is not available, but some firms contracted by the Forest Service for reforestation have traditionally hired minorities; both alternatives provide similar levels of reforestation. Alternative 2 provides slightly greater potential for sustaining opportunities. Implementation of either alternative is not expected to result in adverse impacts to minority or low-income populations.

No minority or low-income populations would be adversely impacted by implementation of any of the alternatives.

3.14.7 FLOODPLAINS (EXECUTIVE ORDER 11988)

The project area and adjacent areas do not contain floodplains.

3.14.8 INVENTORIED ROADLESS AREAS (IRA) AND UNDEVELOPED CHARACTER

INVENTORIED ROADLESS AREAS

No IRAs would be impacted by the proposed action or alternatives. Three IRAs are located adjacent to the TFSR Project area boundaries: Cedar Grove, Dry Cabin, and Shake Table IRAs. No salvage harvest or other project activities are proposed within the Forest Plan FEIS Appendix C inventoried roadless areas. **DEIS Appendix A-9** map shows IRAs in relation to the Shake Table Fire Complex and the TFSR Project area.

Cedar Grove IRA, approximately 112 acres in size, is located within the Shake Table Fire Complex area but outside and adjacent to the TFSR Project area. The Cedar Grove IRA is generally located to the south and east of the TFSR Project area. The portion of the Cedar Grove IRA that was affected by the Shake Table Fire Complex would not be treated with the TFSR project. Alternative 2 proposes activities near, but outside the Cedar Grove IRA, including hazard tree removal along Aldrich Ridge Road 2150 and a small amount salvage harvest by helicopter removal. Alternative 3 proposes activities near, but outside of the Cedar Grove IRA, including hazard tree removal along Aldrich Ridge Road 2150 and a lesser amount of salvage harvest by helicopter removal than Alternative 2.

Dry Cabin IRA, approximately 12,221 acres in size, is partially located within the Shake Table Fire Complex area but outside and adjacent to the TFSR Project area. The Dry Cabin IRA is located to the south and west of the TFSR Project area. The portion of the Dry Cabin IRA that was affected by the Shake Table Fire Complex would not be treated with the TFSR project. Both Alternatives 2 and 3 propose activities near, but outside the Dry Cabin IRA, including hazard tree removal along Aldrich Ridge Road 2150 and some salvage harvest by helicopter and ground-based removal.

Shake Table IRA, approximately 7,137 acres in size, is located adjacent to Shake Table Fire Complex area and outside the TFSR Project area. The Shake Table IRA is located to the south of the TFSR Project area. The Shake Table IRA would not be treated with the TFSR project. Both Alternatives 2 and 3 propose activities near, but outside the Shake Table IRA, including a small amount of hazard tree removal along Road 2170. Any salvage harvest by helicopter or ground-based removal is approximately one-half mile away from the Shake Table IRA.

In Alternative 1, the no action alternative, there would be no direct, indirect or cumulative effects to Cedar Grove, Dry Cabin, and Shake Table IRAs because no project activities would occur in any of the IRAs. Any changes to the IRAs would be through natural processes.

In Alternatives 2 and 3, there would be no direct, indirect or cumulative effects to on-the-ground roadless resources of the Cedar Grove, Dry Cabin, and Shake Table IRAs. No salvage harvest or other project activities are proposed in either alternative in the IRAs. Effects to natural integrity and opportunity opportunity of solitude and primitive experience would be as follows:

Natural integrity would remain the same for all IRAs, as it currently exists in Alternatives 2 and 3. There would not be additional human influences on the natural integrity on the Cedar Grove, Dry Cabin, and Shake Table IRAs.

Opportunities for solitude and primitive experience would remain the same for the Cedar Grove, Dry Cabin, and Shake Table IRAs in Alternatives 2 and 3. In the short-term, increased sights and sounds of human activity associated with salvage harvest activities may affect visitor's primitive recreation experience and opportunity for solitude. Possible effects include increased sights and sounds of helicopters, people, and equipment adjacent to portions of the IRAs during harvest activities.

All alternatives would be consistent with Malheur National Forest Land and Resource Management Plan standards and guidelines. There are no activities proposed in the Cedar Grove, Dry Cabin, and Shake Table IRAs, therefore there would be no change in roadless area character.

UNDEVELOPED CHARACTER

Analyzing the undeveloped character of an 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 the TFSR Project area that meet or exceed the 5,000 acres size criteria for roadless.

The Aldrich Semi-Primitive Non-Motorized Area (SPNM MA-10), approximately 4,951 acres in size, is an area with undeveloped character within the TFSR Project area. Aldrich Ridge Road currently runs between the Aldrich SPNM MA-10 and the Dry Cabin IRA. The Shake Table Fire Complex burned much of the Aldrich SPNM MA-10, within the TFSR Project area, with very high burn severity resulting in 96 to 100 percent mortality, leaving a strong visual impression on the landscape. Majority of the proposed salvage harvest in the Aldrich SPNM MA-10 under the Proposed Action would be done by helicopter logging, and only a small amount of salvage harvest by ground-based logging would occur. Effects to natural integrity and opportunity for solitude and primitive experience are as follows:

Salvage harvest activities would alter the natural integrity of the area in the short-term in Alternative 2 as salvage harvest would modify the recreation naturalness setting from naturally appearing to a slightly modified setting. The visual impact of ground-based logging removal includes skid trails which often create lines of exposed soils across the forest floor in the short-term. Only a small amount of ground-based logging, about 73 acres, is planned in the Aldrich SPNM MA-10. Effects of helicopter removal would be limited to stumps, but these would become less noticeable as understory vegetation re-establishes. Salvage harvest in Alternative 2 would not be naturally appearing in the Aldrich SPNM MA-10 in the short-term, especially in areas with ground-based removal, until shrubs, forbs and grasses re-establish and soften the effects of salvage. In Alternative 3, no salvage harvest is proposed in the Aldrich SPNM MA-10, therefore proposed activities would be naturally appearing in the Aldrich SPNM MA-10 and natural integrity would be similar to the existing condition.

The very high burn severity fire may have already affected the opportunities for solitude and primitive experience as the loss of crown cover, understory vegetative screening, and density may result in more evident sights and sounds of human activity from within the Aldrich SPNM MA 10. Remoteness would only be slightly more affected by harvest activities as the sights and sounds of humans may become slightly more evident with the removal of dead trees. The greatest effects on remoteness would occur in the short term during harvest activities with the increased sights and sounds of helicopters, people, and equipment in the area and would reduce once harvest activities are complete. Opportunities for solitude and primitive experience as a result of either action alternative would be similar to the existing condition. More discussion on natural integrity and opportunities for solitude can be found in the recreation and visuals resource sections of this document.

No new roads or temporary roads would be constructed into the Aldrich SPNM MA-10. The unroaded character of Aldrich SPNM MA-10 would not be changed under either the Proposed Action or Alternative #3.

3.14.9 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are salvaged after a large wildfire. There would be no irreversible commitment of resources from the Proposed Action or alternatives. The forested stands would regenerate over decades and return to natural conditions.

3.14.10 NATIONAL LANDMARKS

There are no National Landmarks in the project area. Therefore, no impacts would occur for any National Landmark.

3.14.11 MUNICIPAL WATERSHEDS

There are no municipal watersheds affected by the project; therefore there would be impacts on any municipal watersheds.

3.14.12 PARKLANDS

There are no lands within the proposed project area that would be characterized as parklands; therefore, there would be no impacts on any parklands.

3.14.13 PRIME FARMLANDS, RANGELANDS, AND FORESTLANDS

- Prime Farmland: The project area is not located in or adjacent to prime farmlands; therefore, there would be no impacts to Prime Farmlands.
- Prime Rangeland: The project does not contain prime rangeland because of soils and climate, and none of the proposed activities in the project would convert rangelands to other uses. Therefore, there would be no impacts on Prime Rangelands.

- Prime Forestland: The project would not convert forestlands to other uses. All lands designated as forested would be retained and managed as forested; therefore, there would be no negative impacts on Prime Forestland.

3.14.14 RELATIONSHIP OF SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

NEPA requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). As declared by the Congress, this includes using all practicable 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 present and future generations of Americans (NEPA Section 101).

This project would result in short-term impacts on various resources but would result in an economic return to the local economy from the dead and dying timber affected by the Shake Table Fire Complex. Over time the landscape would reforest and be reforested thru natural regeneration and the reforestation planting in each action alternative. There would not be any long-term impacts on the productivity of the lands affected.

3.14.15 RESEARCH NATURAL AREAS (RNA)

There are no research natural areas in the project area; however there is a Botanical Special Interest Area (Cedar Grove Botanical Area) that was affected by the Shake Table Fire Complex; however this botanical area would not be affected by this project and is excluded from any proposed treatments, including reforestation planting. The TSFR project would not impact any RNAs or the Cedar Grove Special Botanical Area.

3.14.16 SOCIAL GROUPS

The project would have no impacts on any social groups, including minorities, Native American Indians, women, or the civil liberties of any American citizen.

3.14.17 UNAVOIDABLE ADVERSE EFFECTS

There would be unavoidable short-term minor negative effects to air quality, soils, watershed, range, fisheries, wildlife, and recreation from the Proposed Action and all alternatives. As the landscape reforests with natural regeneration and planting, the effects to resources would be reduced or eliminated with several decades of time. See the Comparison of Alternatives tables at the end of Chapter 2 (Section 2.4) for a summary of effects.

3.14.18 WETLANDS (EXECUTIVE ORDER 11990)

There are no wetlands meeting this definition and therefore the project area would not impact any wetlands.

3.14.19 WILD AND SCENIC RIVERS

There are no lands designated or proposed for Wild and Scenic Rivers in the project area; therefore, the project would not impact any Wild and Scenic Rivers.

4 PREPARERS, CONSULTATION AND COORDINATION

4.1 PREPARERS AND CONTRIBUTORS

This section lists those individuals, agencies and cooperators that have contributed to this analysis.

INTERDISCIPLINARY (IDT) TEAM MEMBERS

Name	Role/Task	Agency
Larry Amell	Silviculture INFORMS	USDA-FS TEAMS Planning
Kim Conlee	Transportation	USDA-FS Malheur NF
Don Hann	Heritage Resources	USDA-FS Malheur NF
Nicole Hill	Recreation and Visuals	USDA-FS TEAMS Planning
John Jesenko	Logging Systems	USDA-FS TEAMS Planning
Larry Kent	Silviculture - Timber	USDA-FS TEAMS Planning
Greg Lind	IDT Team Leader	USDA-FS TEAMS Planning
Neil McCusker	Fuels	USDA-FS TEAMS Planning
Chris Miller	Economics - Social	USDA-FS TEAMS Planning
Janet Moser	Wildlife	USDA-FS TEAMS Planning
Eric Moser	Watershed - Soils	USDA-FS TEAMS Planning
John Natvig	Assistant IDT Team leader	USDA-FS TEAMS Planning
Lucretia Smith	GIS, Range, Weeds	USDA-FS TEAMS Planning
Tiffany Vanosdall	Fisheries	USDA-FS TEAMS Planning
Gene Yates	Rare Plants	USDA-FS Malheur NF
Rachel Young	Air Quality	USDA-FS TEAMS Planning

MALHEUR NF REVIEWERS AND OTHER TEAM MEMBERS

Name	Role/Task	Agency
Stan Benes	Forest Supervisor	USDA-FS Malheur NF
Bob Crisler	District Planner	USDA-FS Malheur NF
Ryan Falk	District NEPA Coordinator	USDA-FS Malheur NF
Tom Friedrichsen	Hydrology	USDA-FS Malheur NF
Chance Gowan	Fisheries	USDA-FS Malheur NF
Patricia L Hammett	Public Affairs	USDA-FS Malheur NF
Jennifer Harris	Recreation	USDA-FS Malheur NF
Jerry Hensley	Forest Logging Specialist	USDA-FS Malheur NF
Carole Holly	Forest NEPA Coordinator	USDA-FS Malheur NF
Elaine Kohrman	Economist	USDA-FS Malheur NF
Mark Lysne	Civil Engineer	USDA-FS Malheur NF
Rene Mabe	Range - Staff Officer	USDA-FS Malheur NF
Donna Mattson	Visuals	USDA-FS Malheur NF
Laura Mayer	Air Quality - Fuels	USDA-FS Malheur NF
Hersh McNeil	Soil Scientist	USDA-FS Malheur NF
Ken Schuetz	Wildlife Biologist – DecAID	USDA-FS Malheur NF
Brooks Smith	District Ranger	USDA-FS Malheur NF
Mike Tatum	Forest Silviculturist	USDA-FS Malheur NF
Ed Uebler	GIS Specialist - INFORMS	USDA-FS Malheur NF

4.2 CONSULTATON AND COORDINATION

The following federal, state, and local agencies, tribal governments, businesses, organizations, and individuals submitted comments during scoping on the Proposed Action. A complete mailing list for the scoping stage (141 addresses) is in the project files. Table 143 below summarizes the responses received to date.

Table 143. List of respondents to scoping letters, scoping letter corrections, NOIs and subsequent NOI corrections[1]

Letter #	Tribal government, Agency, Organization, Business, or Individual	Date
1.	Columbia Helicopters, Portland OR. 2 page email comments on Chrome and Thorn NOIs.	2006.12.07
2.	B. Sachau, Florham Park, NJ. 1 page email comment on Chrome EIS NOI	2006.12.08
3.	B. Sachau, Florham Park, NJ. 1 page email comment on Thorn EIS NOI	2006.12.08
4.	Finlayson, Steve & Stephanie. Burns, OR. Email with 1 page letter attachment.	2006.12.14
5.	Coulter, Karen. Blue Mt Biodiversity Project. Fossil OR. 3 page hand-written letter recd 12.18.2007	2006.12.18
6.	Columbia Helicopters, Portland OR. 2 page email comments on Thorn NOI	2006.12.19
7.	Prairie Wood Products. Prairie City, OR. 1 page letter	2006.12.27
8.	Malheur Lumber Company. John Day, OR. 1 page letter	2006.12.28
9.	Wood, Wendell. Chiloquin, OR. 1 page email comments	2007.01.08
10.	Baldwin, Mari. Eugene, OR. 1 page email comments	2007.01.09
11.	DeJoseph, Nicholas. Eugene, OR. 1 page email comments.	2007.01.09
12.	Guttormsen, Gary. Springfield, OR. 1 page email comments.	2007.01.09
13.	Kimbrough, Oscar. Eugene, OR 1 page email comments.	2007.01.09
14.	Tracie Post. El Cajon, CA. 1 page email comments.	2007.01.09
15.	Stennett, Dale. John Day, OR. 1 page hand-written comments	2007.01.09
16.	Toop, Bill. Mt. Vernon, OR. 3 page hand-written comments with illustrations.	2007.01.09
17.	Grant County Conservationists, Driskill, Linda. John Day, OR. 1 pg email cover dated 2007.01.10 with attachment 3-page letter dated 2007.01.11	2007.01.10
18.	Weidman, Katie. Eugene, OR 1 page email comments.	2007.01.10
19.	Confederated Tribes of the Warm Springs Reservation of Oregon. Warm Springs, Or. 3-page letter signed by Scott Turo, Habitat Biologist.	2007.01.12
20.	Oregon Dept Fish and Wildlife, John Day Watershed Office. John Day. OR. 2 page letter signed by Kevin Blakley, Watershed District Manager.	2007.01.12
21.	Oregon Wild. Eugene OR. 1 pg email cover and 10-page attachment letter. Letter signed by Chandra LeGue, Healthy Forests Advocate, Western Field Office. Eugene. OR.	2007.01.12
22.	Sierra Club-Oregon Chapter. Sisters, OR. 10-page letter signed by Asante Riverwind, Eastern Oregon Forest Organizer, and (signed for) Karen Coulter, League of Wilderness Defenders-Blue Mt Biodiversity Project, Fossil, OR.	2007.01.13
23.	Koenig, John. Eugene, OR . 1 page email comments	2007.01.14
24.	Becker, Dan. Prairie City, OR. 2 page attachment letter to email	2007.01.16
25.	Cascadia Wildlands Project, Eugene OR. 2-page letter attachment to email, signed by Daniel Kruse, Attorney, Legal Director, Cascadia Wildlands Project. Eugene, OR	2007.01.16
26.	Defenders of Wildlife, West Linn, OR. 4 page email letter signed by Rick Brown, Senior Resource Specialist, Defenders of Wildlife, Northwest Office, West Linn, Oregon	2007.01.16
27.	Derby, Kendall. Owner, IN THE STICKS, Portable Sawmill. Dayville, Oregon. Email and 2-pg attachment letter.	2007.01.16
28.	EPA, Region 10, Seattle, WA. 9-pg letter signed by Michael W. Letourneau, Environmental Scientist.	2007.01.16
29.	Rojas, Jessica. Portland, OR. 1-pg email comments	2007.01.16
30.	Schenkel, Abigail. Corvallis, OR. 1-pg email comments	2007.01.16
31.	The Nature Conservancy in Oregon. Bates, OR. 2-pg letter signed by Jeff Fields, Stewardship Ecologist. John Day, OR office.	2007.01.16

4.3 DISTRIBUTION OF THE ENVIRONMENTAL IMPACT STATEMENT

This draft environmental impact statement (DEIS) has been distributed to individuals who specifically requested a copy of the document and those who submitted comments in response to scoping. In addition, copies have been sent to federal agencies, federally recognized tribes, state and local governments. A complete mailing list is in the project files.

This page left intentionally blank

5 LISTS

5.1 GLOSSARY

ACRONYMS

AMP Allotment Management Plan
APE Area of Potential Effect
ARPA Archaeological Resources Protection Act
ASQ Allowable Sale Quantity
ATP Area to Protect
ATV All Terrain Vehicle
BA Biological Assessment
BE Biological Evaluation
BAER Burned Area Emergency Response
BBS Breeding Bird Survey
BMP Best Management Practice
BO Biological Opinion
CAA Clean Air Act
CEQ Council on Environmental Quality
CFR Code of Federal Regulations
CWD Coarse Woody Debris
CWM Coarse Woody Material
CY Calendar year
DBH Diameter Breast Height
DecAID Decayed Wood Advisor Tool
DEIS Draft Environmental Impact Statement
DEQ Department of Environmental Quality
DOG Dedicated Old Growth
DFC Desired Future Condition
EA Environmental Analysis
EIS Environmental Impact Statement
EPA Environmental Protection Agency
ESA Endangered Species Act
ESD Emergency Situation Declaration
FEIS Final Environmental Impact Statement
FMP Fire Management Plan
FP Forest Plan
FR Forest Road
FS Forest Service
FSH Forest Service Handbook
FSM Forest Service Manual
FSR Forest Service Road
FVS Forest Vegetation Simulator
FY Fiscal Year
GIS Geographic Information System
GMU Game Management Unit
HEI Habitat Effectiveness Index
HRV Historic Range of Variability
HUC Hydrologic Unit Code
IDT Interdisciplinary Team
IRA Inventoried Roadless Area
KV Knutson Vandenberg Act
LAU Lynx Analysis Unit
LRMP Land and Resource Management Plan
LWD Large Woody Debris (in streams)
MA Management Area
MBF Thousand Board Feet
MIS Management Indicator Species
MMBF Million Board Feet
MO Management Objectives
MOU Memorandum of Understanding
NAAQS National Ambient Air Quality Standards
NEPA National Environmental Policy Act
NF National Forest
NFMA National Forest Management Act
NFS National Forest System
NHPA National Historic Preservation Act
NMFS National Marine Fisheries Service
NOI Notice of Intent
NRCS Natural Resource Conservation Service
NRHP National Register of Historic Places
NTMB Neotropical Migratory Birds
ODF Oregon Dept. of Forestry
ODFW Oregon Dept. of Fish and Wildlife
OED Oregon Employment Department
OG Old Growth
OML Operational Maintenance Level
ORV Off Road Vehicle
OSMP Oregon Smoke Management Plan
PA Proposed Action
PAG Plant Association Group
PDF Project Design Feature
PFA Post-Fledging Area
PM Particulate Matter
PNV Present Net Value

PVG Potential Vegetation Group
PWFA Pileated Woodpecker Feeding Areas
RD Ranger District
RHCA Riparian Habitat Conservation Area
RMO Riparian Management Objective
ROD Record of Decision (for an FEIS)
ROG Replacement Old Growth
ROS Recreation Opportunity Spectrum
RNA Research Natural Area
ROD Record of Decision
S&G Standard and Guideline
SHPO State Historic Preservation Office
SPNM Semi-primitive Nonmotorized
SRI Soil Resource Inventory
TES Threatened, Endangered or Sensitive
TFSR Thorn Fire Salvage Recovery (project)
TMDL Total Maximum Daily Load
USDA United States Dept. of Agriculture
USDI United States Dept. of Interior
USFS United States Forest Service
USFWS US Fish and Wildlife Service
VQO Visual Quality Objective
WEPP Water Erosion Prediction Program
WMA Wildlife Management Area
WUI Wildland Urban Interface

DEFINITIONS

A

Activity fuels – Fuels generated or altered by a management activity.
Adfluvial individuals – are those fish species which emigrate as juveniles from spawning tributaries, maturing and overwintering in lakes and reservoirs.
Advisory Council on Historic Preservation (ACHP) — An independent Federal agency that provides a forum for influencing Federal activities, programs, and policies as they affect historic resources.
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.
Analysis Area – A delineated area of land subject to analysis of (1) responses to proposed management practices in the production, enhancement, or maintenance of forest an rangeland outputs and environmental quality objectives; and (2) economic and social impacts.
Area of Potential Effect (APE) — An Area of Potential Effect is the area that contains cultural resources that may reasonably be expected to be impacted by an undertaking.
Aspect - The direction a surface faces. A hillside facing east has an eastern aspect.
Allowable Sale Quantity (ASQ) - 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

Bankfull 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, which 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 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.
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 Evaluation (BE) - A document prepared by the Forest Service to disclose impacts to FS Regional Foresters Sensitive Species.
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.
Cavity - A hole in a tree often used by wildlife species, usually birds, for nesting, roosting, and reproduction.
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).
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.
Closure — A road management term indicating the road cannot be used by motorized traffic. This limitation can be accomplished by regulation, barricade, or blockage devices. The road can be available for emergency use or permitted use, such as firewood cutting, during dry periods.
Coarse Woody Debris (CWD) — Pieces of woody material derived from tree limbs, boles, and roots in various stages of decay, generally having a diameter of at least three inches and a length greater than three feet.
Code of Federal Regulations (CFR) - A codification of the general and permanent rules published in the Federal Register by the Executive departments and agencies of the federal government.
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, and decreases 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.
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.
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.
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

Danger Tree – A danger 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.
Density (stand) — The number of trees growing in a given area; usually expressed in terms of trees per acre.
Desired future condition - A vision of the long-term conditions of the land.
Detrimental soil impacts - Soil erosion, displacement, compaction, puddling, or burning that exceeds certain thresholds. For instance, displacement is a detrimental soil impact only if more than 50% of the topsoil or humus-enriched A-horizon is removed from an area of 100 square feet or more, which is at least 5 feet in width. A Forest Plan standard limits the amount of detrimental soil impacts to 20% of an activity area.
Diameter at Breast Height (DBH) - The diameter of a tree 4 1/2 feet above the ground measured on the uphill side of the tree.
Direct effects – Impacts on the environment that is caused by the action and occurs at the same time and place.
Disturbance - Any event, such as flood, wildfire, insect infestations, or timber harvest, which 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.
Downed wood — A tree or part of a tree that is dead and laying on the ground.
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 Forester'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.
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.
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."
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.
Equivalent Treatment Acres (ETA) –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.
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.
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 regime – 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.
Flame Length - The visible measurable indicator of fireline intensity. It is the length of a flame at the flaming front of a fire.
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.
Fluvial individuals – are those which emigrate as juveniles from spawning tributaries, maturing and overwintering in large rivers.
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 (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.
Fuel Model - The combination of live and dead fuel loadings and arrangement that is used in conjunction with weather and topography inputs to model the fire behavior of a surface fire.
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.
Graminoid - Grass like plants such as grasses and sedges.
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.
Hard Snag – A snag composed primarily of sound wood, particularly sound sapwood that is generally unmerchantable.
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.
Historic site — A type of cultural resource associated with the historic-era that may possess archaeological values; or may be valued in light of its ability to convey its association with important historic events, people, or architectural/engineering techniques. Historic sites usually must be 50 years of age or more.
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.
Hydrophobic Soil - Soil that does not readily absorb water. Hydrophobic soil is highly erodible. It is sometimes formed during sever fire on coarse textured soils. Hydrophobic soil usually returns to a nonhydrophobic condition after one or two winters.

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.
INFISH — Interim Inland Native Fish Strategy for the Intermountain, Northern, and Pacific Northwest Regions (Forest Service).
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.
Large downed wood — Logs on the forest floor with a large end diameter of at least 21 inches.

Large woody debris (LWD) — Pieces of wood that are of a large enough size to affect stream channel morphology.
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.
Management direction — A statement of goals and objectives, management prescriptions, and associated standards and guidelines for attaining them.
Management Indicator Species (MIS) - 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").
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..
MBF - Thousand Board Feet (see board foot).
Merchantable timber - Timber that can be bought or sold.
Middleground – A term used in visual management to describe the portions of a view extending from the foreground zone out to 3 to 5 miles from the observer.
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

National Environmental Policy Act (NEPA) - 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.
National Forest Management Act (NFMA) - A law passed in 1976 requiring the preparation of Regional Guides and Forest Plans and regulations to guide that development.
National Register of Historic Places (NRHP) - A list of significant cultural resources that is maintained by the National Park Service. A “significant” site is a site that has been evaluated as eligible for inclusion to the National Register of Historic Places, or its eligibility status is

undetermined.

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.

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 do 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. For all National Forests in the Pacific Northwest Region, an old growth stand is defined as any stand of trees 10 acres or greater generally containing the following characteristics:

> a. Stands contain mature and over-mature trees in the overstory and are well into the mature growth stage (see Handbook of Terminology, Society of American Foresters
> b. Stands would usually contain a multi-layered canopy and trees of several age classes.
> c. Standing dead trees and down material are present.
> d. Evidence of human activities may be present but may not significantly alter the other characteristics and would be a subordinate factor in a description of such a stand..

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.

Precommercial 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.
Proposed Action - A proposal by a federal agency to authorize, recommend, or implement an action.
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.
Recreation Opportunity Spectrum (ROS) — The Forest Service developed the Recreation Opportunity Spectrum (ROS) system to help identify, quantify, and describe the variety of recreational settings available in National Forests. The ROS system provides a framework for planning and managing recreation resources. The ROS settings are classified on a scale ranging from primitive to urban. Seven elements are used to determine where the setting belongs on the scale: •

Visual Quality – the degree of apparent modification of the natural landscape.
• **Access** – the mode by which activities are pursued and how well users can travel to or within the setting.
• **Remoteness** – the extent to which individuals perceive themselves removed from the sight and sounds of human activity.
• **Visitor Management -** the degree and appropriateness of how visitor actions are managed and serviced.
• **On-Site Recreation Development -** the degree and appropriateness of recreation facilities provided within the setting.
• **Social Encounters -** the degree of solitude or social opportunities provided.
• **Visitor Impacts -** the degree of impact on both the attributes of the setting and other visitors within the setting.
• Based on the seven elements, the Forest Service assigns one of six ROS settings zones to all Forest Service land; four of these apply to the project area.
• **Roaded Modified:** A natural environment substantially modified, particularly by vegetation and landform alterations. There is strong evidence of roads and /or highways. Frequency of contact is low to moderate.
• **Roaded Natural:** A natural-appearing environment with moderate evidence of the sights and sounds of humans. Such evidence usually harmonizes with the natural environment. Interaction between users may be moderate to high with evidence of other users prevalent. Motorized use is allowed.
• **Semiprimitive Nonmotorized:** A natural or natural-appearing environment of moderate to large size. Concentration of users is low, but there is often evidence of other users. Use of

local roads for recreational purposes is not allowed.
• **Semiprimitive Motorized:** A natural or natural-appearing environment of moderate to large size. Interaction between users is low, but there is often evidence of other users. The opportunity exists to use motorized equipment.

Recreation Visitor Day (RVD) — One visitor day equals 12 hours (one person for 12 hours, or 12 people for 1 hour, or any combination thereof).
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 and other body of water and the adjacent upland; includes wetlands and those portions of floodplains and valley bottoms that support riparian vegetation.
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.
Riparian Habitat Conservation Area (RHCA) – Portions of watershed where riparian-dependent resources receive primary emphasis, and management activities are subject to specific standards and guidelines. RHCAs 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 Management Objectives (RMO) – Quantifiable measures of stream and stream-side conditions that define good anadromous fish habitat, and serve as indicators against which attainment, or progress toward attainment, of the goals will be measured.
Road Density – The measure of the degree to which the length of road miles occupies a given land area.
Roaded Modified — A natural environment substantially modified, particularly by vegetation and landform alterations. There is strong evidence of roads and /or highways. Frequency of contact is low to moderate.
Roaded Natural — A natural-appearing environment with moderate evidence of the sights and sounds of humans. Such evidence usually harmonizes with the natural environment. Interaction between users may be moderate to high, with evidence of other users prevalent. Motorized use is allowed.
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". 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.

Satisfactory cover – A stand of coniferous trees 40 or more feet tall with an average canopy closure equal to or more than 70 percent. Malheur Forest Plan defines it as cover used by animals to ameliorate the effect of weather.

Scenery Management System – Management guidelines based on the premise that land management activities (including construction of facilities) should not contrast with the existing natural appearing landscape. Within a framework of regional landscape, character types, form, line, color, and texture should be used to make activities and structures "fit" within landscapes.

Scenic Integrity Objectives (SIOs) – The degree of direct human-caused deviations in the landscape, such as road construction, timber harvesting, or activity debris. Indirect deviations, such as landscape created by human suppression of the natural role of fire, are not included. The level to which an area meets its SIOs is indicated by the ratings Very High, High, Moderate, Low, Very Low, or Unacceptably Low.

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.

Semiprimitive Motorized — A natural or natural-appearing environment of moderate to large size. Interaction between users is low, but there is often evidence of other users. The opportunity exists to use motorized equipment.

Semiprimitive Nonmotorized — A natural or natural-appearing environment of moderate to large size. Concentration of users is low, but there is often evidence of other users. Use of local roads for recreational purposes is not allowed.

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, usually larger than five feet tall and larger than six inches in diameter at breast height. Snags are important as habitat for a variety of wildlife species and their prey.
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.
State Historic Preservation Office (SHPO) - The agency that represents the interests of the state in historic preservation and cultural resources. Federal land managers are required by the National Historic Preservation Act of 1966, to consult with the SHPO during land management planning.
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.
Structural stage — A stage of development of a vegetation community that is classified on the dominant processes of growth, development, competition, and mortality. See Stand Structure
Subwatershed — A drainage area of approximately 20,000 acres, equivalent to a 6th-field Hydrologic Unit Code (HUC). Hierarchically, subwatersheds (6th-field HUC) are contained within a watershed (5thfield HUC), which in turn is contained within a subbasin (4th-field HUC).

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.
Unroaded area — Portion of the National Forest System that does not contain classified roads (see Road) that is of sufficient size and configuration that the inherent values associated with an unroaded condition can be protected. Unroaded areas do not overlap with inventoried roadless areas.
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. A desired level of management based on physical and sociological characteristics of an area. Refers to the degree of acceptable alteration of the characteristic landscape.

- **Preservation**—Allows only ecological changes. Management activities, except for very low visual impact recreation facilities, are prohibited. This objective applies to specially classified areas, including wilderness.
- **Retention**—Provides for management activities that are not visually evident. Management activities are permitted, but the results of those activities on the natural landscape must not be evident to the average viewer.
- **Partial Retention**—Management activities may be evident to the viewer but must remain visually subordinate to the surrounding landscape.
- **Modification**—Management activities may visually dominate the natural surrounding landscape but must borrow from naturally established form, line, color, and texture.
- **Maximum Modification**—Land management activities can dominate the natural landscape to greater extent than in the modification objective, except as viewed from background when visual characteristics must be those of natural

W

Water yield - The runoff from a watershed including groundwater outflow.
Watershed - (1) The region draining into a river, river system, or body of water. (2) A watershed also refers specifically to a drainage area of approximately 50,000 to 100,000 acres, which is equivalent to a 5th-field Hydrologic Unit Code (HUC). Hierarchically, subwatersheds (6th-field HUC) are contained within a watershed (5th-field HUC), which in turn is contained within a subbasin (4th-field HUC).
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.

5.2 REFERENCES

5.2.1 TIMBER / SILVICULTURE

Agee, J.K. 1993. Fire ecology of Pacific Northwest forests. Washington, DC: Island Press. 493 p.

American Lands Alliance. 2005. After the fires: do no harm in America's forests; a report on the impacts of logging on forest recovery. Washington, DC: American Lands Alliance. 23 p.

Andrews, P.L.; Bevins, C.D. 1999. BEHAVE fire modeling system: redesign and expansion. Fire Management Notes. 59(2): 16-19.

Beschta, R.L.; Frissell, C.A.; Gresswell, R.; Hauer, R.; Karr, J.R.; Minshall, G.W.; Perry, D.A.; Rhodes, J.J. 1995. Wildfire and salvage logging: recommendations for ecologically sound post-fire salvage logging and other post-fire treatments on federal lands in the west. Unpublished Report. [Place of publication unknown]: [Publisher unknown]. 15 p.

Beschta, R.L.; Rhodes, J.J.; Kauffman, J.B.; Gresswell, R.E.; Minshall, G.W.; Karr, J.R.; Perry, D.A.; Hauer, F.R.; Frissell, C.A. 2004. Postfire management on forested public lands of the western United States. Conservation Biology. 18(4): 957-967.

Bevins, C.D. 1980. Estimating survival and salvage potential of fire-scarred Douglas-fir. Research Note INT-287. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 8 p.

Brown J 2000 Brown, James K.; Smith, Jane Kapler, eds. 2000. Wildland fire in ecosystems:effects of fire on flora. Gen.Tech. Rep. RMRS-GTR-42-vol. 2. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 257 p.

Brown, Richard T., Agee, James K., Franklin, Jerry F. Forest Restoration and Fire: Principles in the Context of Place. Conservation Biology.

DellaSala, D.A.; Nagle, G.; Karr, J.R.; Fairbanks, R.; Odion, D.; Williams, J.E.; Frissell, C.; Ingalsbee, T. 2006. The facts and myths of post-fire management: a case study of the Biscuit Fire, southwest Oregon. Unpublished Report. Ashland, OR: World Wildlife Fund, Klamath-Siskiyou Program. 31 p

Devlin, R.J. 1998a (August 27). Screens review, Colville NF; file designation 2430/2600 memorandum to Forest Supervisors, Eastside Forests. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region. 5 p. On file with: Umatilla National Forest, 2517 SW Hailey Avenue, Pendleton, OR 97801.

Devlin, R.J. 1998b (September 10). Screens review, Winema and Fremont NF's; file designation 2430/2600 memorandum to Forest Supervisors, Eastside Forests. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region. 5 p. On file with: Umatilla National Forest, 2517 SW Hailey Avenue, Pendleton, OR 97801.

Donato, D.C.; Fontaine, J.B.; Campbell, J.L.; Robinson, W.D.; Kauffman, J.B.; Law, B.E. 2006a. Post-wildfire logging hinders regeneration and increases fire risk. Science. 311(5759): 352.

Donato, D.C.; Fontaine, J.B.; Campbell, J.L.; Robinson, W.D.; Kauffman, J.B.; Law, B.E. 2006b. Supporting online material for post-wildfire logging hinders regeneration and increases fire risk. Science. 311(5759).

Everett, R. 1995 (August 17). Review of recommendations for post-fire management; file designation 4410-1-2 memorandum to Regional Forester, R-6. Wenatchee, WA: Pacific Northwest Research Station, Wenatchee Forestry Sciences Laboratory. 19 p. On file with: Umatilla National Forest, 2517 SW Hailey Avenue, Pendleton, OR 97801. http://inr.oregonstate.edu/download/beschta_review_1995.pdf (accessed February 2006)

File code 1920: Establishment of a potential vegetation hierarchy for forest planning July 18, 2002. Malheur, Umatilla and Wallowa-Whitman National Forests

Filip, Gregory M.; Schmitt, Craig L.; Scott, Donald W.; Fitzgerald, Stephen A. Understanding and Defining Mortality in Western Conifer Forests,Western Journal of Applied Forestry, Volume 22, Number 2, April 2007, pp. 105-115(11)

Fowler, James F.; Sieg, Carolyn Hull. 2004. Postfire mortality of ponderosa pine and Douglas-fir: a review of methods to predict tree death. Gen. Tech. Rep. RMRS-GTR-132. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 25 p.

Goodman, 2002 Regional Forester Letter, “Reforestation Requirements Following Salvage Sales”, File Code 2470/2430, USDA Forest Service, Pacific Northwest Region, Nov. 19, 2002

Goodman, L. 2005 (July 1). Defining conifer mortality; file designation 2400 memorandum to Forest Supervisors. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region. 1 p. On file with: Umatilla National Forest, 2517 SW Hailey Avenue, Pendleton, OR 97801.

http://www.americanlands.org/documents/1130855803_AftertheFiresFinalEmail.pdf (accessed February 2007)

Jimenez, D. 2004. Development and implementation of a system for the prediction of fire-induced tree mortality. Final Report of Joint Fire Sciences Program Project 00-1-1-06. Missoula, MT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. 27 p (+ appendix).

Johnson, C.G. and R.R. Clausnitzer, “Plant Associations of the Blue and Ochoco Mountains”, R6-ERW-TP-036-92, USDA Forest Service, Pacific Northwest Region, 1992. Available in hard copy from the Supervisors Office, Wallowa-Whitman National Forest.

Lindenmayer, D.B.; Foster, D.R.; Franklin, J.F.; Hunter, M.L.; Noss, R.F.; Schmiegelow, F.A.; Perry, D. 2004. Salvage harvesting policies after natural disturbance. Science. 303(27 February): 1303.

McHugh, C.W.; Kolb, T.E. 2003. Ponderosa pine mortality following fire in northern Arizona. International Journal of Wildland Fire. 12: 7-22.

McIver, J.; Starr, L. 2001b. Restoration of degraded lands in the interior Columbia River basin: passive vs. active approaches. Forest Ecology and Management. 153(1-3): 15-28.

McIver, J.D.; Starr, L. 2000. Environmental effects of postfire logging: literature review and annotated bibliography. General Technical Report PNW-GTR-486. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 72 p.

McIver, J.D.; Starr, L. 2001a. A literature review on the environmental effects of postfire logging. Western Journal of Applied Forestry. 16(4): 159-168.

Noss, Reed F. Franklin, Jerry F., Baker, William L., Schoennagel, Tania, and Moyle, Peter B. Ecology andManagement of Fire-prone Forests of the Western United States. Society for Conservation Biology, Arlington VA, August 2006

Peterson, D.L.; Arbaugh, M.J. 1986. Postfire survival in Douglas-fir and lodgepole pine: comparing the effects of crown and bole damage. Canadian Journal of Forest Research. 16: 1175-1179.

Peterson, D.L.; Ryan, K.C. 1986. Modeling postfire mortality for long-range planning. Environmental Management. 10: 797-808

Quigley, T.M.; Haynes, R.W.; Graham, R.T. 1996. Integrated scientific assessment for ecosystem management in the interior Columbia basin. General Technical Report PNW-GTR-382. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 303 p

Reinhardt, E.D.; Keane, R.E.; Brown, J.K. 1997. First order fire effects model: FOFEM 4.0, user’s guide. General Technical Report INT-GTR-344. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 65 p.

Reinhardt, E.D.; Keane, R.E.; Brown, J.K. 1997. First order fire effects model: FOFEM 4.0, user’s guide. General Technical Report INT-GTR-344. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 65 p.

Reinhardt, E.D.; Keane, R.E.; Brown, J.K. 2001. Modeling fire effects. International Journal of Wildland Fire. 10: 373-380.

Ryan, K.C. 2000. Effects of fire injury on water relations of ponderosa pine. Tall Timbers Fire Ecology Conference Proceedings. 21: 58-66.

Ryan, K.C.; Frandsen, W.H. 1991. Basal injury from smoldering fires in mature Pinus ponderosa Laws. International Journal of Wildland Fire. 1(2): 107-118.

Ryan, K.C.; Reinhardt, E.D. 1988. Predicting postfire mortality of seven western conifers. Canadian Journal of Forest Research. 18: 1291-1297

Ryan, K.C.; Reinhardt, E.D. 1988. Predicting postfire mortality of seven western conifers. Canadian Journal of Forest Research. 18: 1291-1297.

Scott, 2007 personal communication (email)

Scott, D.W.; Schmitt, C.L.; Spiegel, L.H. 2002. Factors affecting survival of fire injured trees: a rating system for determining relative probability of survival of conifers in the Blue and Wallowa mountains. BMPMSC-03-01. La Grande, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, Wallowa-Whitman National Forest, Blue Mountains Pest Management Service Center. 66 p. as amended.

Scott, D.W.; Schmitt, C.L.; Spiegel, L.H. 2002. Factors affecting survival of fire injured trees: a rating system for determining relative probability of survival of conifers in the Blue and Wallowa mountains. BMPMSC-03-01. La Grande, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, Wallowa-Whitman National Forest, Blue Mountains Pest Management Service Center. 66 p.

Scott, D.W.; Schmitt, C.L.; Spiegel, L.H. 2003. Factors affecting survival of fire injured trees: a rating system for determining relative probability of survival of conifers in the Blue and Wallowa mountains; amendment 1. BMPMSC-03-01. La Grande, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, Wallowa-Whitman National Forest, Blue Mountains Pest Management Service Center. 6 p.

Stephens, S.L.; Finney, M.A. 2002. Prescribed fire mortality of Sierra Nevada mixed conifer tree species: effects of crown damage and forest floor consumption. Forest Ecology and Management. 162(2-3): 261-271.

Stephens, S.L.; Finney, M.A. 2002. Prescribed fire mortality of Sierra Nevada mixed conifer tree species: effects of crown damage and forest floor consumption. Forest Ecology and Management. 162(2-3): 261-271

Stratton, R.D. 2004. Assessing the effectiveness of landscape fuel treatments on fire growth and behavior. Journal of Forestry. 102(7): 32-40.

Thies, W.G.; Westlind, D.J.; Loewen, M.; Brenner, G. 2006. Prediction of delayed mortality of fire-damaged ponderosa pine following prescribed fires in eastern Oregon, USA. International Journal of Wildland Fire. 15(1): 19-29.

Thies, W.G.; Westlind, D.J.; Loewen, M.; Brenner, G. 2006. Prediction of delayed mortality of fire-damaged ponderosa pine following prescribed fires in eastern Oregon, USA. International Journal of Wildland Fire. 15(1): 19-29.

U.S. Department of Agriculture, Forest Service. 2005. Briefing paper: USDA Forest Service response to American Lands Alliance position paper: “logging after fires.” Washington, DC: U.S. Department of Agriculture, Forest Service, Washington Office. 5 p.

USDA 1998 file code 2430/2600 Historical percentages for use with HRV analysis

USDA, 1965: Agriculture handbook 271: Silvics of Forest Trees of the United States. Also see: http://www.na.fs.fed.us/spfo/pubs/silvics_manual/table_of_contents.htm

Waring, R.H.; Cleary, B.D. 1967. Plant moisture stress: evaluation by pressure bomb. Science. 155: 1248-1254.

Waring, R.H.; Running, S.W. 1978. Sapwood water storage: its contribution to transpiration and effect upon water conductance through the stems of old-growth Douglas-fir. Plant, Cell and Environment. 1: 131-140.

5.2.2 FUELS

Agee, J.K. 1993. Fire ecology of Pacific Northwest Forests. Island Press, Washington D.C.

Agee, J.K. 1996. Fire in the Blue Mountains: a history, ecology, and research agenda. In: Jaindl, R.G.; Quigley, T.M., editors. Search for a solution: sustaining the land, people, and economy of the Blue Mountains. Washington, DC: American Forests: 119-145.

Agee, J.K. 1998. The landscape ecology of western forest fire regimes. Northwest Science. 72 (special issue): 24-34.

Andrews, Patricia L. 1986. BEHAVE: Fire behavior prediction and fuel modeling system BURN Subsystem, Part I. Gen. Tech. Rep.INT-194. Ogden, UT: U.S. Department of Agriculture, ForestService, Intermountain Forest and Range Experiment Station.130 p.

Brown, J.K. 1995. Fire regime and their relevance to ecosystem management. Pages 171-178 in Proceeding of Society of American Foresters National Convention, September 18-22, 1994, Anchorage, Alaska. Society of American Foresters, Washington, D.C.

Brown, J.K.; Reinhardt, E.D.; Kramer, K.A. 2003. Coarse woody debris: managing benefits and fire hazard in the recovering forest. General Technical Report RMRS-GTR-105. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 16 p.

Finney, Mark A. 1998. FARSITE: Fire Area Simulator model development and evaluation. Res. Pap. RMRS-RP-4. Ogden, UT:U.S. Department of Agriculture, Forest Service, RockyMountainResearch Station. 47 p.

Glickman, Dan, and Bruce Babbitt. 2000. Managing the impact of wildfires on communities and the environment. A report to the President in response to the wildfires of 2000. USDA and USDI.

Graham, Russell T.; McCaffrey, Sara; Jain, Theresa B. 2004. Science basis for changing forest structure to modify wildfire behavior and severity. RMRS-GTR-120. Missoula, Montana: USDA, Forest Service, Rocky Mountain Research Station. 41 p.

Hann, W.J.; Bunnell, D.L.2001 Fire and land management planning and implementation across multiple scales. Int. J. Wildland Fire. 10:389-403.

Hardy, Colin C.; Schimdt, Kirsten M.; et al. 2001. Spatial Data for national fire planning and fuel management. Int. J. Wildland Fire. 10 (3&4):353-372.

Laverty, L., J. Williams. 2000. Protecting People and Sustaining Resources in Fire-Adapted Ecosystems, A Cohesive Strategy. The Forest Service Management Response to the General Accounting Ofice Report GAO/RCED-99-65.

McIver, J.D; Ottmar, R. 2006. Fuel mass and stand structure after post-fire logging of a severely burned ponderosa pine forest in northeastern Oregon. Forest Ecology and Management. 238 (2007): 268-279.

National Fire Plan. 2001. A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment 10-year Comprehensive Strategy.

National Fire Plan. 2002. A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment 10-year Comprehensive Strategy Implementation Plan.

Reinhardt, Elizabeth; Crookston, Nicholas L. (Technical Editors). 2003. The Fire and Fuels Extension to the Forest Vegetation Simulator. Gen. Tech. Rep. RMRS-GTR-116. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 209 p.

Rothermel, Richard C. 1983. How to predict the spread and intensity of forest and range fires. Gen. Tech. Rep. INT-143. Ogden,UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 161 p.

Scott, Joe H.; Reinhardt, Elizabeth D. 2001. Assessing crown fire potential by linking models of surface and crown fire behavior. Research Paper RMRS-RP-29. Fort Collins, CO:U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 59 p.

Schmidt, K. M.; Menakis, J.P. et al. 2002. Development of Coarse Scale Spatial Data for Wildland Fire and Fuel Management. USDA Forest Service. RMRS-GTR 87. 41 p.

U.S. Department of Agriculture, Forest Service, Region Five. 1976. Resistance to control calculation matrix. USDA Forest Service Manual, Region Five Supplement 5151. 14-2.

U.S. Department of Agriculture, Forest Service. 1990. Malheur National Forest Land and Resource Management Plan. John Day, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, Malheur National Forest.

U.S. Department of Agriculture, Forest Service. 2002. Establishment of a potential vegetation hierarchy for forest planning. Unpublished Report. John Day, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, Malheur, Umatilla, and Wallowa-Whitman National Forests. 21 p.

U.S. Department of Agriculture, Forest Service. 200?. Fire Management Plan Malheur National Unpublished Report. John Day, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, Malheur National Forest.

5.2.3 AIR QUALITY

Dzomba, Thomas; Story, Mark. 2005. Smoke NEPA Guidance: Air Resource Smoke Impacts from Prescribed Fire on National Forests & Grasslands of Montana, Idaho, North Dakota, & South Dakota in Regions 1 & 4. November.

U.S. Environmental Protection Agency. 1998. Interim air quality policy on wildfire and prescribed fires. Final report. U.S. Environmental Policy Agency.

U.S. Environmental Protection Agency. 1999. Regional Haze Regulations, Final Rule, 40 CFR Part 51.

5.2.4 SOILS / WATERSHED

Beschta, R.L. 1978. Long-Term Pattern of Sediment Production Following Road Construction and Logging in the Oregon Coast Range. Water Resources Research, Vol. 14, No. 6 Pages 1011-1016.

Beschta, R.L., M.R. Pyles, A.E. Skaugset and C.G. Surfleet. 2000. Peakflow Responses to Forest Practices in the Western Cascades of Oregon. Journal of Hydrology, Vol 233, Pages 102-120.

Biswell, H. H. 1989. Prescribed Burning in California Wildlands Vegetation Management. University of California, Berkeley Press. 255p.

Brown, J. K., Elizabeth D. Reinhard, and Kylie K. Kramer. 2003. Coarse Woody Debris: Managing Benefits and Fire Hazard in the Recovering Forest. General Technical Report RMRS-GTR-105. U.S. Forest Service Rocky Mountain Research Station.

Castelle, A.J., A.W. Johnson, and C. Conolly. 1994. Wetland and Stream Buffer Size Requirements—A Review. Journal of Environmental Quality. Volume 23, pp 878-882.

Conlee, K. Personal communication, March 1, 2007. Malheur National Forest.

Dietrich, R.V., and B.J. Skinner. 1979. Rocks and Rock Minerals. John Wiley and Sons. 319 p.

Gamble, B. 2002. Prairie City Ranger District FY 2001 Harvest Activity BMP Monitoring Report. Unpublished report. Malheur National Forest.

Hershfield, D.M. 1961. Rainfall Frequency Atlas of the United States for Durations from 30 Minutes to 24 Hours and Return periods from 1 to 100 years. Technical Paper No.40. Washington D.C. U.S. Department of Commerce, Weather Bureau.

Hewlett, J.D., and W.L. Nutter. 1970. The Varying Source Area of Streamflow on Upland Basins. Proceedings of the Symposium on Interdisciplinary Aspects of Watershed Management, ACSE, New York, pp. 65-83.

Huffman, E. 2006. Burned Area Emergency Response; Hydrology and Watershed Report, Shake Table Complex, Oregon. Malheur National Forest.

Hurlbut, C.S. and C. Klein. 1977. Manual of Mineralogy 19th ed. John Wiley and Sons. 532 p.

Jones, J.A. and G.E. Grant. 1996. Peak Flow Responses to Clear-Cutting and Roads in Small and Large Basins, Western Cascades, Oregon. Water Rersources Research, Vol. 32, No. 4, Pages 959-974.

Jones, J.A. 2000. Hydrological Processes and peak Discharge Response to Forest Removal, Regrowth, and Roads in 10 Small Experimental Basin, Western Cascades, Oregon. Water Resources Research, Vol 36, No. 9, Pages 2621-2642.

Julien, P.Y. 2002. River Mechanics. Cambridge University Press. 434 p.

Keppeler, E.T. and R.R. Ziemer. 1990. Logging Effects on Streamflow: WaterYield and Summer Low Flows at Caspar Creek in Northwestern California. Water Resource Research Vol. 26, No. 7, Pages 1669-1679.

Kent, L. April, 2007. Draft of Silvicultural Report for TFSR Salvage Sale.

Krammes, J.S. and D.M. Burns. 1973. Road Construction on Caspar Creek Watersheds. . .10-Year Report on Impact. U.S. Forest Service Research paper PSW-93/1973

McIver, J.D. and R.C. McNeil. 2006. Soil Disturbances and Hill-Slope Sediment Transport After Logging of a Severely Burned Site in Northeastern Oregon. Western Journal of Applied Forestry, 21:123-133

McNeil, R.C. 1996a. Effects of a Feller Buncher Operation on Soil Bulk Density. Unpublished report. Malheur National Forest.

McNeil, R.C. 2001. Sediment Export from Logging Units During Summit Fire Salvage. Unpublished report. Malheur National Forest.

McNeil, R.C. 2005. Effect of Tractor Logging on Soil in Unit 34 of Flagtail Fire Salvage. Unpublished Report. Malheur National Forest.

McNeil, R.C. 2006a. Shake Table Complex, Malheur NF; Burned Area Emergency Response Assessment, Soil Resources Conditions. Malheur National Forest.

McNeil, R.C. 2006b. Field notes for detrimental disturbance survey, TFSR Project. Malheur National Forest.

McNeil, R.C. 2006c. Soil Effects from Logging Silvies Canyon Timber Sales. Unpublished Report. Malheur National Forest.

McNeil, R.C. March, 2007a. GIS Mapping of landslide risk areas in TFSR Salvage Sale.

McNeil, R.C. 2007b. Soils Effects from Logging, Silvies Canyon Timber Sale. Unpublished Report. Malheur National Forest.

McNeil, R.C. 2007c. Quantitative Logging Effects on Detrimental Soil Conditions. Unpublished Report. Malheur National Forest.

Moser, E.A. and V. Archer. 2006. Summaries for Soils Resources on Units for Gash, Springer II and West Tolan Projects, and Various Units on Middle East Fork EIS. Unpublished, for Bitterroot National Forest.

Neary, D.G., P.F. Ffolliot and J. D. Landsberg. 2005. Fire and Streamflow Regime; Chapter 5, in Wildland Fire in Ecosystems: Effects of Fire on Soil and Water. U.S. Forest Service General Technical Report RMRS-GTR-42, Vol.4.

NOAA. 1973. Precipitation Frequency Atlas 2. http://www.wrcc.dri.edu/pcpnfreq.html

NRCS. March 29, 2007. Dovenberg—Shake Table Fire Complex Rehabilitation. A letter to Lorainne Vogt, John Day FO, NRCS; from Sean Welch PE, State Hydraulic Engineer

Powers, R.F. 2002. Effects of Soil Disturbance on the Fundamental, Sustainable Productivity of Managed Forests. USDA Forest Service General Technical Report, PSW-GTR-183.

Rice, R.M., J.S. Rothacher, and W.F. Megahan. 1973. Erosional Consequences of Timber Harvesting: An Appraisal. National Symposium on Watersheds in Transition.

Schnepf, M. and B. J. Newton. 2000. Conservation Buffer Initiative: Progress and Issues. In Proceedings of International Conference on Riparian Ecology and Management in Multi-use Watersheds. American Water Resources Association. Portland Oregon. pp 601-603.

Selley, R.C. 1976. An Introduction to Sedimentology. Academic Press.408 p.

Sierra Nevada Ecosystem Project. 1997. Final Report to Congress. Wildland Resources Center Report # 40. University of California, Davis. 328p.

State of Oregon. 1974. Hydraulics Manual, Location Section. Oregon State Highway Division.

State of Oregon. 2003. http://www.deq.state.or.us/wq/303dlist/303dpage.htm

State of Oregon. 2007. Water Quality Standards : Beneficial Uses, Policies, and Criteria for Oregon. Department of Environmental Quality. http://arcweb.sos.state.or.us/rules/OARs_300/OAR_340/340_041.htm

Tiedemann, A.R., C.E. Conrad, J.H. Dieterich, J.W. Hornbeck, W.F. Megahan, L.A. Viereck, and D.D. Wade. 1979. Effects of Fire on Water: A State-of-Knowledge Review. General Technical Report WO-10 USDA Forest Service.

USDA Forest Service. 1953. Range Management Plan, Aldrich C & H Allotment. Unpublished report. Malheur national Forest

USDA Forest Service. 1974. Malheur National Forest Soil Resource Inventory. Malheur National Forest.

USDA Forest Service. 1979. Environmental Assessment Report and Aldrich Allotment Management

Plan. Malheur National Forest.

USDA Forest Service. 1990. Land and Resource Management Plan. Malheur National Forest.

USDA Forest Service. 1993. Riparian Checklist, Field Notes for Billy Timber Sale. Malheur National Forest.

USDA Forest Service. 1996. Todd Planning Area; Detailed Integrated Resource Analysis—Watershed and Soil. Unpublished Report. Malheur National Forest

USDA Forest Service, 1995a. Environmental Assessment for the Interim Strategies for Managing Anadromous Fish-Producing Watersheds in Eastern Oregon and Washington, Idaho and Portions of California.

USDA Forest Service. 1995b. Todd Timber Sale Fish IRA Input—Field notes, maps and summary.

USDA Forest Service. 1998. Watershed Protection and Management—Forest Service Manual. R6 Supplement No. 2500-98-1.

USDA Forest Service. 2002. Disturbed WEPP: WEPP Interface for Disturbed forest and Range Runoff, Erosion and Sediment Delivery. USDA Forest Service Rocky Mountain Research Station and San Dimas Technology and Development Center.

USDA Forest Service. 2004a. Assessment of Post Storm Conditions, Christmas Day, 2003, Grand Prix and Old Fires Area, San Bernardino National Forest. Unpublished. 21 p.

USDA Forest Service. 2006. TFSR Project, Potential Cumulative Activities Considered. Internal memo. Malheur National Forest.

USGS. 1966. Geologic Map of the Aldrich Mountain Quadrangle, Grant County, Oregon. Map GQ-438. Washington D.C.

USGS. 2006. Historic Daily Stream Flow Data. http://waterdata.usgs.gov/nwis/sw

Western Regional Climate Center. 2004. http://www.wrcc.dri.edu/index.html

Welsch, D. J. 1991. Riparian Forest Buffers. USDA-Forest Service, Forest Resources Management Northeastern Area. Radnor, PA. 20p.

Williamson, J. R. and W. A. Neilson. 2000. The Influence of Forest Site on Rate and Extent of Soil Compaction and Profile Disturbance of Skid Trails During Ground-Based harvesting. Can. J. of For. Res. 30: 1196-1205.

Ziemer, R.R. 1998. Flooding and Stormflows. U.S. Forest Service General Technical Report PSW-GTR-168-Web.

5.2.5 WILDLIFE

Ackenson, H. and T. Schommer. 1992. Upland Sandpiper Survey Protocol for the Blue Mountains of Oregon and Washington. Unpubl. Rep. Wallowa-Whitman National Forest, Baker City, OR.

Adamus, P.R., K. Larsen, G.Gillson, and C.R. Miller. 2001. Oregon Breeding Bird Atlas. Oregon Field Ornithologiesist, P.O. Box 10373, Eugene, OR 97440. CD-ROM.

Altman, B. 2000. Conservation Strategy for Landbirds in the Northern Rocky Mountains of Eastern Oregon and Washington. American Bird Conservancy and Oregon-Washington Partners in Flight [Available online at http://community.gorge.net/natres/pif/con_plans/north_rocky/north_rocky_page1.html].

Banci, V. 1994. Wolverine. Pages 99-127 in L.F. Ruggiero, K. B. Aubry, S. W. Buskirk, L. J. Lyon, and W. J. Zielinski tech eds. 1994. The Scientific Basis for Conserving Forest Carnivores: American Marten, Fisher, Lynx, and Wolverine in the Western United States. Gen. Tech. Report RM-254. USDA, Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 184 pp.

Baydack, R.K., H. Campa III and J.B. Haufler. 1999. Practical Approaches to the Conservation of Biological Diversity. Island Press. Washington DC.

Block, W.M. and L.A. Brennan. 1987. Characteristics of Lewis' Woodpecker Habitat on the Modoc Plateau, California. Western Birds 18:209-212.

Brittell, J.D., R.J. Poelker, S.J. Sweeney, and G.M. Koehler. 1989. Native cats of Washington. Section III: Lynx. Unpublished, Washington Dept. of Wildlife, Olympia, WA. *Referenced in:* Ruediger, B., J. Claar, S. Gniadek, B. Holt, L. Lewis, S. Mighton, B. Naney, G. Patton, T. Rinaldi, J. Trick, A. Vandehey, F. Wahl, N. Warren, D. Wenger, and A. Williamson. 2000. Canada Lynx Conservation Assessment and Strategy. USDA Forest Service, USD Fish and Wildlife Service, USDI National Park Service, Forest Service Publication #R1-00-53, Missoula, MT. 142 pp.

Bull E.L., and R.S. Holthausen. 1993. Habitat Use and Management of Pileated Woodpeckers in Northeastern Oregon. Journal of Wildlife Management 57:335-345.

Cook, J.L., L.L. Irwin, L.D. Bryant, R.A. Riggs, and J.W. Thomas. 1998. Relations of Forest Cover and Condition of Elk: A Test of the Thermal Cover Hypothesis in Summer and Winter. The Wildlife Society. Wildlife Monographs, No. 141.

Csuti B., A. J. Kimerling, T. A. O'Neil, M. M. Shaughnessy, E. P. Gaines, and M. M. P. Huso. 1997. Atlas of Oregon Wildlife, Distribution, Habitat and Natural History. Oregon State University Press, Corvallis, Oregon.

Dechant, J.A., M.L. Sondreal, D.H. Johnson, L.D. Igl, C.M. Goldade, A.L. Zimmerman and B.R. Euliss. 2001. Effects of Management Practices on Grassland Birds: Bobolink. Northern Prairie Wildlife Research Center, Jamestown ND. Northern Prairie Wildlife Research Center Home Page. http://www.npwrc.usgs.gov/resource/literatr/grasbird/bobo/bobo.htm (Version 17FEB2000).

Haggard, M. and W.L. Gaines. 2001. Effects of Stand-Replacement Fire and Salvage Logging on a Cavity-Nesting Bird Community in Eastern Cascades, Washington. Northwest Science, Vol. 75, No. 4.

Hawley, V.D. and F.E. Newbry. 1957. Marten Home Ranges and Fluctuations in Montana. Journal of Mammalogy 38: 174-184.

Hutto, R.L. 1995. Composition of Bird Communities Following Stand Replacement Fires in Northern Rocky Mountain (U.S.A.) Conifer Forests. Conservation Biology 9(5): 1041-1058. *Referenced in:* Saab, V., R. Brannon, J. Dudley, L. Donohoo, D. Vanderzanden, V. Johnson, and H. Lachowski. 2002. Selection of Fire-Created Snags at Two Spatial scales by Cavity-nesting Birds. USDA Forest Service. Gen. Tech. Rep. PSW-GTR-181.

Jackman, S.M. 1974. Woodpeckers of the Pacific Northwest: Their Characteristics and Their Role in the Forests. Corvallis, OR: Oregon State University. M.S. Thesis. 147 p.

Jensen, W.F., T.K. Fuller, and W.L. Robinson. 1986. Wolf, *Canis lupus*. Distribution on the Ontario-Michigan Border Near Sault St. Marie. Can. Field. Nat 100(3): 363-366.

Johnson, D.H. and T. A. O'Neil, ed. 2001. Wildlife-habitat Relationships in Oregon and Washington. Oregon State University Press, Corvallis OR. 736 pp.

Knotts, L. 1998. Reanalysis of Snag Management Indicator Species. *In:* Summit Fire Recovery Project, Final Supplemental Environmental Impact Statement, Appendix H. USDA Forest Service, Malheur National Forest.

Koehler, G.M. 1990. Population and Habitat Characteristics of Lynx and Snoeshoe Hares in North Central Washington. Canada Journal of Zoology 68:845-851.

Koehler G.M. and J.D. Brittell. 1990. Managing Spruce-fir Habitat for Lynx and Snowshoe Hares. J. Forestry 88: 10-14.

Kotliar, N.B, S. Heil, R.L. Hutto, V.A. Saab, C.P. Melcher, and M.E. McFadzen. 2002. Effects of Fire and Post-fire Salvage Logging On Avian Communities in Conifer-Dominated Forests of the Western United States. Studies in Avian Biology No. 25: 49-64.

Marshall, D.B. 1992. Status of the Northern Goshawk in in Oregon and Washington, Portland Audubon Society.

Marshall, D.B. 1992a. Status of the Black-backed Woodpecker in Oregon and Washington. Portland Audubon Society, Blue Mountains Biodiversity Conference, May 26-29, 1992, 13 p.

Marshall, D.B. 1992b. Lewis' Woodpecker (Melanerpis lewis). In: Sensitive Vertebrates of Oregon, First ed. Oregon Department of Fish and Wildlife.

Marshall, D.B., M.W. Chilcote, and H. Weeks. 1996. Species at Risk: Sensitive, Threatened and Endangered Vertebrates of Oregon. 2nd edition. Oregon Dept. of Fish and Wildlife, Portland, OR.

Marshall, D.B., M.G. Hunter, and A.L. Contreras, Eds. 2003 Birds of Oregon: A General Reference. Oregon State University Press, Corvallis, OR. 768 Pp.

McKelvey, K.S., J.J. Claar, G.W. McDaniel, and G. Hanvey. 1999. National Lynx Selection Protocol. Unpublished, USDA Forest Service, Rocky Mountain Research Station, Missoula, MT.

Mech, L.D. 1988. Wolf Distribution and Road Density in Minnesota. Wildl. Soc. Bull. 16:85-87.

Mellen, T.K., E.C. Meslow and R.W. Mannan. 1992. Summertime Home Range and Habitat Use of Pileated Woodpeckers in Western Oregon. Journal of Wildlife Management, 56(1): 96-103.

Mellen, Kim, Bruce G. Marcot, Janet L. Ohmann, Karen Waddell, Susan A. Livingston, Elizabeth A. Willhite, Bruce B. Hostetler, Catherine Ogden, and Tina Dreisbach. 2006. DecAID, the decayed wood advisor for managing snags, partially dead trees, and down wood for biodiversity in forests of Washington and Oregon. Version 2.0. USDA Forest Service, Pacific Northwest Region and Pacific Northwest Research Station; USDI Fish and Wildlife Service, Oregon State Office; Portland, Oregon. http://wwwnotes.fs.fed.us:81/pnw/DecAID/DecAID.nsf

Morrison, M.L., and M.G. Raphael.1993. Modeling the Dynamics of Snags. Ecological Applications 3(2): 322-330.

NatureServe Explorer: An Online Encyclopedia of Life [web application]. 2006. Version 6.1. Arlington, Virginia, USA: NatureServe. Available: http://www.natureserve.org/explorer.

Oregon Department of Fish and Wildlife. 2004. Memo on Spring survey results.

Oregon Department of Fish and Wildlife. Miller, ODFW biologist, personal communication 2007.

Petersen, K.L and L.B. Best. 1987. Effects of Prescribed Burning on Nongame Burns in a Sagebrush Community. Wildlife Society Bulletin. 15(3): 317-329. *Referenced in:* Smith, J.K., ed. 2000. Wildland fire in ecosystems: effects of fire on fauna. Gen. Tech. Rep. RMRS-GTR-42-vol 1.

Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 83p.

Quinn, N.W.S. and G. Parker. 1987. Lynx. Pages 683-694 *in* M. Novak, J.A. Baker, M.E. Obbard, and B. Malloch, editors. Wild Furbearer Management and Conservation in North America. Ontario Ministry of Natural Resources, Ontario.

Raphael, M.G., and M. White. 1984. Use of Snags by Cavity Nesting Birds in the Sierra Nevada. Wildlife Monographs, 86: 1-66.

Reynolds, R.T., R.T. Graham, M.H. Reiser, R.L. Bassett, P.L. Kennedy, D.A. Boyce, Jr., G. Goodwin, R. Smith, and E.L. Fisher. 1992. Management recommendations for the northern goshawk in the Southwestern United States. Gen. Tech, Rep. RM-217. Ft. Collins, CO: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. 90 pp.

Rieman, Bruce and Jim Clayton. Wildfire and native fish: Issues of forest health and conservation of sensitive species. Fisheries. Vol. 22 (11): pp. 6-15. 1997.

Rose, C.L., Marcot, B.G., Mellen, T.K., Ohmann, J.L., Waddell, K.L., Lindley, D.L., and B. Schreiber. 2001. Decaying Wood in Pacific Northwest Forests: Concepts and Tools for Habitat Management, Chapter 24 in Wildlife Habitat Relationships in Oregon and Washington (Johnson, D.H. and T.A. O'Neil. 2001. OSU Press.).

Rowland, M.M.; Wisdom, M.J.; Johnson, B.K. and Kie, J.G. 2000. Elk Distribution and Modeling in Relation to Roads. Journal of Wildlife Management. 64(3):672-684.

Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, J.L. Lyon, and W.J. Zielinski. 1994. The Scientific Basis for Conserving Forest Carnivores: American Marten, Fisher, Lynx, and Wolverine in the Western United States. GTR RM-254, USDA Forest Service, Rocky Mountain Station, Ft. Collins, CO.

Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, G.M. Koehler, C.J. Krebds, K.S. McKelvey, and J.R. Squires. 2000. Ecology and Conservation of Lynx in the United States. USDA Forest Service, Rocky Mountain Research Station, Fort Collins, CO. General Technical Report RMRS-GTR-30WWW.

Ryser, F.A. 1985. Birds of the Great Basin: a Natural History. University of Nevada Press, Reno, NV.

Saab, V. and J. Dudley. 1997. Bird Responses to Stand Replacement Fire and Salvage Logging in Ponderosa Pine/Douglas-Fir Forests of Southwestern Idaho. Progress Report 94-96 of Study No. 4202-1-7-7. Unpublished Report, USDA Forest Service, Intermountain Research Station, Boise, ID. 34 p.

Saab, V.A., and T.D. Rich. 1997. Large Scale Conservation Assessment for Neotropical Migratory Land Birds in the Interior Columbia River Basin. GTR PNW-GTR-399, USDA Forest Service, PNW Station, Portland, OR, (Quigley, T.M., ed. Interior Columbia Basin Ecosystem Management Project: Scientific Assessment).

Saab, V. and J. Dudley. 1998. Responses of Cavity-Nesting Birds to Stand-Replacement Fire and Salvage Logging in Ponderosa Pine/Douglas-Fir Forests of Southwestern Idaho. USDA Forest Service, Rocky Mountain Research Station, Research Paper RMRS-RP-11. 18 p.

Saab, V., R. Brannon, J. Dudley, L. Donohoo, D. Vanderzanden, V. Johnson, and H. Lachowski. 2002. Selection of Fire-Created Snags at Two Spatial scales by Cavity-nesting Birds. USDA Forest Service. Gen. Tech. Rep. PSW-GTR-181.

Sallabanks, R. 1995. Effects of Wildfire on Breeding Bird Communities in Coniferous Forests of Northeastern Oregon. Unpublished annual report to the Blue Mountains Natural Resources Institute.

Sharp, B.E. 1996. Avian Population Trends in the Pacifc Northwest. Bird Populations 3:26-45.

Smith, J.K., ed. 2000. Wildland fire in ecosystems: effects of fire on fauna. Gen. Tech. Rep. RMRS-GTR-42-vol 1. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 83p.

Spahr, R. 1991. Factors affecting the distribution of bald eagles and effects of human activity on bald eagles wintering along the Boise River. Abstract for M.S. Thesis. Boise State University, Boise, ID.

Steenhof, K. 1978. Management of wintering bald eagles. Unpublished document. USDI Fish and Wildlife Service. Contract No. 14-15-0006-77-030. Columbia, Mo.

Thiel, R.P. 1978. Relationship Between Road Densities and Wolf Habitat Suitability in Wisconsin. Am. Midl. Nat. 113(2): 404-407.

Thomas, J.W., Tech. Ed. 1979. Wildlife Habitats in Managed Forest of the Blue Mountains of Oregon and Washington. Ag. Handbook No. 553, USDA, in cooperation with: Wildlife Management Institute, USDI Bureau of Land Management.

Thomas, J.W., and D.E. Toweill (eds.). 1982. Elk of North America: Ecology and Management. Wildlife Management Institute, Stockpole Books, Harrisburg, PA.

Thomas, J.W., D.A. Leckenby, M. Henjum, R.J. Pederson, and L.D. Bryant. 1988. Habitat-Effectiveness Index for Elk on Blue Mountain Winter Range. USDA Forest Service, Pacific Northwest Research Station, General Technical Report PNW-GTR-218.

USDA Forest Service. 1986. A Report on Minimum Management Requirements for Forest Planning on the National Forests of the Pacific Northwest Region.

USDI Fish and Wildlife Service. 1986. Recovery Plan for the Pacific bald eagle. USDI Fish and Wildlife Service. 160 pp.

U.S. Fish and Wildlife Service. 2002. Birds of Conservation Concern 2002. Division of Migratory Bird Management, Arlington, Virginia. 99 pp.

Verts, B. J. and L. N. Carraway. 1998. Land Mammals of Oregon. University of California Press, Berkeley and Los Angles, CA. pp. 455-458.

Wisdom, M.J.; Cimon, N.J.; Johnson, B.K.; Garton, E.O.; Bryant, L.D.; Thomas, J.W. and Kie, J.G. 1999. Distribution and Spatial Partitioning of Mule Deer and Elk in Relation to Traffic. University of Idaho. Moscow, Idaho. 52 p.

Wisdom, M. J., R. S. Holthausen, B. C. Wales, C. D. Hargis, V. A. Saab, D. C. Lee, W. Hann, T. D. Rich, M. M. Rolland, W. J. Murphy, and M. R. Eames. 2000. Source Habitats for Terrestrial Vertebrates of Focus in the Interior Columbia Basin: Broad-scale Trends and Management Implications. Gen. Tech Rep. PNW-GTR-485 May 2000. USDA Forest Service, Pacific Northwest Research Station, Portland, OR.

Yunick, R.P. 1985. A Review of Recent Irruptions of the Black-backed Woodpecker and Three-toed Woodpecker in Eastern North America. J. Field Ornithol, 56(2): 138-152.

5.2.6 FISHERIES

Beche, L.A., S.L. Stephens, and V.H. Resh. 2005. Effects of prescribed fire on a Sierra Nevada

(California, USA) stream and its riparian zone. Forest Ecology and Management. 218: 37-59.

Behnke R. J. 1992. Native Trout of Western North America. American Fisheries Society Monograph. (6): 275.

Beechie, T.J., Pess, G., Kennard, P., Bilby, R.E. and S. Bolton. 2000. Modeling recovery rates and pathways for woody debris recruitment in northwestern Washington streams. N. Am. J. Fish. Manage.20: 436-452.

Behnke, R.J. 2002. Trout and salmon of North America. New York Free Press.

Berg, N., D. Azuma and A. Carlson. 2000. Streamflow and fire effects on woody debris dynamics of Sierran streams. Winter 2000 Newsletter. Watershed Management Council, Boise, ID. 3 p. http://watershed.org/news/win_00/7_woody_debris.htm. (accessed October 2005).

Beschta, R.L. and R.L. Taylor. 1988. Stream temperature increases and land use in a forested Oregon watershed. Water Resources Bulletin 24:19-25.

Chapman, D.W. and K.P. McCloud. 1987. Development of criteria for fine sediment in the Northern Rockies Ecoregion. US-EPA, Water Division. 910/9-87-162. Seattle, WA. 279p.

Columbia River Inter-Tribal Fish Commission. 1995. Wy-Kan-Ush-Mi Wa-Kish-Wit: Spirit of the Salmon. http://www.critfc.org/text/trptext.html

Detenbeck, N.E., Devore, P.W., Niemi, G.J. and A. Lima. 1992. Recovery of temperate-stream fish communities from disturbance: a review of case studies and synthesis of theory. Enviorn. Manage. 16: 33-53.

Dunham, J. B., M. K. Young, R. E. Gresswell and B. E. Rieman. 2003. Effects of fire on fish populations: landscape perspectives on persistence of native fishes and nonnative fish invasions. Forest Ecology and Management. 178: 183-196.

Everest, F.H., and R.D. Harr. 1982. Influence of forest and rangeland management on anadromous fish habitat in western North America; 6. Silvicultural Treatments. USDA, Forest Service Gen. Tech. Rep. PNW-134. PNW Forest and Range Exp. Station, Portland, Ore. 19 pp.

Helvey, J.D. & Fowler, W.B. 1995. Effects of timber harvest on the hydrology and climate of four small watersheds. Umatilla Nat. For. Barometer Watershed Program Contracted Report No. 53-043R-5-42. Umatilla Nat. For., Pendleton, OR.

MacDonald, L., Smart, H.A. and R.C. Wismar. 1991. Montoring guidelines to evaluate effects of forestery activities on streams in the Pacific Northwest and Alaska. U.S. Environmental Protection Agency, Region 10, NPS Section, EPA/910/9-91-001. Seattle, WA. 166p.

McIntyre, J.D. and B.E. Rieman. 1995. Westslope Cutthroat Trout IN Conservation Assessment for Inland Cutthroat Trout. General Technical Report RM-256. US Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado. M.K. Young, tech. Ed. Pages 1-15.

Minshall, G.W. 2003. Responses of stream benthic macroinvertebrates to fire. Forest Ecology and Management 178:155-161.

Nehlsen, W., J.E. Williamson and J.A. Lichatowich. 1991. Pacific salmon at the crossroads: stocks at risk from California, Oregon, Idaho, and Washington. Fisheries 16(2): 4-21.

ODFW. 2006. Telephone conversation between Jeff Neal (Assistant Fisheries Biologist, Oregon Department of Fish and Wildlife, John Day, OR) and Scott Cotter (Fish Biologist, Blue

Mountain Ranger District) on 3 May 2006.

Phillips, R.W., R.L. Lantz, E.W. Claire and J.R. Moring. 1975. Some effects of gravel mixtures on emergence of coho salmon and steelhead trout fry. Transactions of the American Fisheies Society 104:461-466.

Quigley, T.M., R.W. Haynes, R.T. Graham, Tech. Eds. 1996. Integrated scientific assessment for ecosystem management in the interior Columbia basin and portions of the Klamath and Great Basins. Gen. Tech. Rep. PNW-GTR-382. Portland, OR.

Reeves, G.H., Benda, L.E., Burnett, K.M., Bisson, P.A. and J.R. Sedell. 1995. A disturbance-based ecosystem approach to maintaining and restoring freshwater habitats of evolutionarily significant units of anadromous salmonids in the Pacific Northwest. Am. Fish. Soc. Symposium 17: pp 334-349. In: Nielsen,J. (ed.) Evolution and the Aquatic Ecosystem. Proc. 17th Symp. Amer. Fish. Soc. Bethesda, MD.

Rieman, B and J. Clayton. 1997. Wildfire and Native Fish: Issues of Forest Health and Conservation of Sensitive Species. Fisheries 22(11): 6-15.

Rosgen, D. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, Colorado.

Rosenfeld, J.S. and L. Huato. 2003. Relationship between large woody debris characteristics and pool formation in small coastal British Columbia streams. N. Am. J. Fish. Manage. 23: 928-938.

Spahr, R., L. Armstrong, D. Atwood, and M. Rath. 1991. Threatened, Endangered, and Sensitive Species of the Intermountain Region. USDA Forest Service, Intermountain Region, Ogden, Utah.

Troendle, C.A. 1982. The effects of small clearcuts on water yield from the Deadhorse Watershed, Fraser, Colorado. In Proc. 50th Ann. Western Snow Conf. Colo. State U., Ft. Collins.

U.S. Department of Agriculture and U.S. Department of the Interior. 1995. Decision Notice/Decision Record Finding of No Significant Impact, Environmental Assessment for the Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon, and Washington, Idaho, and portions of California (PACFISH).

USDA Forest Service. 1990. Malheur National Forest Land and Resource Management Plan. John Day, OR.

USDA Forest Service. 1992. Region 6 Level II stream survey – Wickiup Creek and Fields Creek. Reach summary report. John Day, OR.

USDA Forest Service. 1994. Region 6 Level II stream survey – Duncan Creek and Todd Creek. Reach summary report. John Day, OR.

5.2.7 SENSITIVE PLANTS

Brooks, PJ, K Urban, E Yates, Ed. CG Johnson. 1991. Sensitive Plants of the Malheur, Ochoco, Umatilla, and the Wallowa-Whitman National Forests. USDA Forest Service, Pacific Northwest Region, Wallowa-Whitman National Forest (R6 WAW TP 040-92)

Johnson CG and Clausnitzer RR. 1992. Plant Associations of the Blue and Ochoco Mountains. USDA Forest Service, Pacific Northwest Region, Publication R6-ERW-TP-036-92.

Hurd, E, NL Shaw, J Mastrogiuseppe, LC Smithman, S Goodrich. 1998. Field Guide to Intermountain Sedges. USDA Forest Service, Rocky Mountain Research Station, General

Technical Report RMRS-GTR-10.

Oregon State University Herbarium. 2007. Herbarium Record Online Database. http://ocid.nacse.org/cgi-bin/qml/herbarium/plants/vherb.qml, accessed April 20, 2007.

USDA. Forest Service. 2004. R–6 Regional Forester's Sensitive Species List of July 2004.

USDI. Fish and Wildlife Service. 2006. Letter to Karen Haines, WWNF, Bi-annual Project Planning, Reference # D304F80F444718AD882571E20081CB8C, September 7, 2006. Oregon State Office, Portland. (Letter on file with Wallowa-Whitman National Forest, Baker City, Oregon.)

Washington Natural Heritage Program. 2007. Field Guide to Selected Rare Vascular Plants of Washington, http://www.dnr.wa.gov/nhp/refdesk/fguide/htm/fgmain.htm, accessed April 23, 2007

5.2.8 RANGE / NOXIOUS WEEDS

Briese, D.T. 1996. Biological control of weeds and fire management in protected natural areas: Are they compatible strategies? Biological Conservation 77(2-3): 135-141.

Falk, Ryan. 2007. Personal communications with Ryan Falk, Environmental Coordinator, Prairie City Ranger District

Gelbard, J.L. and J. Belnap. 2003. Roads as Conduits for Exotic Plant Invasions in a semiarid landscape. Conservation Biology 17:420-432.

Mabe, Rene.2007. Personal communications with Rene Mabe, Natural Resource Staff Officer, Malheur National Forest Supervisor's Office

Maret, M.P. and M.V. Wilson. 2000. Fire and Seedling population dynamics in western Oregon prairies. Journal of vegetation science 11(2): 307-314.

Oregon Department of Agriculture Plant Division, Noxious Weed Control. Oregon Noxious Weed List. http://oregon.gov/ODA/PLANT/WEEDS/docs/weed_policy.pdf, site visited by April 13, 2007.

Silveri, A, P.W. Dunwiddie, & H.J. Michaels. 2001. Logging and edaphic factors in the invasion of an Asian woody vine in a mesic North American forest. Biological Invasions 3: 379-389.

USDA Forest Service. May, 2006. Easy Fire Recovery Project. FEIS Volume II. Appendix H – Post-Fire Grazing Guidelines. Malheur National Forest, John Day, OR.

USDA Forest Service. 1990. Malheur National Forest Land and Resource Management Plan. Malheur National Forest, John Day OR.

USDA Forest Service. 2005. Pacific Northwest Region Final Environmental Impact Statement for the Invasive Plant Program.

USDA Forest Service. 1988. Record of Decision for Managing Competing and Unwanted Vegetation (1988 ROD) and the 1989 Mediated Agreement.

5.2.9 RECREATION

Hesseln, Hayley; Loomis, John B. and; Gonzalez-Caban, Armando. 2004. The effects of fire on recreation demand in Montana. Western Journal of Applied Forestry. Vol. 19, no. 1 (Jan. 2004): p. 47-53.

Taylor, Jonathan G.; Daniel, Terry C. 1984. Prescribed fire: public education and perception. Journal of Forestry. 82: 361-365.

U.S. Department of Agriculture, Forest Service. 1986. 1986 ROS Book. Washington, DC: U.S. Department of Agriculture, Forest Service. n.p.

U.S. Department of Agriculture, Forest Service. 1990. Land and Resource Management Plan. Malheur National Forest. Pacific Northwest Region.

Vaux, H.J., Jr., P.D. Gardner, and T.J. Mills. 1984. Methods for assessing the impact of fire on forest recreation. USDA Forest Service. Gen. Tech. Rep. PSW-79. 13 p.

5.2.10 VISUALS

Gobster, Paul H. 1994. The aesthetic experience of sustainable forest ecosystems. In: Covington, W. Wallace; Debano, Leonard F., tech. coord. Sustainable ecological systems: implementing an ecological approach to land management; 1993 July 12-15; Flagstaff, AZ. Gen. Tech. Rep. RM-247. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station: 246-255.

McNab, Henry W.; Avers, Peter E. 1994. Ecological Subregions of the United States. Section M332G--Blue Mountains. U.S. Department of Agriculture, Forest Service. WO-WSA-5. 23 March 2007. <http://www.fs.fed.us/land/pubs/ecoregions/ch44.html#M332G>.

Ryan, Robert L. 2005. Social Science to improve fuels management: a synthesis of research on aesthetics and fuels management. Gen. Tech. Rep. NC-261. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station. 58 p.

Taylor, Jonathan G.; Daniel, Terry C. 1984. Prescribed fire: public education and perception. Journal of Forestry. 82: 361-365.

U.S. Department of Agriculture, Forest Service. 1974. National Forest Landscape Management Volume 2, Chapter 1, Visual Management System, Agricultural Handbook 462.

U.S. Department of Agriculture, Forest Service. 1990. Land and Resource Management Plan. Malheur National Forest. Pacific Northwest Region.

U.S. Department of Agriculture, Forest Service. 1995. Landscape Aesthetics: A handbook for scenery management. Agriculture Handbook 701. December, 1995.

5.2.11 HERITAGE RESOURCES

Burtchard, Greg C., 1998, Environment, Prehistory, and Archaeology of John Day Fossil Beds National Monument, Blue Mountain Region, North Central Oregon. Report for USDI National Park Service, Pacific Northwest Region, Seattle. International Archaeological Research Institute, Inc. Honolulu.

Justice, Noel D. 2002. Stone Age Spear and Arrow Points of California and the Great Basin. Bloomington: University of Indiana Press.

U.S. Department of Agriculture, Forest Service. 1990. Malheur National Forest Land and Resource Management Plan. John Day, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, Malheur National Forest

5.2.12 ECONOMICS / SOCIAL

EPS, 2007. A Socio-economic Profile – Grant County, OR. Report generated by the Economic Profile System (2004 Version), developed by Headwaters Economics and updated by the Sonoran Institute (www.Sonoran.org).

Lindenmayer, D., 2006. Salvage harvesting- Past lessons and future issues. *The Forestry Chronicle* 82(1):48-53

Minnesota IMPLAN Group 2003. IMPLAN Professional Version 2.0 (regional economic impact modeling software).

OED, 2006. Regional Profile Labor force, employment and unemployment in Region 14. Prepared by Jason Yohannan, Oregon Employment Department – Workforce Analysis.

Random Lengths, 2007. The Random Lengths Big Book – 2007. Random Lengths, Eugene OR.

USDA Forest Service, 1992. “Forest Health in the Blue Mountains: Social and Economic Perspectives”. Report prepared by T. Quigley (PNW-GTR-296). Pacific Northwest Research Station, USDA Forest Service, Portland OR.

USDA Forest Service, 2003. Recovery Efforts 2002 Fires. USDA Forest Service, Malheur National Forest, John Day, OR.

USDA Forest Service. 2004. FEAST Software 2004 Model Outputs and Response Coefficients.

USDA Forest Service, 2004. Socio-economic Specialist Report: Monument Restoration Project. Malheur National Forest, John Day, OR.

USDA Forest Service, 2006. Oregon’s Forest Products Industry and Timber Harvest, 2003. PNW-GTR-681. Pacific Northwest Research Station, Portland OR.

USDA Forest Service, 2006a. Field notes and Wood Products industry survey, 9/06 to 3/07. E. Kohrman (Blue Mountains National Forests) and C. Miller, TEAMS enterprise unit, USDA Forest Service.

USDA Forest Service, 2006b. Oregon’s Forest Products Industry and Timber Harvest, 2003. PNW-GTR-681 (Aug. 2006). Pacific Northwest Research Station, USDA Forest Service.

USDA Forest Service, 2007. Supporting data and calculations for economic analysis for the TFSR Project (spreadsheet: econanalysis_thorn_calcs.xls). Prepared by Chris Miller, Economist. Malheur National Forest, John Day, OR.

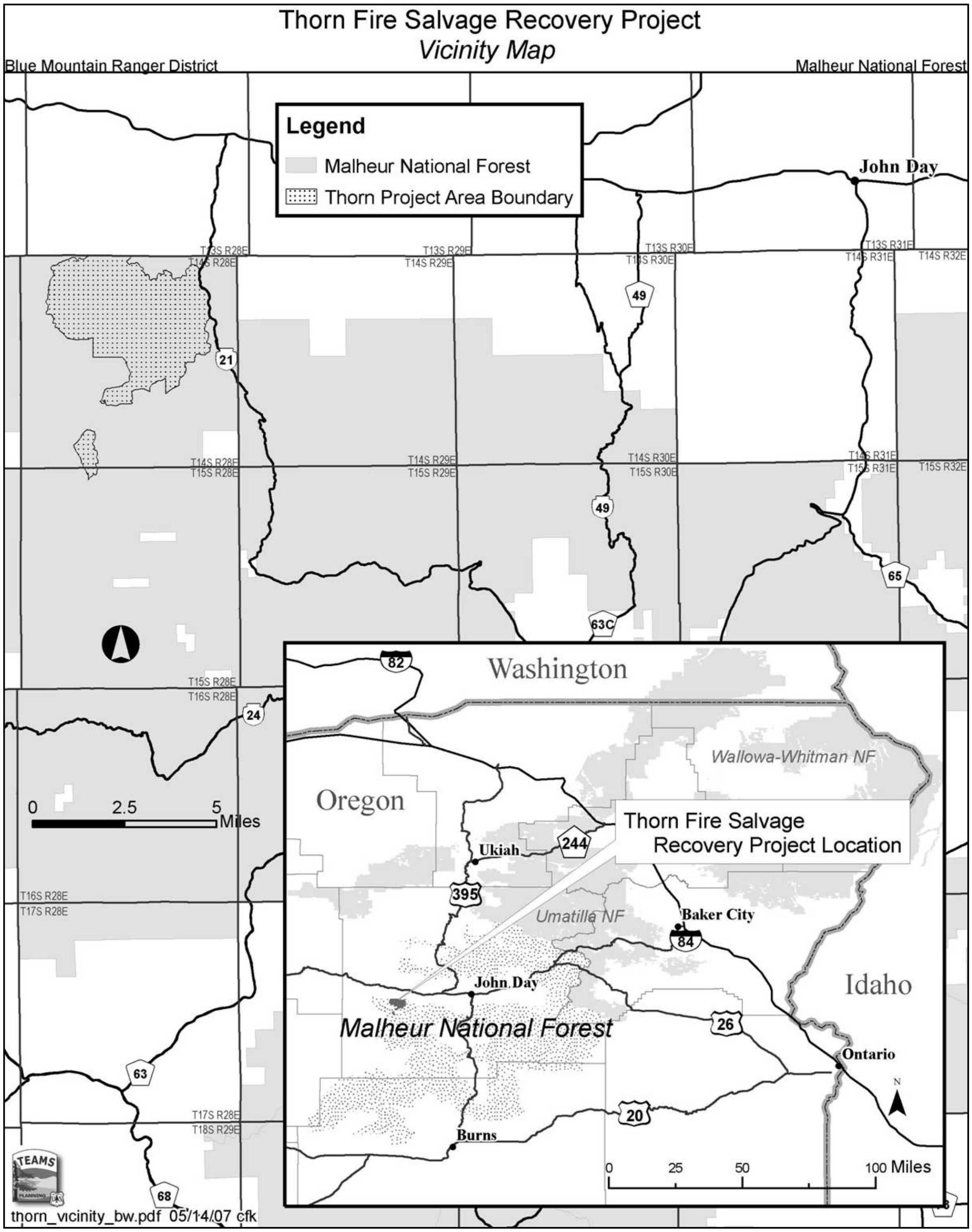
USDA Forest Service 1990. Land and resource management plan for the Malheur National Forest. Malheur National Forest, John Day, OR.

5.3 INDEX

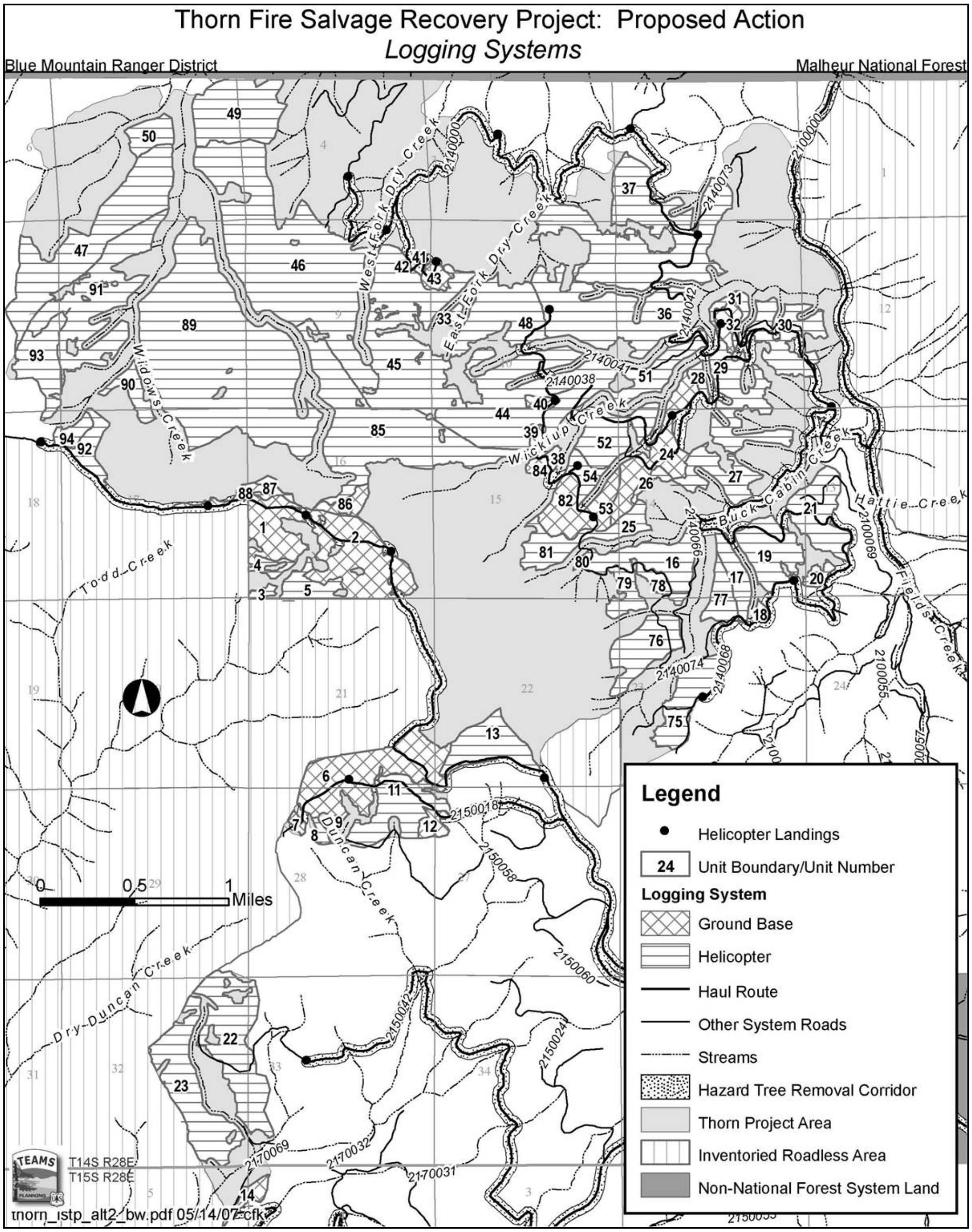
DEIS APPENDICES

APPENDIX A – PROJECT MAPS

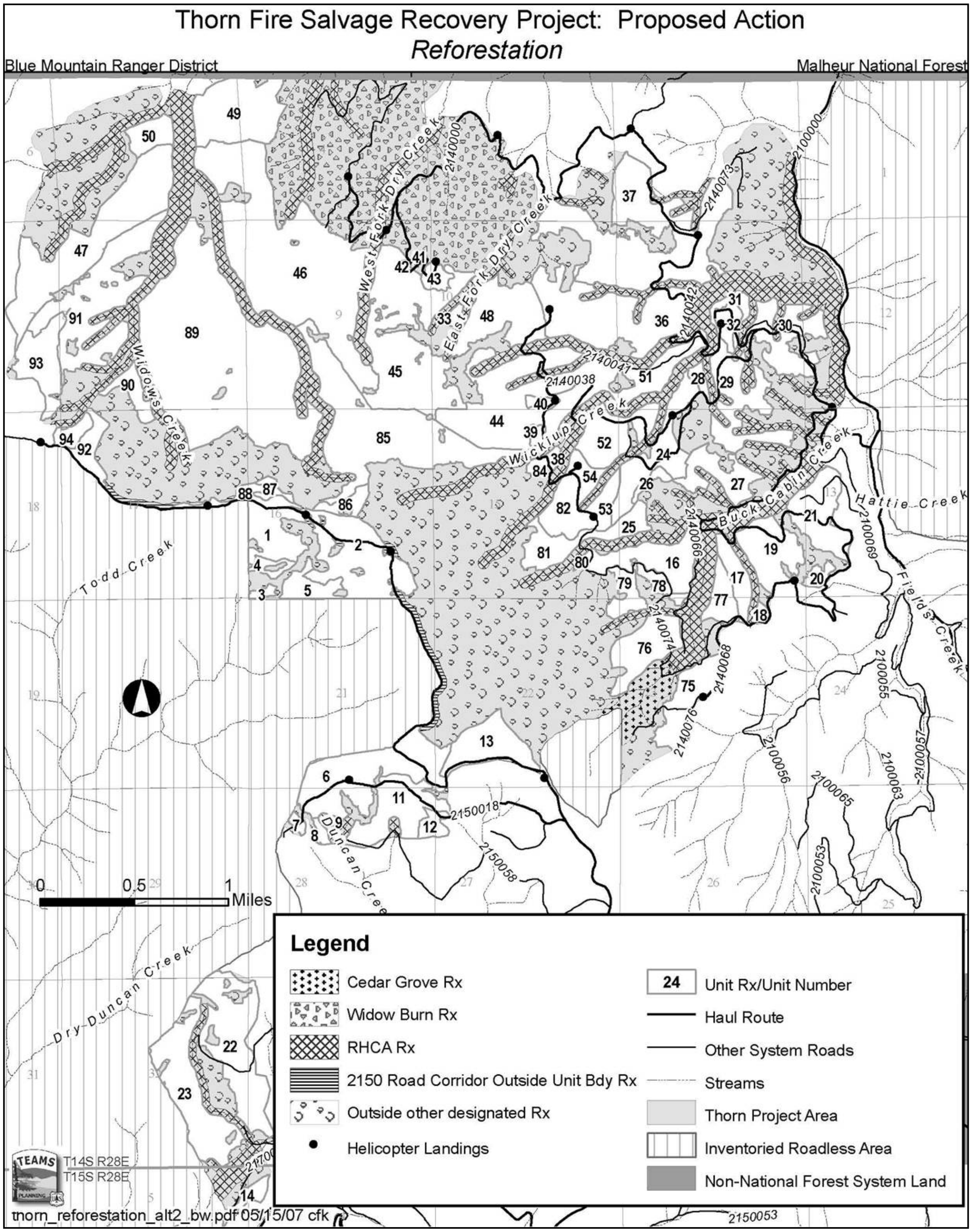
Appendix A- Figure 1. Project Location Map



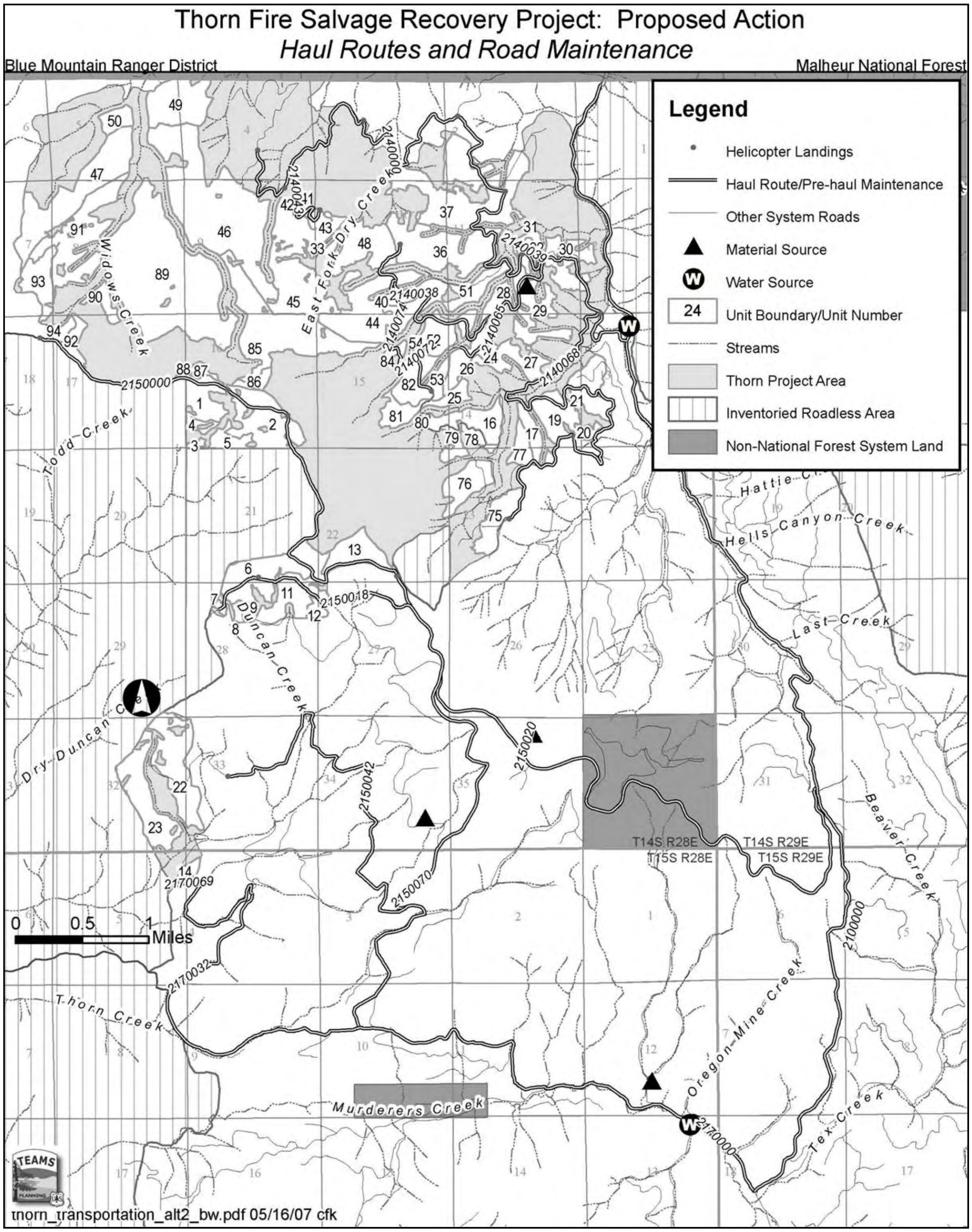
Appendix A- Figure 2a. Proposed Action Logging Systems Map



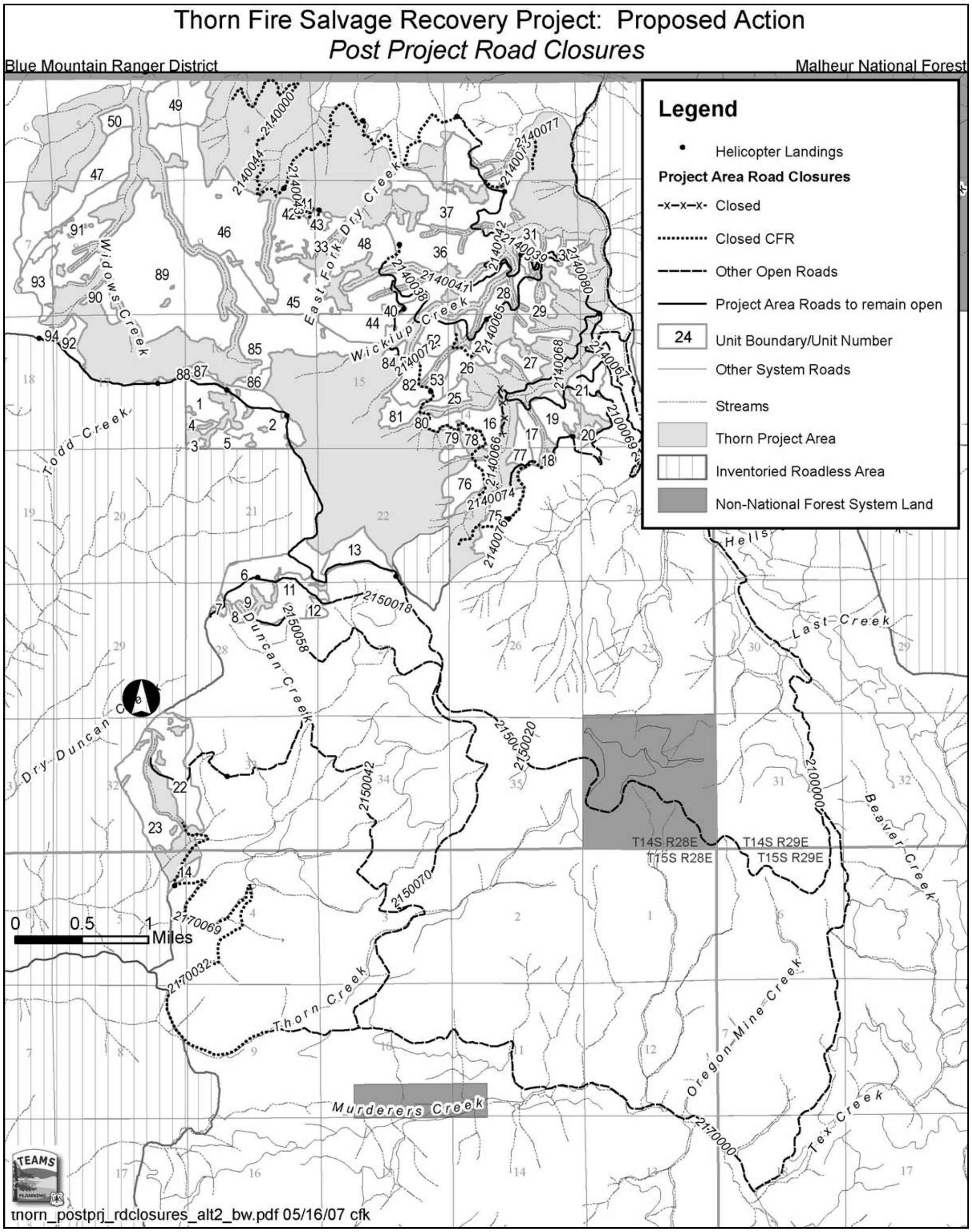
Appendix A- Figure 2b. Proposed Action Reforestation Map



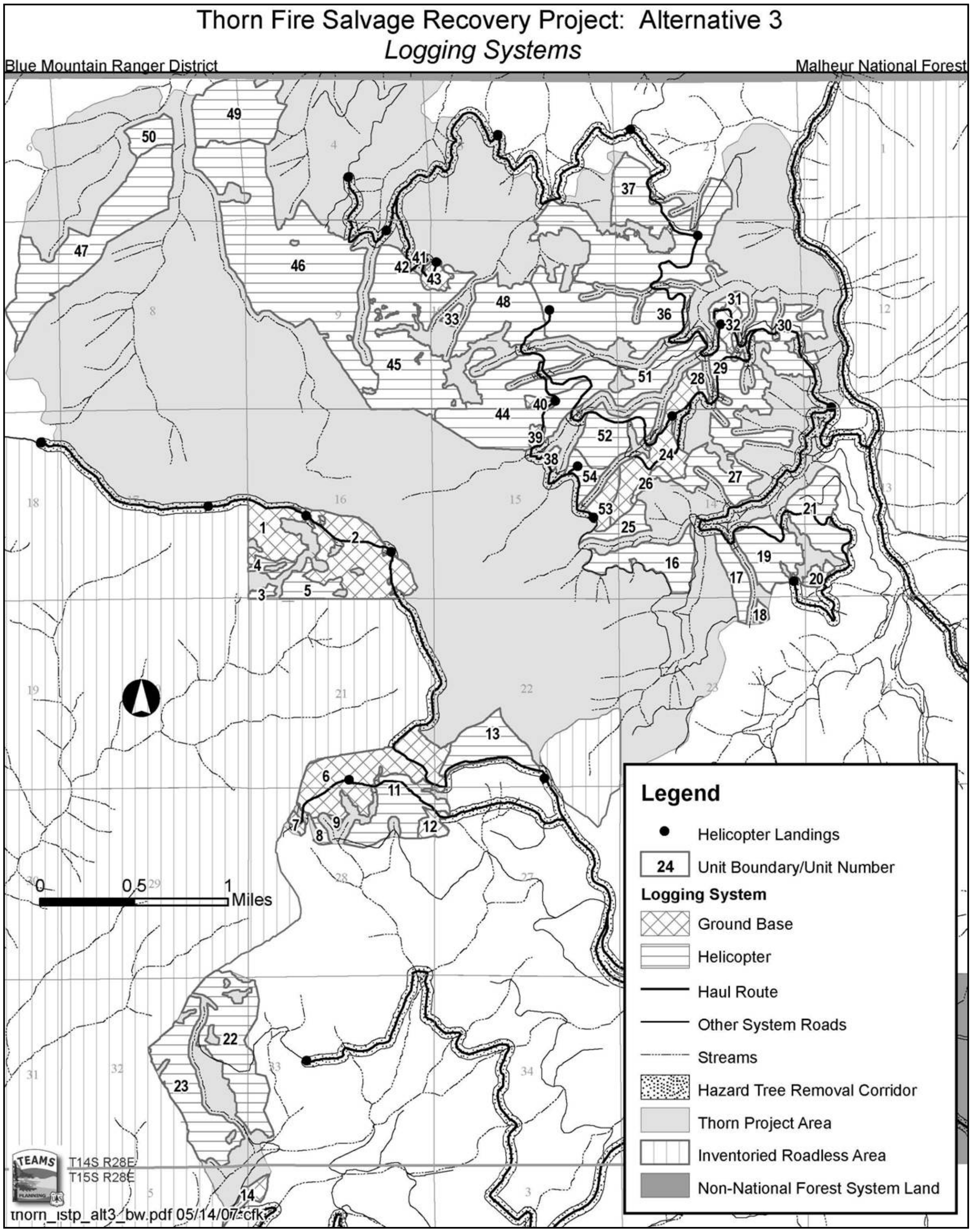
Appendix A- Figure 2c. Proposed Action Haul Routes Map



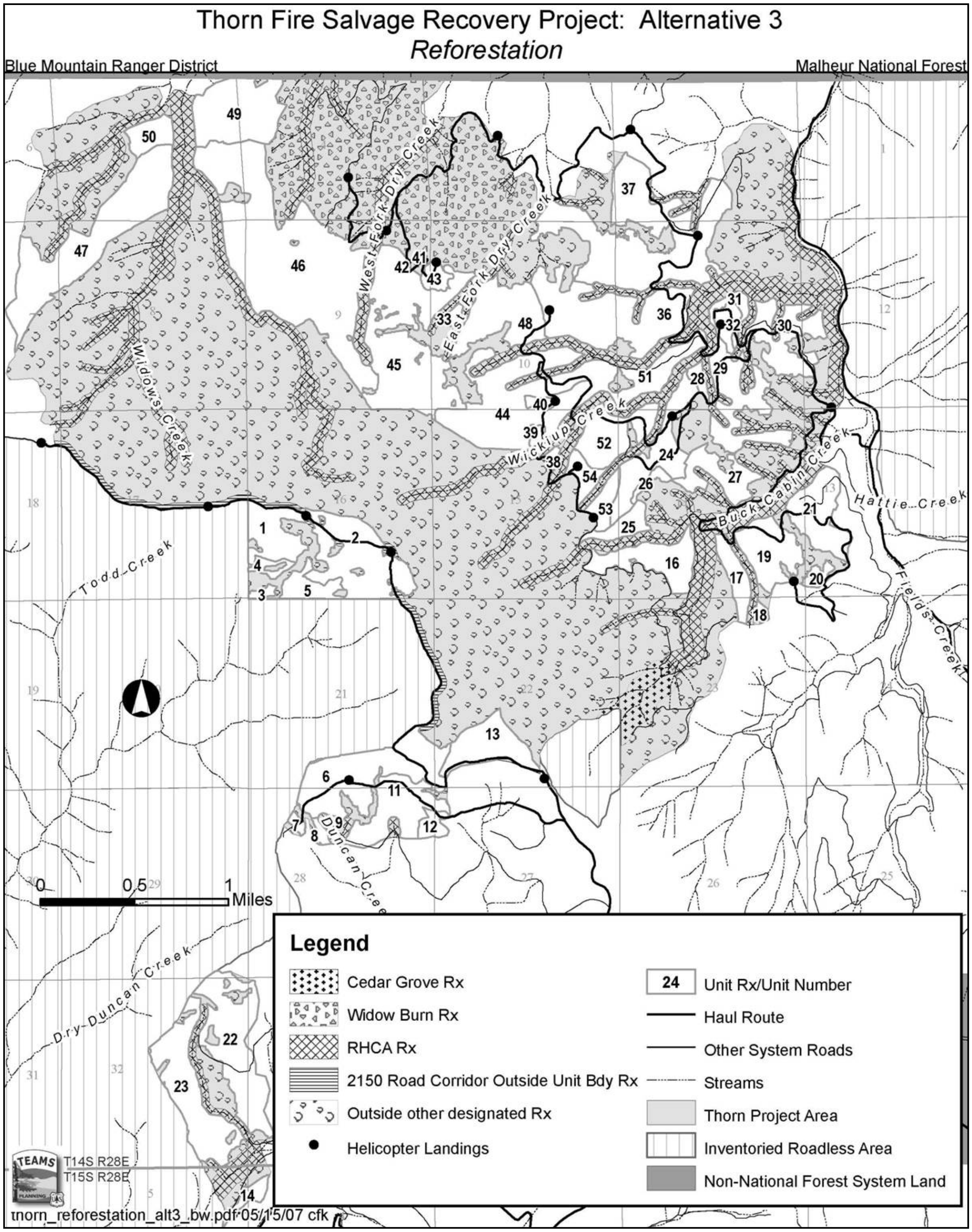
Appendix A- Figure 2d. Proposed Action Road Closure Map



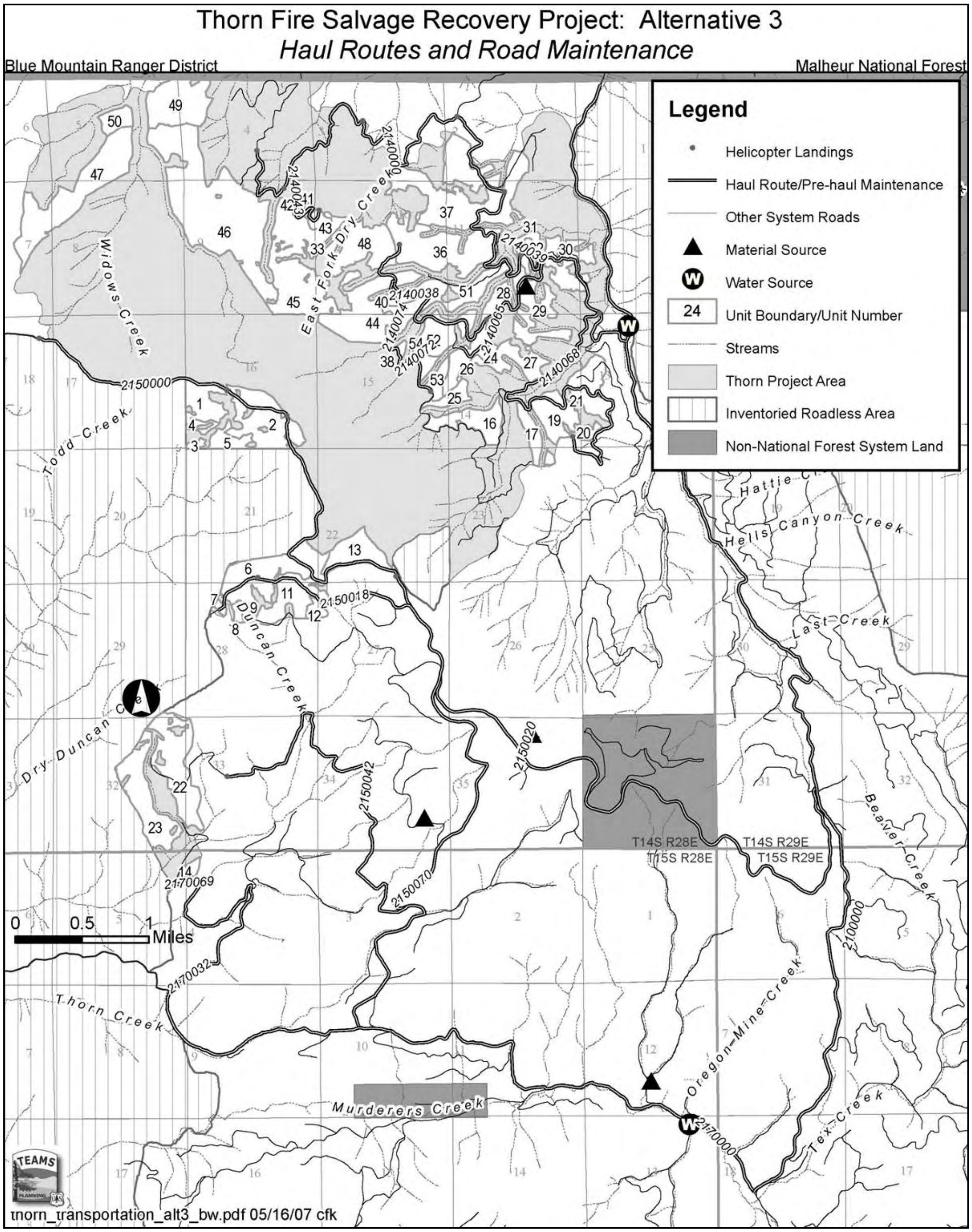
Appendix A- Figure 3a. Alternative #3 Logging Systems Map



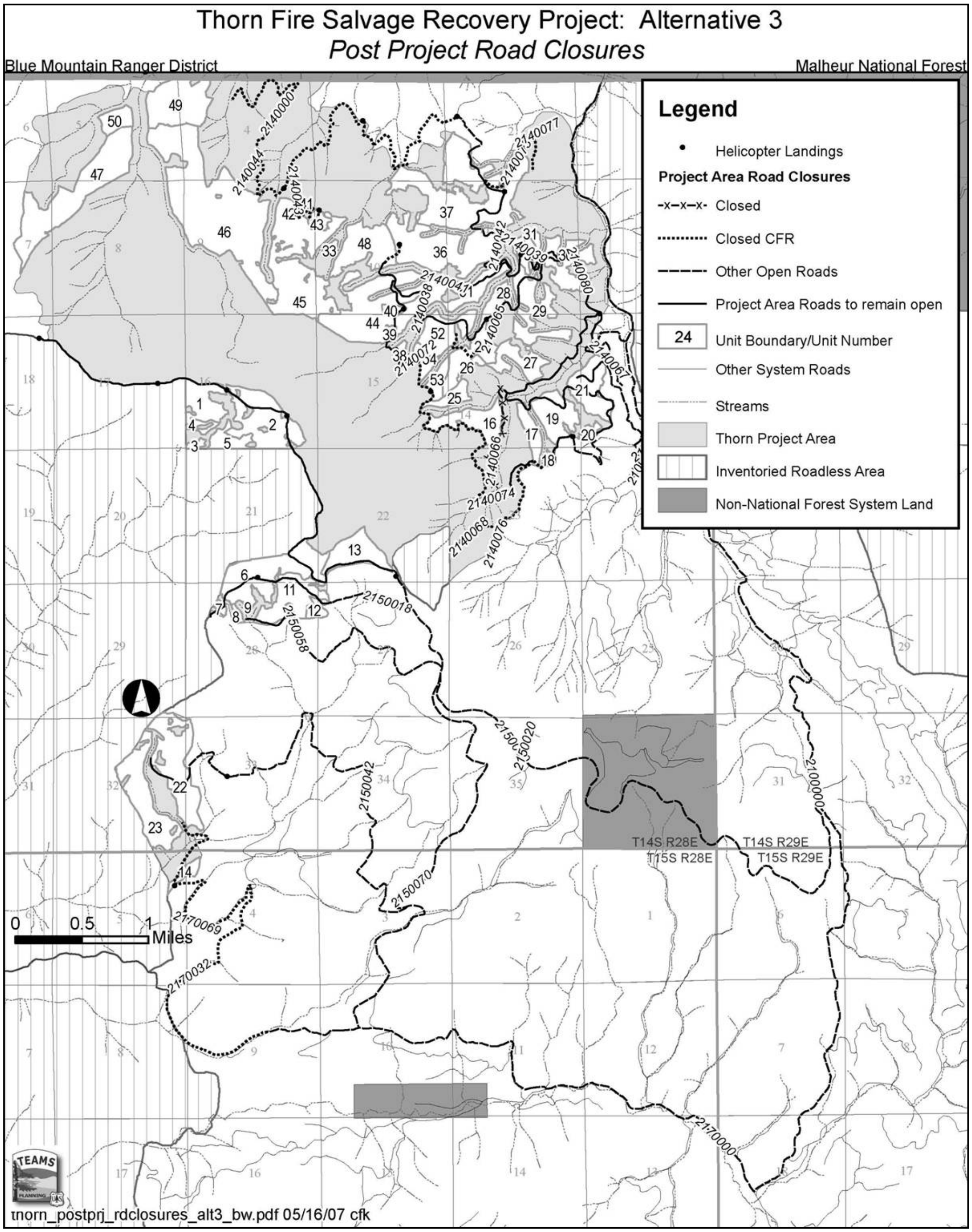
Appendix A- Figure 3b. Alternative #3 Reforestation Map



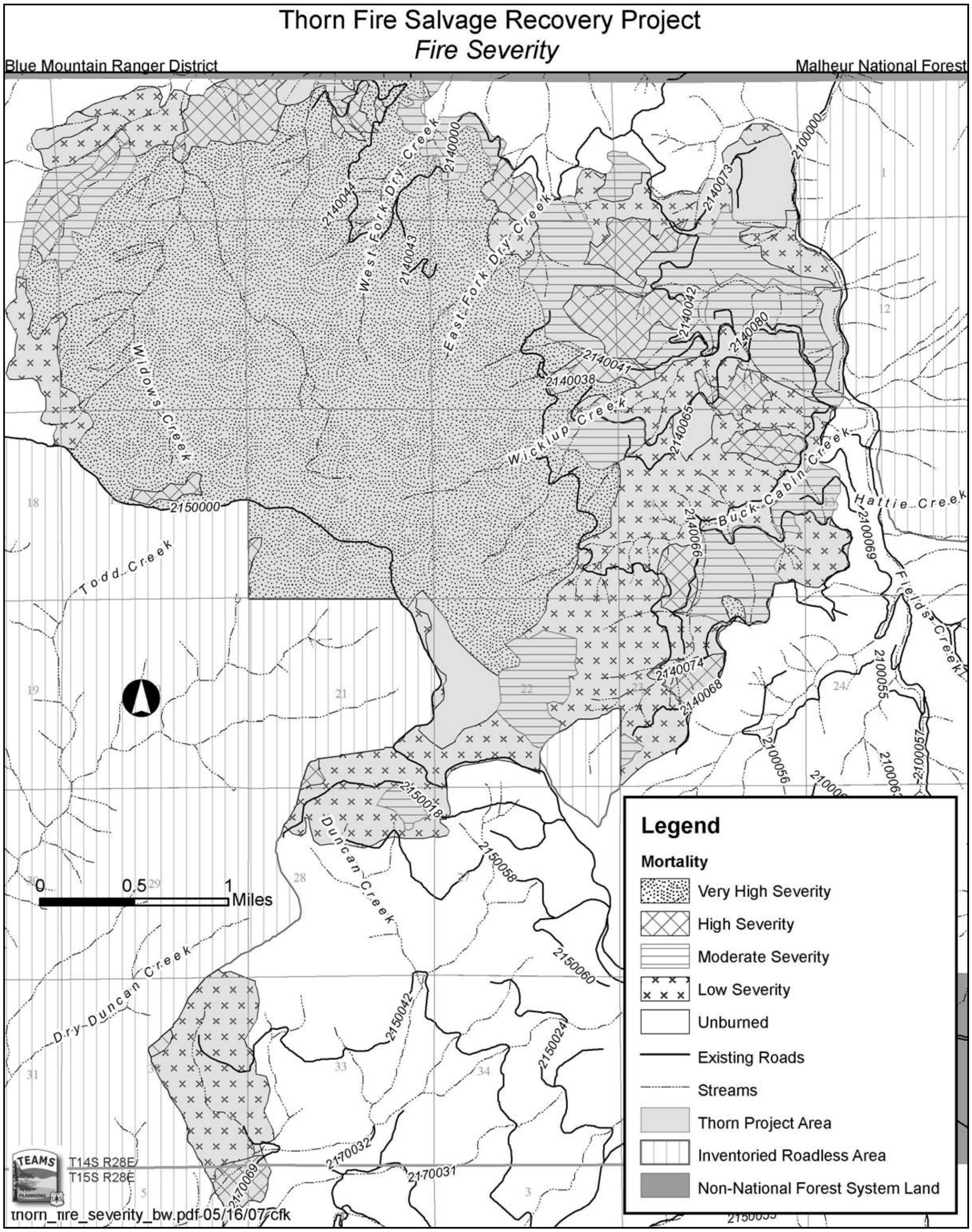
Appendix A- Figure 3c. Alternative #3 Haul Routes Map



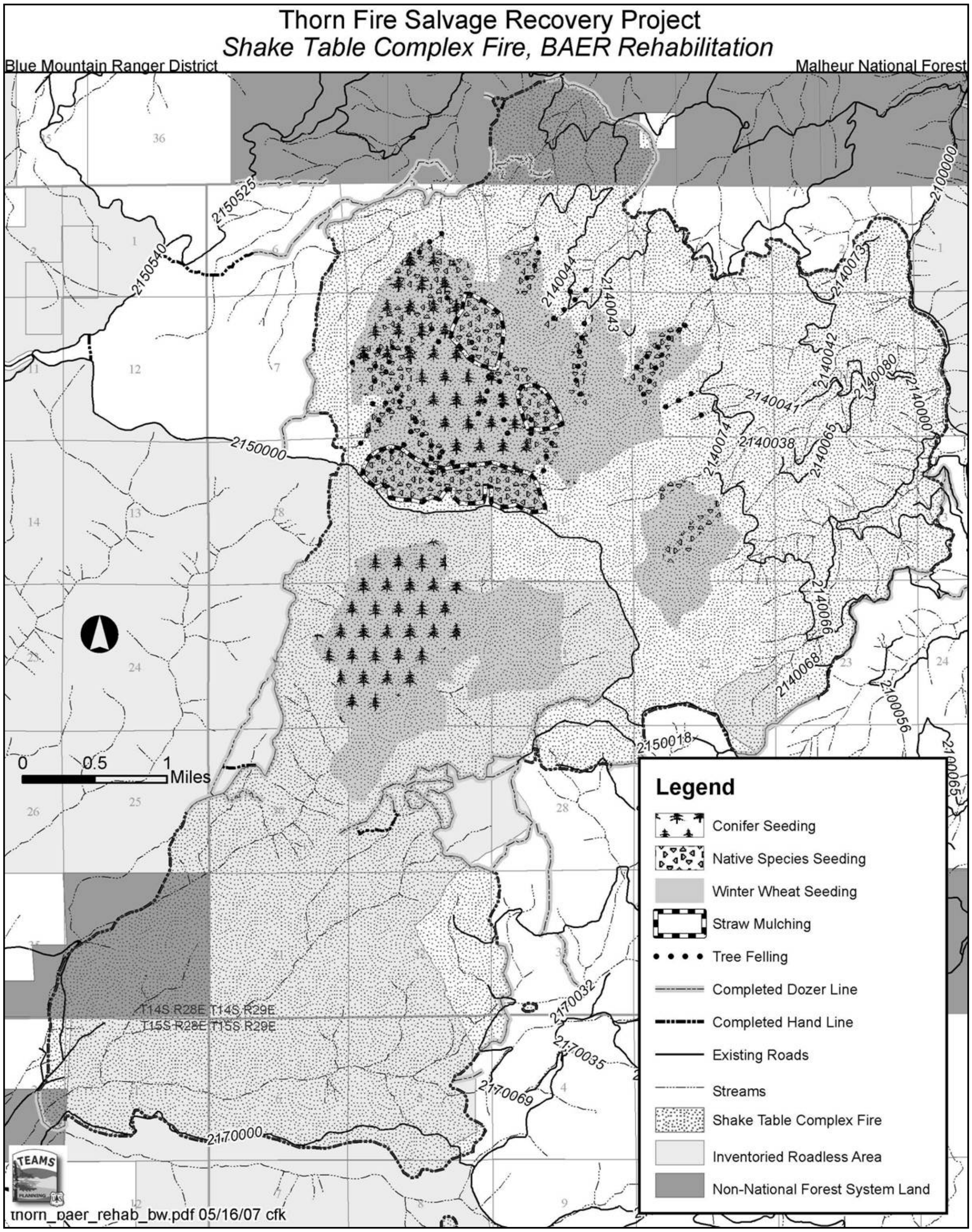
Appendix A- Figure 3d. Alternative #3 Road Closure Map



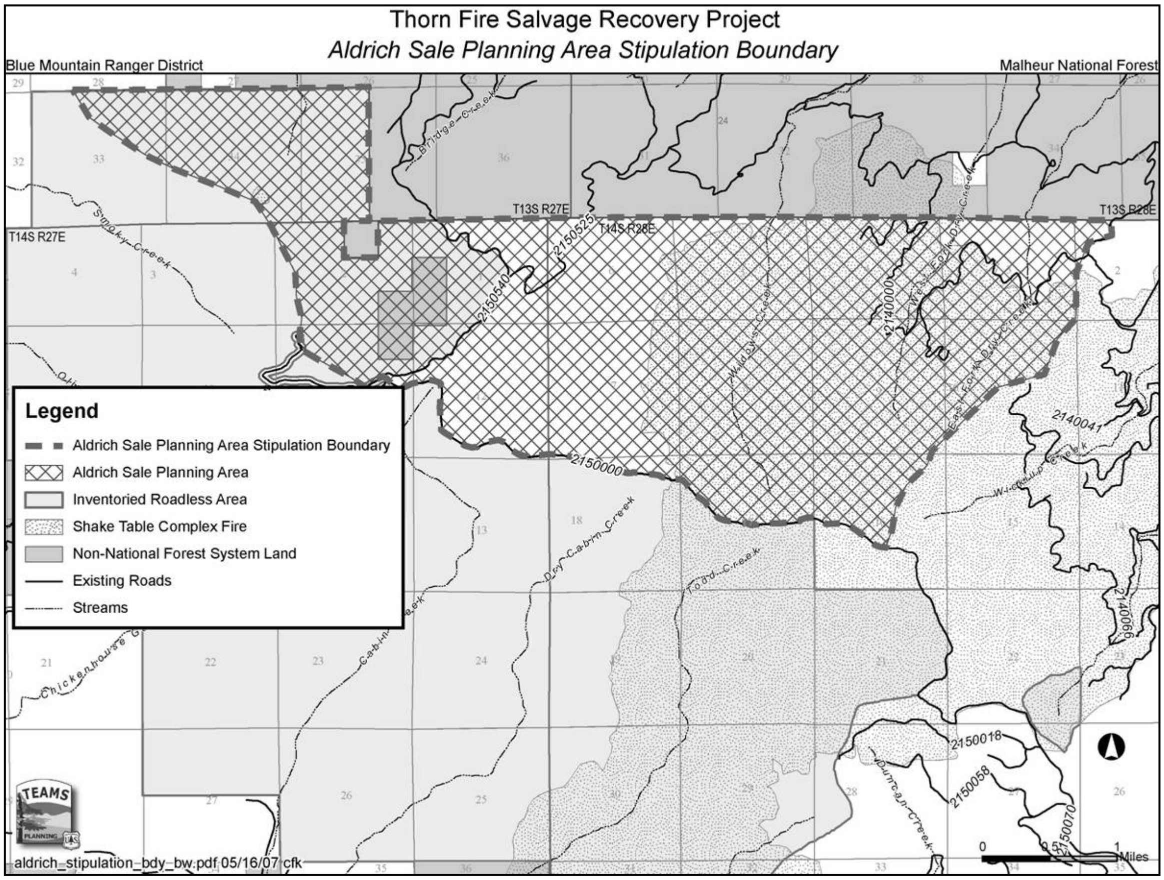
Appendix A- Figure 4. Shake Table Fire Severity Map



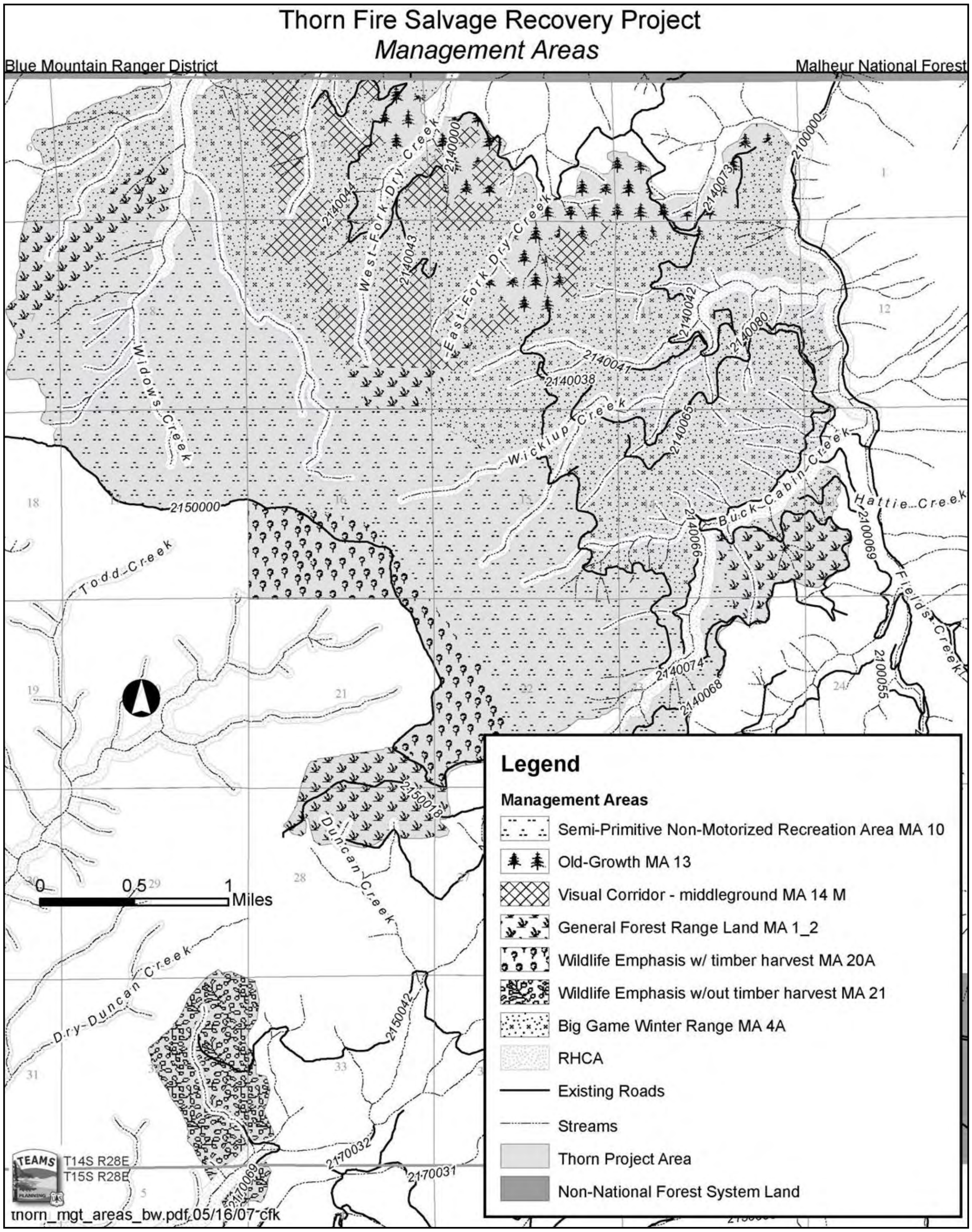
Appendix A- Figure 5. Shake Table Fire BAER Rehabilitation Map



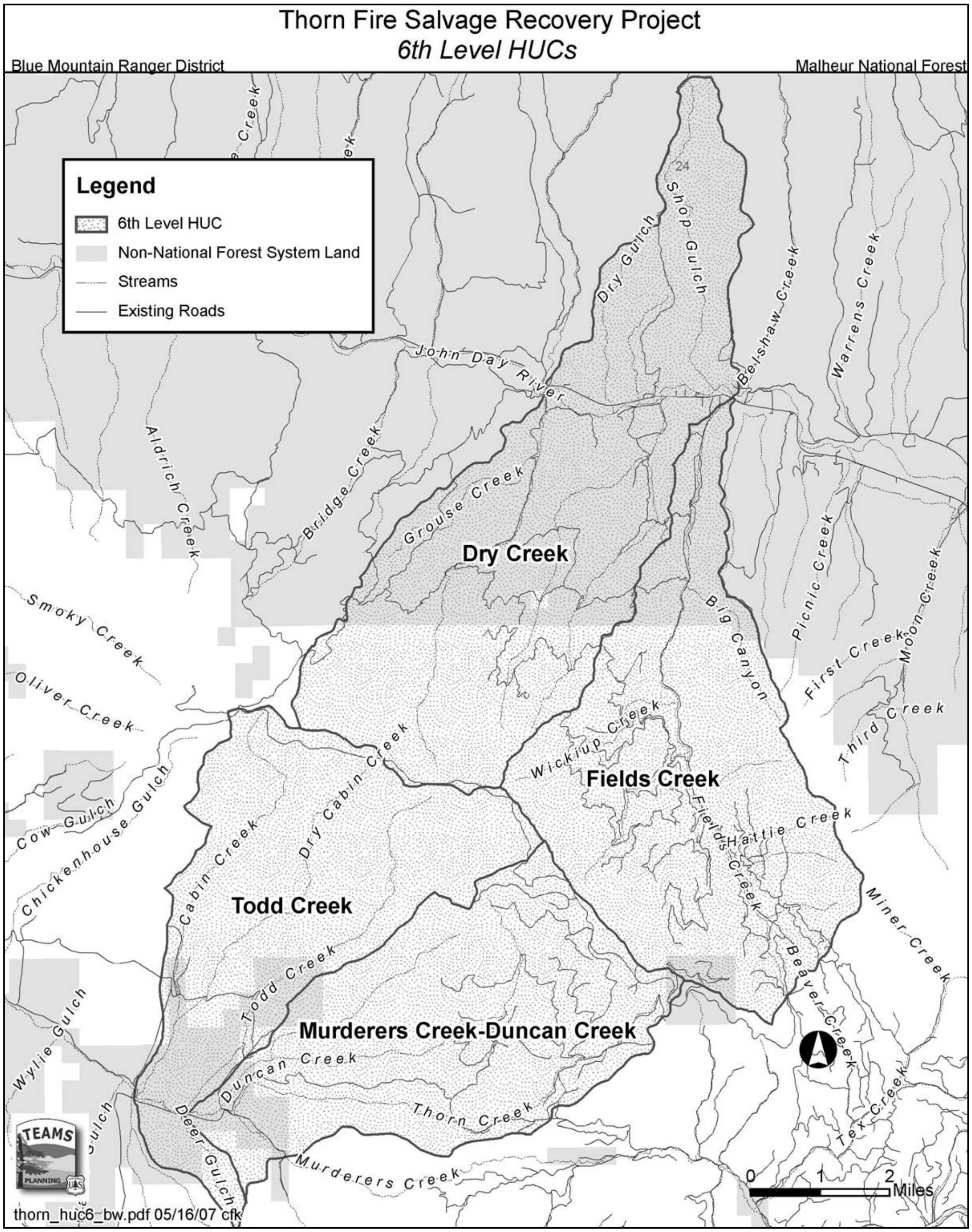
Appendix A- Figure 6. Aldrich Stipulation Area Map



Appendix A- Figure 7. Management Areas Map

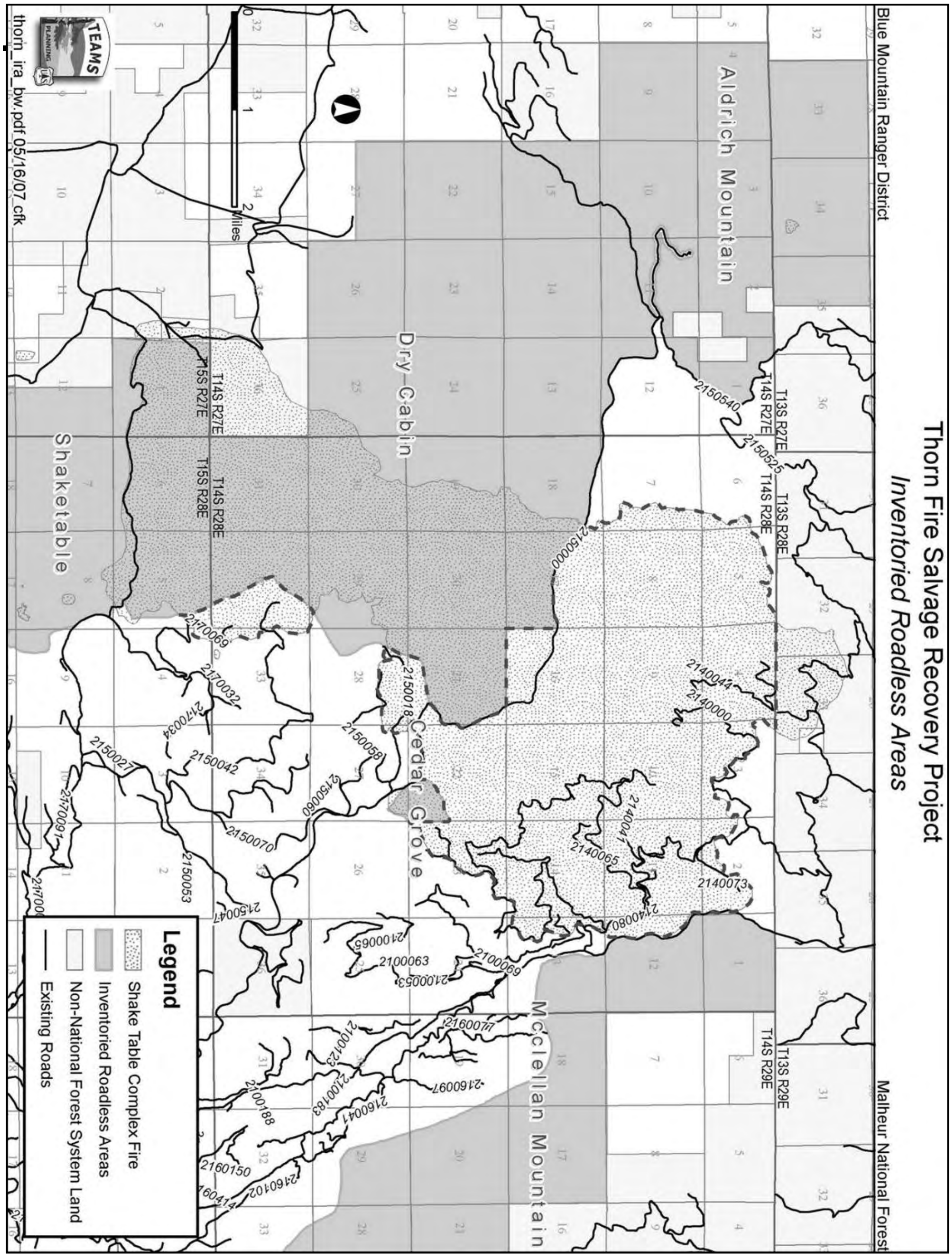


Appendix A- Figure 8. 6th Code HUC Map



Appendix A- Figure 9. Inventoried Roadless Areas

1.



APPENDIX B –TIMBER / SILVICULTURE

Appendix B-1. INFORMS Model Used for Landscape Discussion and HRV

TFSR Salvage Vegetation Data Preparation

The Shake Table Fire Complex started in the late summer of 2006 and the TFSR project proposes to salvage a portion of that fire. The following documents the procedures used to assemble vegetation data for use by the IDT team for effects analysis.

The Malheur National Forest uses an analytical tool called the Integrated Forest Resource Management System (INFORMS Version 1.3). It is used on the forest to support planning analysis of forest vegetation at the project level. This is a tool developed by the Natural Resource Information (NRIS) Tools group of the USDA Forest Service. It is essentially a Graphical User Interface (GUI) created in ORACLE that formats data entered or obtained form corporate data sources that can be used in growth and yield programs such as the Forest Vegetation Simulator (FVS) and displayed in a Geographic Information System (GIS) software package such as Arcview. INFORMS can be used to develop alternatives and contains some canned analytical tools to display effects of treatments over time.

For the TFSR Project INFORMS was used to assemble available data the forest has in the Field Sampled Vegetation (FSVeg) database which stores all stand exams the forest has taken over the years and formats it to be used with FVS. Since the area to be analyzed was not 100 percent examined prior to the fire, a tool called Most Similar Neighbor (MSN) (Crookston Moeur and Renner , 2002) is incorporated into INFORMS and used to populate any non-sampled forested polygon with data from polygons that are sampled or stand examined. Once all forest polygons are populated with data FVS grows the stands up to the planned implementation date which was set at 6/1/2007. The tool also provides ways for us to describe both pre and post fire conditions.

The Following steps were used to create the dataset. These steps are completely documented in Performing Analysis with INFORMS (Twombly 2005). In this document there are 9 steps. For this project INFORMS was used thru step 8 to create pre and post fire conditions. No treatment alternatives were modeled in INFORMS. All documentation for INFORMS can be obtained from the Forest Service Intranet website
http://fsweb.nris.fs.fed.us/products/INFORMS/documentation/aix_doc.shtml :

1. Step 1 thru 3. These steps essentially set up the project and make available the National tools to be used in creating the pre and post fire conditions. It involves entering project specific data like implementation date, user access and roles and assignment of optional tools to use. In this case all national tools were assigned and used

2. Step 4. INFORMS at this time uses ARCVIEW 3.3 and ARC/INFO as its primary spatial tool. The project is opened in ARCVIEW and the boundary of the analysis area is imported and selected. This boundary is then used to clip a polygon layer called evg, which contains all the current vegetation delineated polygons. In this step the tool clips the forest wide coverage evg to the analysis boundary and extracts from the FSVeg database any exam data that is identified in the database as a useable exam for this area. It formats the data so it can be read by the FVS growth and yield program. At the completion of the program a cover is created called

FSVEG_data that identifies which polygons are forested, non-forested and non-vegetated. It furthers identifies which polygons have stand exams on them.

A discussion of analysis boundary used is needed. The size of the area to analyze is determined by what is needed to analyze snag levels. In normal projects a sub watershed or 6 field Hydrologic Unit Code (HUC) is adequate. Region 6 uses a tool called DECAID Advisor for snag and down woody analysis. It is recommended by the authors of the advisor that for fire salvage projects, an area 5 times the size of the fire or larger is needed when analyzing snag levels. The Shake Table complex was approximately 14,000 acres so a minimum of 70,000 acres is needed for analysis. The area was enlarged to include all of or parts of sub-watersheds (6th Field HUC) that were inside the National Forest proclaimed boundary that the fire had influenced. Private land in-holdings inside the proclaimed boundary were included. The following map shows the boundary and sub-watersheds affected. Total analysis area is approximately 88,043 acres.

3. Step 5- Essentially is a verification step to make sure that stands identified as examined are truly correct and that they can represent the current forested vegetation of the polygon they were done in. .

4. Step 6: This step runs a series of programs provided by the developers of INFORMS. The programs are national tools that upon successful completion of all the tools the entire landscape is populated with exam information or treelists that can be modeled with the FVS model

a. MSN_NF_DATA_ENT. In this step non-forested examined information is entered. At this point in time there are no national protocols for non-forest data that can be incorporated automatically. INFORMS provides a way to enter various non-forest attributes such as Fuel model and percent crown cover of trees, shrubs and grass, which can be used in the non-forest MSN imputations. To date there is no data available to be used.

b. MSN_NF_INT_PREP. This step prepares the Non-forest data entered in the previous step to be used with the MSN tool. This step was NOT done. Non forest information was incorporated later from Photo Interpreted data of off 2001 1:12000 air photography.

c. MSN_FV_INT_PREP. This step grows all the examined stands to the year of the Landsat satellite scene used in the later MSN step. The most current Landsat Scene the forest has was from 2003.

d. MSN_EXT_PREP. This tool prepares the data created in the previous step for use with the MSN tool

e. MSN. This process uses Landsat satellite imagery, and a digital elevation model to impute data from inventoried polygons to polygons that have no inventory. It does this by finding the most similar neighbor polygon that has a similar signature from the Landsat scene and other digital elevation model attributes like aspect slope, solar insolation etc. For more information see the INFORMS documentation or the “Users Guide to the Most Similar Neighbor Imputation Program Version 2”. (Crookston, Moeur, Renner) 2002.

f. MSN_REPORT. These are the results of the run. It provides information on the validity of the run and the error around the mean one can expect for certain attributes like basal area, Stand Density Index, percent crown cover, height, and volume. It also provides the number of variates used in the algorithms of the MSN run and the r squared value used for goodness of fit of the algorithms. It is recommended that for EA or EIS defense a minimum of 4 variates need to be used and a the r squared vale is greater than or equal to .8. If it is not then more stand-exam information needs to be collected. For the TFSR Project the run meets those minimums.

g. MSN_FOR_USE_LOAD. This step adds additional attributes into the FSVEG_DATA cover discussed earlier and identifies which stands were used as the most similar neighbor. In this cover a field is created and called USE1_GIS_LINK. This field identifies the stand that was used to represent the polygon It also provides an estimate of which MSN imputed polygons are imputed as OK or POOR. .

5. Step 7 Creates a default no Action alternative. A tool called VEG_DATA_PREP is now run which grows all the forested stands up to the implementation date in the FVS model. The date was set at June 1,2007 in the setup steps. . Once completed the CREATE_VEG_COVER is run and it creates a cover called base_fvs_veg for each of 5 decades into the future starting with 2007 and ending in 2047. It includes most of the attributes in the FSVEG_DATA cover plus stand density index, basal area, quadratic mean diameter, over story DBH, Species and volume of the three most abundant species.

The tool called FARSITE_PREP was also run and creates a cover called stand-fire for each of the decades identified above. This tool adds attributes to the FSVEG_DATA cover that are useful for specialists concerned with fire risk.

6. Step 8. Creates a No Action plus alternative. There were two alternatives created. The first is the Pre Fire Existing Conditions and the second was Post Fire Conditions. The base FVS model does not incorporate the most recent information on density management. Mortality is based on a density model where at the point where the density is above 55percent of the maximum level possible for that stand natural mortality begins to increase at a faster rate as time goes on. The default maximums in the model are set using the Plant Association code assigned to that stand when it is extracted from the database. However these maximums are generally set to high for stands that are mostly in the mixed conifer Plant Associations. This assumption is based on a research note done in 1994 that Suggested Stocking Levels for Forest Stands in the Blue Mountains of Northeastern Oregon and Southeastern Washington Cochran and Others 1994). In this research note they suggested ways to calculate upper and lower management zones by Plant Association. David Powell Silviculturist of the Umatilla National Forest in 1999 took this research and published a document called Suggested Stocking Levels for Forest Stands in Northeastern Oregon and Southeastern Washington: An Implementation Guide for the Umatilla National Forest. This guide is also applicable to the Malheur National Forest and provides information necessary to calculate Maximum Stand Density Index (MAXSDI) that the model uses .

To adjust MAXSDI a cover was created for each forested polygon and the plant association code extracted from FSVEG database for the sampled stands and then assigned to each forested polygon that each of the 270 sampled stands was used on. These assignments were then manually adjusted to reflect local and personal knowledge of the area where dry forest types were assigned by the imputation process and were changed to a moist forest type. Keyword sets were created for each of the plant associations that changed MAXSDI. Keyword sets were also created to calculated structure class using the STRCLASS keyword and a forest developed set of keywords using a TPA by diameter and a series of IF Ten Statements to assigns another estimate of structural stage. Other keywords were also applied to calculate additional variables that the forest generally finds useful. FVS provides ways of importing any calculated variables into a database or spreadsheet which then can be attached to the covers describer earlier.

In INFORMS prescriptions are created by using activities or a series of activities that point to keyword sets used by FVS. Prescriptions are then assigned using a prescription assignment tools. In this case the GIS cover assignment tool was used to assign MAXSDI, calculation of structure stage, snag levels for the DECAID advisor, and other calculated variables. The Pre Fire Condition or Alternative in INFORMS was then created using this prescription assignment.

The Post-Fire condition was created by copying the Pre-Fire Condition and then assignment of keyword sets that killed trees based on estimated mortality caused by intensity of the burn. To do this, a mortality map was created by using the burn intensity map used in the Burn Area Emergency Recovery plan (BAER) and overlaying it on Digital Globe's Quickbird Satellite Imagery acquired immediately after the fire. This imagery is high resolution and provides up to 1/2 meter resolution in true color, panchromatic and infrared bands. Keyword sets were developed to estimate Very High, High, Moderate and Low mortality.

Upon completion of the above steps the base_fvs_veg and stand_fire covers were imported as feature classes into a geodatabase feature dataset for each of the 5 decades. This then became the primary vegetation description of pre and post fire conditions used in furthur project analysis

Results

As discussed in the introduction INFORMS is a tool that helps gather available data in corporate sources and structures that are specific to the project analysis area. It then formats that data for uses in growth and yield modeling programs like FVS. In a perfect world with unlimited budgets and time the ideal situation would be to have 100percent of the polygons with a stand exam. This is generally not possible for most projects. In the past pure remote sensing was used quite often to do analysis either by human air photo interpretation or computer aided pixel analysis. This was quick way to get information for extremely large area but only could give you general estimates of species densities and sizes. None of these sources of vegetation data could be used in growth and yield models and was generally useless at stand levels or landscapes below a watersheds 5th field HUC. In most cases then people would then go out and walk through stands and make general interpretations of what they saw and combined it with the remote sensing product for project implementation analysis. In many cases they also had stand exam information and would identify stands that were not examined but were similar enough to the examined one and use that data for all unexamined ones.

Advantages

In 2002 the process called MSN was developed and combined both remote sensing techniques and stand level information. The technique essentially populates every stand polygon in the project area using a systematic and repeatable method with treelist information that can be read in to the FVS growth and yield model. This is the basic advantage of INFORMS it incorporates MSN and provides a systematic method of assignment of treelists to stands with no inventory. The other advantage is that now one has treelist information that can be summarized in traditional expressions of densities and sizes, such as basal area, trees per acre, diameter, volumes, stand density index, structural stages, stand heights along with almost any other attribute that can be arithmetically arrived at.

Accuracies and Problems

The general goal for any project is to accurately predict for each stand what is there on the ground. In this ideal situation you could display spatially various attributes like structural stages, snag levels, basal area and so on over the landscape. Obviously then the closer to 100percent inventory one had the more dependable the maps produced would be. However it is impractical and very expensive to 100percent inventory every stand and in many instances we have to use what is available especially in salvage projects. Therefore at a minimum, it is recommended that 10percent of the stands be inventoried in a project area, to derive a reasonable estimate of landscape averages with the MSN process. In practice it has been somewhat lower around 7 or 8 percent on this forest. The exams need to be distributed in most if not all the forest types and sizes. At the minimum number of stands for a project the overall averages or percentages of acres in various groupings have been dependable and users on the Malheur have been happy with the results and believe it is giving an accurate description. It also has helped narrow down what stands that need to be treated or identify stands that may qualify as late seral stages. However at this level it only has been dependable on a stand by stand basis 60 to 70 percent of the time when they field visit a stand of interest. In some cases it is even less accurate for example Plant Association calls. Therefore it is estimated that when 30percent to 50percent of the stands are inventoried, the MSN process will begin provide estimates that accurately depict characteristics at the stand level.

For the TFSR Project, 270 stands were examined of the 3545 stands clipped out of the vegetation polygon coverage called evg. This represents approximately 8percent of the stands. The exams are fairly well distributed in most of the forest types except for juniper dominated areas and unmanaged moist forest stands.

The data provided through MSN and INFORMS for this project is best used when aggregated up to a higher level of grouping. For example each stand was given a Plant Association call and I indicated above that it predicts this attribute poorly on a stand by stand basis when inventoried stands are at this level. However when each stand is placed into the Potential Vegetation Groupings (PVG) of Moist, Dry and or Cold forests using a crosswalk the three blue mountain forests have agreed to for each Plant Association code, it reflects what is on the ground. In the TFSR project area the north aspects at the highest elevations are dominated by grand fir and Douglas-fir moist forest with little ponderosa pine and as one progresses lower in elevation the stands increase in dominance of ponderosa pine and classify as dry forest but are still mixed conifer forests of pine Douglas-fir and some grand-fir. The MSN and INFORMS created data sets support this local knowledge. Likewise on the south aspects there is no moist forest and the highest elevations are primarily mixed conifer ponderosa pine dominated dry forest and at the lower elevations become pure ponderosa pine with some juniper. The datasets created by INFORMS and MSN for this project when displayed in Arcview also support this local knowledge.

Submitted:

Edward H. Uebler

Forest Analyst April, 2007

Appendix 1a MSN Report

INFORMS Condensed MSN Summary
Report Name: msn_report.txt
Report Path: /msn
Date Created: Tue Dec 12 08:34:29 2006
Created By: ehuebler
Project Name: PC_THORN
---------- Report for Forested Vegetation ---------------
MSN Run Information:
Number of variates used is 5
The threshold value is 0.08159
There were 5 notably large distances among reference observations.
This represents 1.9 percent of the 270 references.
There were 232 notably large distances between reference and target observations.
This represents 7.1 percent of the 3247 imputations.
Canonical R Squared of 1st variate is: 0.78482

Attribute	Average Difference
Basal Area	41
Stand Density Index	78
Stand Height	9
QMD	2.9
Total CuFt Volume	1236
Canopy Cover	11

Total number of reference stands: 270
The average difference is the absolute difference between all the observed and imputed values.
The absolute difference between the observed and imputed value is calculated for each stand and then these differences are totaled. This total is divided by the total number of reference stands to obtain the average listed above.
Note: The actual values with all the decimal places are used in the Calculations. A rounded value is displayed in the report except for QMD

Appendix B-2. Modeling Assumptions and Process

Table B-2-1. Silv App 1 Model inputs to FVS to simulate sample stand attributes over time.

ALTERNATIVE 1	WARM-DRY	MOIST
LOW SEVERITY All distances from edges	establish 300 PP nats at age 10, then then 50 PP tpa every third cycle, beginning cycle 5	establish 300 (200 pp, 100 df) nats at age 10, then then 50 (25pp, 25df) tpa every third cycle, beginning cycle 5
MODERATE SEVERITY Less than 200 feet from seedwall	establish 300 PP nats at age 10, then then 50 PP tpa every third cycle, beginning cycle 5	establish 300 (200 pp, 100 df) nats at age 10, then then 50 (25pp, 25df) tpa every third cycle, beginning cycle 5
HIGH SEVERITY Greater than 200 feet from seedwall	establish 300 pp nats at age 40, then then 50 (25df. 25pp) tpa every third cycle, beginning cycle 7	establish 300 (200 pp, 100df) nats at age 40, then then 50 (25 pp 25 df) tpa every third cycle beginning cycle 7
VERY HIGH SEVERITY Greater than 200 feet from seedwall	establish 300 pp nats at age 60, then then 50 (25df. 25pp) tpa every third cycle, beginning cycle 8	establish 300 (200 pp, 100df) nats at age 60, then then 50 (25 pp 25 df) tpa every third cycle beginning cycle 8
ALTERNATIVES 2 and 3	WARM-DRY	MOIST
LOW SEVERITY All distances from edges	Salvage as prescribed, plant as described(75 pp, 75 df, 40percent survival), establish 100 pp nats at age 10, then 50 tpa pp every third cycle, beginning cycle 5	No salvage. Plant as described (150 tps, 75 pp 75 df, 70percent survival), establish 300 (200pp, 100df)nats at age 10, then 50 tpa (25 pp, 25 df) every third cycle beginning cycle 5
MODERATE SEVERITY Less than 200 feet from seedwall	Salvage as prescribed, plant as described (300 pp, 40percent survival) , establish 100 pp nats at age 10 then then 50 pp tpa every third cycle	No salvage. Plant as described (230 pp, 120 df, 60percent survival), establish 100 (75pp, 25 df) nats at age 10 then then 50 tpa (25 p, 25 df) every third cycle beginning cycle 5
HIGH SEVERITY Greater than 200 feet from seedwall	Salvage as prescribed, plant as described (300 pp, 40percent survival) , establish 100 pp nats at age 40 then then 50 pp tpa every third cycle beginning cycle 7	No salvage. Plant as described (230 pp, 120 df, 60percent survival), establish 300 (200pp,100df) nats at age 40 then then 50 tpa (25 p, 25 df) every third cycle beginning cycle 7
VERY HIGH SEVERITY Greater than 200 feet from seedwall	Salvage as prescribed, plant as described (300 pp, 40percent survival) , establish 100 pp nats at age 60 then then 50 pp tpa every third cycle beginning cycle 8	No salvage. Plant as described (230 pp, 120 df, 60percent survival), establish 300 (200pp,100df) nats at age 60 then then 50 tpa (25 p, 25 df) every third cycle beginning cycle 8

TFSR FVS modeling process for Forested Vegetation Section Effects

The primary uses for FVS modeling are to compare the relative differences through time, of structure stage development, snag densities, and fuel conditions

Representative stands will be selected for each PAG (warm-dry, and cool-moist), and for each burn severity; very high, high, moderate, low and unburned. Stand selections will be from the stands inside the project area, and will include, where available, measured stands, but to reach about six stands in each condition, imputed stands may be included.

INFORMS keyword .kcp files will be used as a basis for each simulation, because they were developed to simulate conditions immediately after the fire.

With that basic simulation, salvage will be added to the simulation and regeneration will be added to the simulation to show the effects of those activities on future stand development.

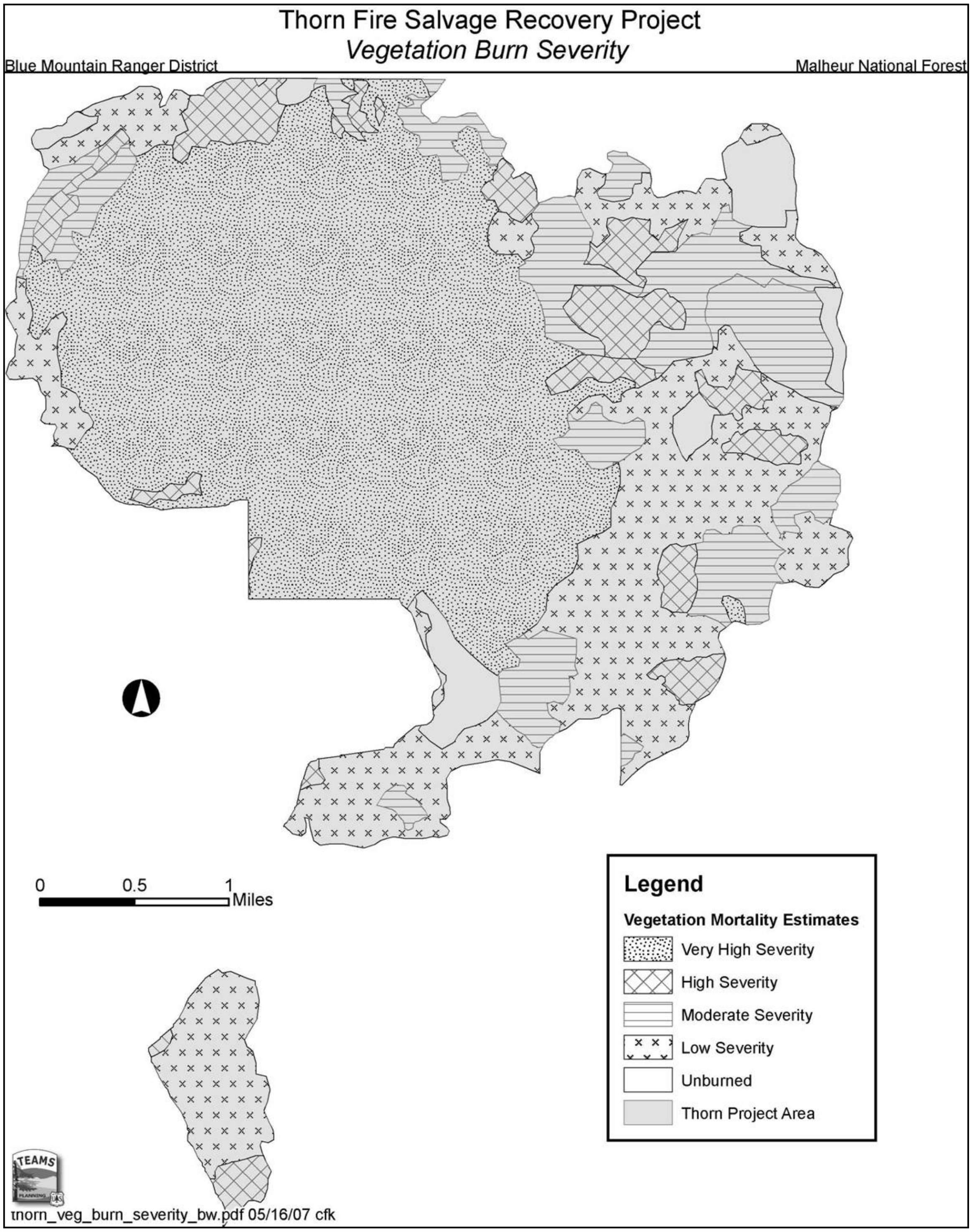
Both planting and natural keywords will be used to simulate regeneration at the assumed densities, timing and species (described in “Analysis Methods in Silviculture specialist report).

Note that results from this process will not be directly comparable to the results from initial INFORMS runs for pre- and post-fire. This is because INFORMS assigns attributes to each site in the entire area, while the FVS used to simulate future conditions uses representative stands, and average per-acre conditions, which are then proportioned across the project or subwatershed area. The FVS modeling will be used to look at relative proportions of structural stages in the future, and may not compare well with INFORMS existing conditions.

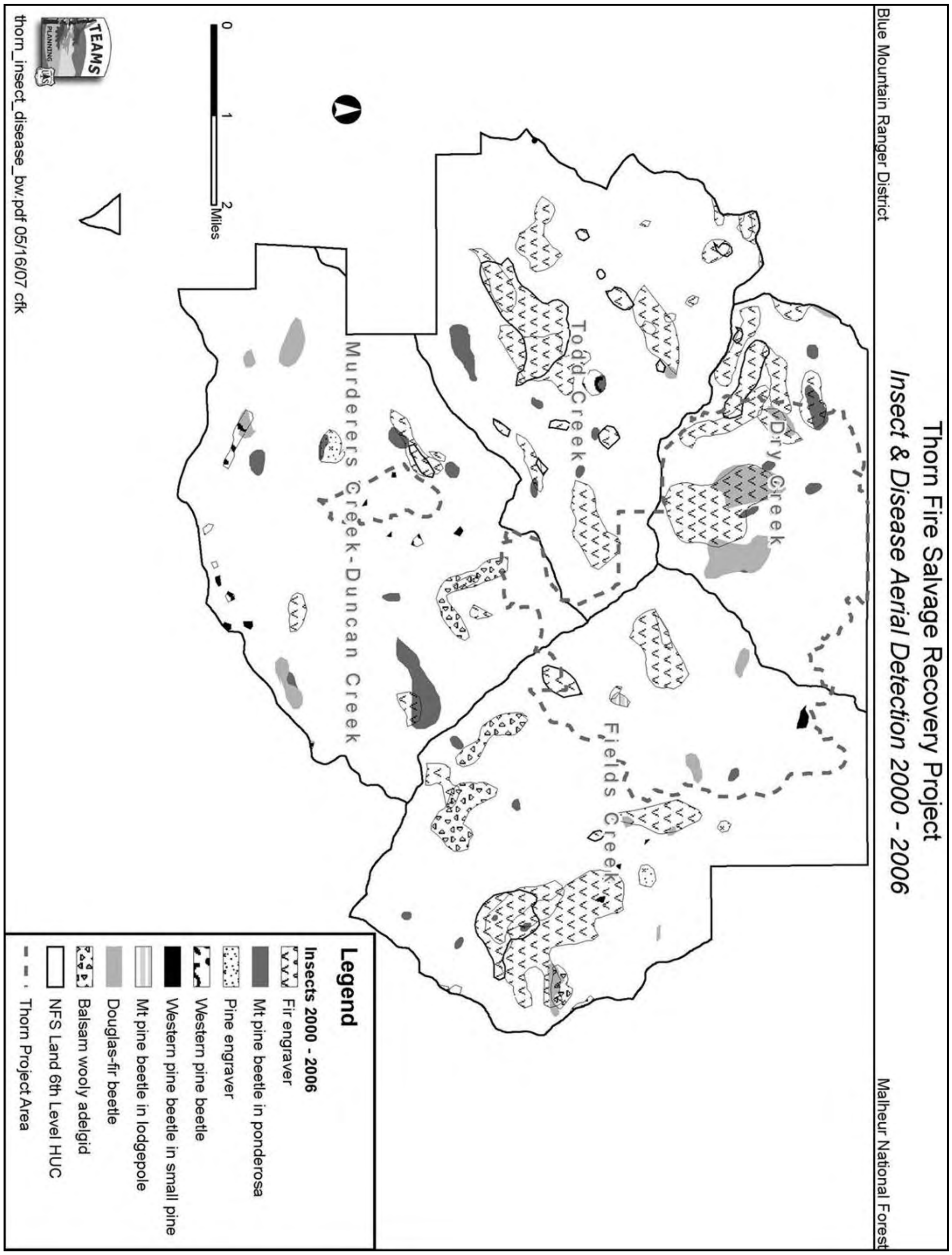
The process steps include:

1. select representative stands
2. bring to common starting year (done by informs keywords)
3. increase the number of cycles to 17
4. Alts 2 and 3: planting; use 2009, because it is at the mid-point of the 4-year planting period (both PAGs)
5. Alt 1 and to model the half of stands in Alts 2 and 3 that will regen on their own. naturals established at year 10 for low severity burns
6. Alt 1: naturals established at year 20 for moderate burns
7. Alt 1: naturals established at year 40 for high severity burns
8. Alt 1: naturals established at year 60 for very high severity burns
9. Alts 2 and 3: invoke salvage keyword at year 2007 for the Warm-Dry PAG. Moist types are not included in the Proposed Action or Alternative 3 model removal of 85percent of dead trees, used diameters from 9.0 to 999 inches. Leave 10percent as down material
10. Alts 2 and 3: Do not model salvage in moist PAG, but do model planting
11. Plant/Naturals keyword: Plant as appropriate. Establish naturals at 10 years for Low, 20 years for Mod, 40 years for High and 60 years for Very High.

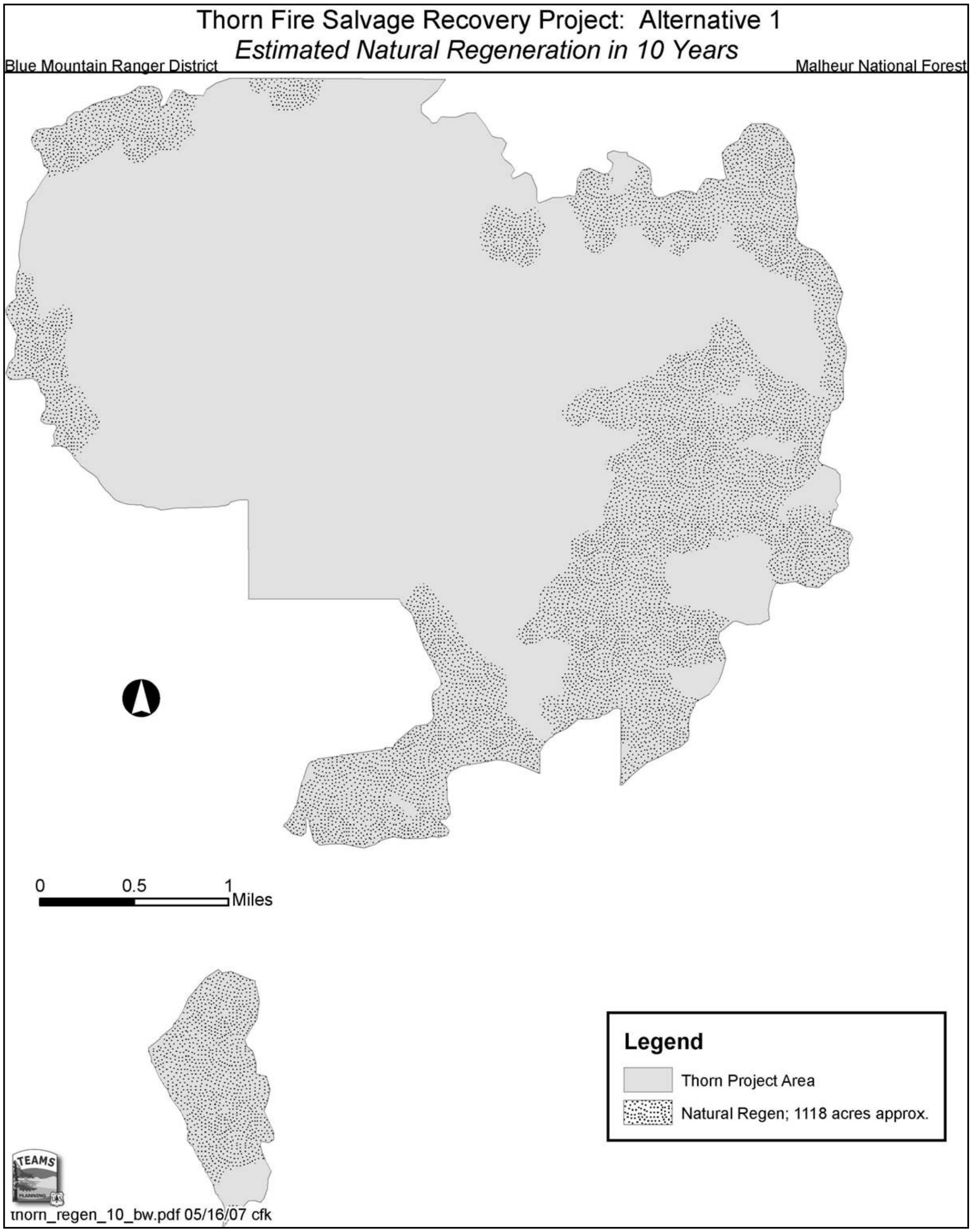
Appendix B-3. Map of Vegetation Burn Severity and Mortality



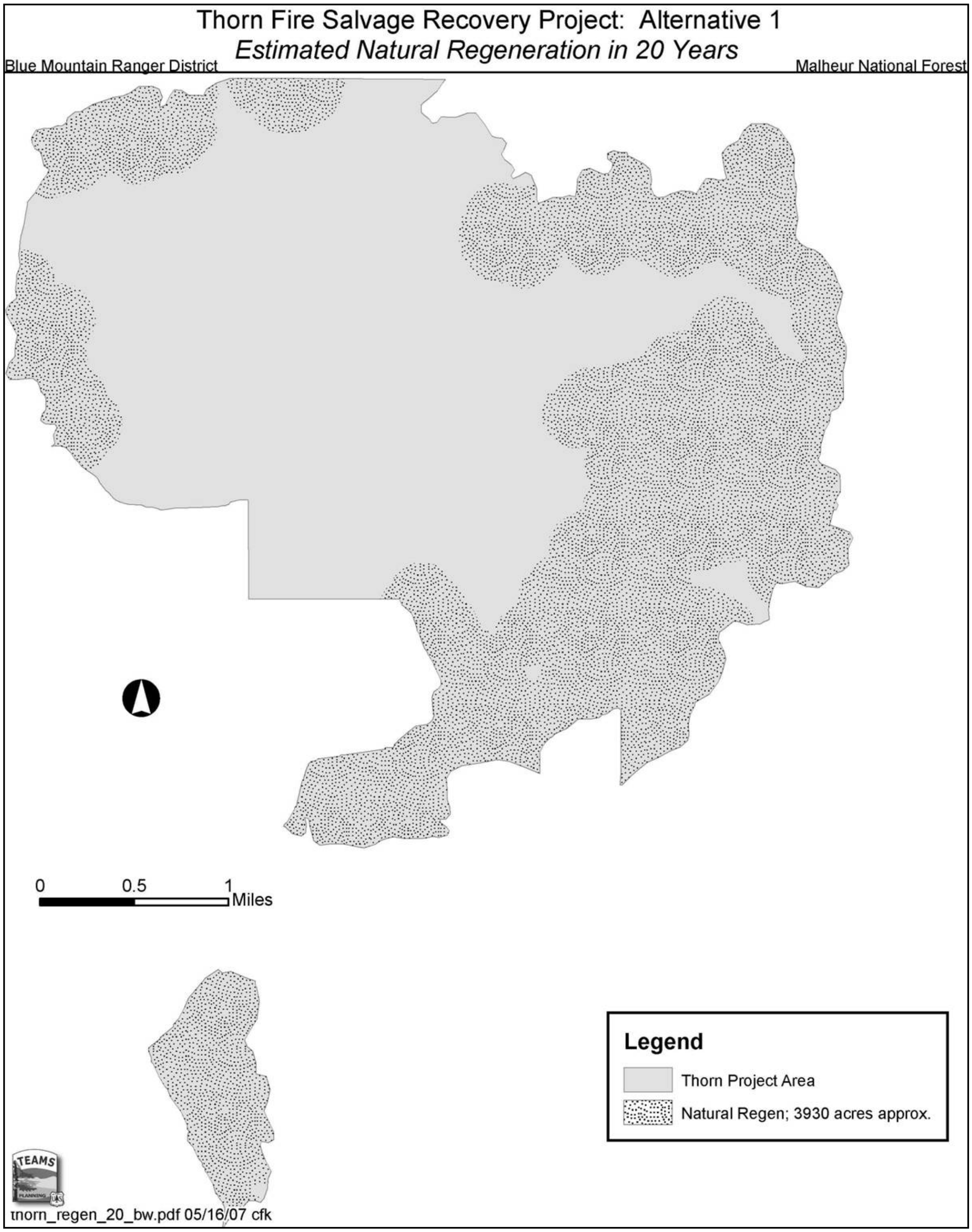
Appendix B-4. Map of Insect and Disease Aerial Detection 2000-2005



Appendix B-5. Estimated Natural Regeneration in 10 years – Alternative 1.



Appendix B-6. Estimated Natural Regeneration in 20-years – Alternative 1.



Appendix B-7. Structural Stage Model Results

Structural Stage Proportional Assessments for each Alternative, for both the project area, and the four surrounding subwatersheds.

Alternative 1 Percent Structural Stage by PAG and Decade within the Project Area								
				STRUCTURAL STAGE				
YEAR	PAG	OFMS	OFSS	SECC	SEOC	SI	UR	YFMS
2006	percentMoist	13	0	0	2	0	0	85
	percentWarm-dry	2	0	26	70	0	1	1
2016	percentMoist	13	0	0	0	68	2	17
	percentWarm-dry	2	0	1	25	46	11	15
2026	percentMoist	30	0	0	0	68	2	0
	percentWarm-dry	2	0	1	14	46	11	25
2036	percentMoist	30	0	0	0	68	2	0
	percentWarm-dry	3	0	0	0	46	10	40
2046	percentMoist	30	0	0	0	68	2	0
	percentWarm-dry	42	1	0	0	46	10	1
2056	percentMoist	30	1	0	0	68	2	0
	percentWarm-dry	44	0	0	0	56	0	0
2066	percentMoist	30	1	0	0	68	2	0
	percentWarm-dry	44	0	0	0	56	0	0
2076	percentMoist	30	1	2	0	68	0	0
	percentWarm-dry	44	0	10	0	46	0	0
2086	percentMoist	30	1	2	0	0	68	0
	percentWarm-dry	44	0	10	0	46	0	0
2096	percentMoist	30	1	70	0	0	0	0
	percentWarm-dry	44	0	56	0	0	0	0
2106	percentMoist	30	1	70	0	0	0	0
	percentWarm-dry	44	0	56	0	0	0	0
2116	percentMoist	30	1	70	0	0	0	0
	percentWarm-dry	44	0	56	0	0	0	0
2126	percentMoist	30	1	68	2	0	0	0
	percentWarm-dry	44	0	56	0	0	0	0
2136	percentMoist	17	1	68	2	0	0	12
	percentWarm-dry	30	0	56	0	0	0	14
2146	percentMoist	17	1	68	2	0	0	12
	percentWarm-dry	25	5	56	0	0	0	14
2156	percentMoist	17	1	68	2	0	0	12
	percentWarm-dry	25	5	56	0	0	0	14

Alternative 2 Percent Structural Stage by PAG and Decade for the Project Area								
		Structure Stage						
YEAR	PAG	OFMS	OFSS	SECC	SEOC	SI	UR	YFMS
2006	Moist	13	0	0	2	0	0	85
	Warm-dry	2	0	15	74	0	1	8
2016	Moist	13	0	0	0	68	2	17

Alternative 2 Percent Structural Stage by PAG and Decade for the Project Area								
		Structure Stage						
	Warm-dry	2	0	1	26	46	11	15
2026	Moist	12	0	0	0	68	2	17
	Warm-dry	2	0	1	7	46	11	33
2036	Moist	12	0	68	2	0	0	17
	Warm-dry	28	0	6	50	0	0	15
2046	Moist	30	0	68	2	0	0	0
	Warm-dry	42	1	10	46	0	0	1
2056	Moist	30	1	70	0	0	0	0
	Warm-dry	44	0	6	46	0	4	0
2066	Moist	30	1	70	0	0	0	0
	Warm-dry	44	0	0	46	0	10	0
2076	Moist	30	1	0	2	0	0	68
	Warm-dry	44	0	6	31	0	4	15
2086	Moist	30	1	0	2	0	0	68
	Warm-dry	44	0	10	0	0	0	46
2096	Moist	30	1	0	2	0	0	68
	Warm-dry	37	0	10	46	0	0	7
2106	Moist	98	1	2	0	0	0	0
	Warm-dry	37	0	10	31	0	0	22
2116	Moist	98	1	2	0	0	0	0
	Warm-dry	54	14	10	0	0	0	22
2126	Moist	98	1	2	0	0	0	0
	Warm-dry	69	14	10	0	0	0	7
2136	Moist	98	1	0	2	0	0	0
	Warm-dry	83	0	10	7	0	0	0
2146	Moist	85	1	0	2	0	0	12
	Warm-dry	83	0	10	7	0	0	0
2156	Moist	85	1	0	2	0	0	12
	Warm-dry	83	0	10	7	0	0	0

Alternative 3 Structure Stages by PAG and Decade for the Project Area								
		Structure Stage						
Decade	PAG	OFMS	OFSS	SECC	SEOC	SI	UR	YFMS
2006	Moist	13	0	0	2	0	0	85
	Warm-dry	2	0	12	76	0	1	8
2016	Moist	13	0	0	0	68	2	17
	Warm-dry	2	0	1	25	46	11	14
2026	Moist	12	0	0	0	68	2	17
	Warm-dry	2	0	1	6	46	11	33
2036	Moist	12	0	68	2	0	0	17
	Warm-dry	28	0	5	51	0	0	15
2046	Moist	30	0	68	2	0	0	0
	Warm-dry	42	1	10	46	0	0	1
2056	Moist	30	1	70	0	0	0	0
	Warm-dry	44	0	5	46	0	5	0
2066	Moist	30	1	70	0	0	0	0

Alternative 3 Structure Stages by PAG and Decade for the Project Area								
		Structure Stage						
	Warm-dry	44	0	0	46	0	10	0
2076	Moist	30	1	0	2	0	0	68
	Warm-dry	44	0	5	17	0	5	29
2086	Moist	30	1	0	2	0	0	68
	Warm-dry	44	0	10	0	0	0	46
2096	Moist	30	1	0	2	0	0	68
	Warm-dry	37	0	10	46	0	0	6
2106	Moist	98	1	2	0	0	0	0
	Warm-dry	36	0	10	17	0	0	36
2116	Moist	98	1	2	0	0	0	0
	Warm-dry	42	12	10	0	0	0	36
2126	Moist	98	1	2	0	0	0	0
	Warm-dry	71	12	10	0	0	0	7
2136	Moist	98	1	0	2	0	0	0
	Warm-dry	83	0	10	7	0	0	0
2146	Moist	85	1	0	2	0	0	12
	Warm-dry	83	0	10	7	0	0	0
2156	Moist	85	1	0	2	0	0	12
	Warm-dry	83	0	10	7	0	0	0

Alternative 1 Percent Structural Stage by PAG and Decade for Four Surrounding Subwatersheds								
		Structural Stage						
Decade	PAG	OFMS	OFSS	SECC	SEOC	SI	UR	YFMS
2006	Moist	27	16	0	1	0	0	56
	Warm Dry	33	2	31	28	0	2	4
2016	Moist	26	16	0	0	40	1	17
	Warm Dry	36	3	13	15	19	6	8
2026	Moist	43	16	0	0	40	1	0
	Warm Dry	36	5	11	4	18	6	19
2036	Moist	43	16	0	0	40	1	0
	Warm Dry	38	6	11	0	18	4	22
2046	Moist	43	16	0	0	40	1	0
	Warm Dry	60	7	8	0	18	3	2
2056	Moist	60	0	0	0	40	1	0
	Warm Dry	78	0	0	0	22	0	0
2066	Moist	60	0	0	0	40	1	0
	Warm Dry	78	0	0	0	22	0	0
2076	Moist	60	0	1	0	40	0	0
	Warm Dry	78	0	3	0	18	0	0
2086	Moist	60	0	1	0	0	40	0
	Warm Dry	78	0	3	0	18	0	0
2096	Moist	60	0	41	0	0	0	0
	Warm Dry	78	0	22	0	0	0	0
2106	Moist	60	0	41	0	0	0	0
	Warm Dry	78	0	22	0	0	0	0
2116	Moist	60	0	41	0	0	0	0

Alternative 1 Percent Structural Stage by PAG and Decade for Four Surrounding Subwatersheds								
				Structural Stage				
	Warm Dry	78	0	22	0	0	0	0
2126	Moist	60	0	40	1	0	0	0
	Warm Dry	78	0	22	0	0	0	0
2136	Moist	17	35	40	1	0	0	8
	Warm Dry	74	0	22	0	0	0	4
2146	Moist	17	35	40	1	0	0	8
	Warm Dry	73	1	22	0	0	0	4
2156	Moist	17	35	40	1	0	0	8
	Warm Dry	73	1	22	0	0	0	4

Alternative 2 Percentage Structure Stage by PAG for the four Surrounding Subwatersheds								
		Structural Stage						
YEAR	PAG	OFMS	OFSS	SECC	SEOC	SI	UR	YFMS
2006	Moist	27	16	0	1	0	0	56
	Warm-dry	33	2	28	27	0	2	7
2016	Moist	26	16	0	0	40	1	17
	Warm-dry	36	3	13	16	19	6	8
2026	Moist	26	16	0	0	40	1	16
	Warm-dry	36	5	11	1	18	6	23
2036	Moist	26	16	40	1	0	0	16
	Warm-dry	45	6	13	13	7	1	16
2046	Moist	43	16	40	1	0	0	0
	Warm-dry	60	7	11	12	7	1	2
2056	Moist	59	0	41	0	0	0	0
	Warm-dry	78	0	1	11	8	1	0
2066	Moist	59	0	41	0	0	0	0
	Warm-dry	78	0	0	11	8	2	0
2076	Moist	59	0	0	1	0	0	40
	Warm-dry	78	0	2	1	7	1	11
2086	Moist	59	0	0	1	0	0	40
	Warm-dry	78	0	3	0	7	0	11
2096	Moist	59	0	0	1	0	0	40
	Warm-dry	78	0	10	11	0	0	0
2106	Moist	99	0	1	0	0	0	0
	Warm-dry	75	0	10	1	0	0	14
2116	Moist	99	0	1	0	0	0	0
	Warm-dry	72	4	10	0	0	0	14
2126	Moist	99	0	1	0	0	0	0
	Warm-dry	83	4	10	0	0	0	3
2136	Moist	99	0	0	1	0	0	0
	Warm-dry	86	0	10	3	0	0	0
2146	Moist	91	0	0	1	0	0	8
	Warm-dry	84	1	10	3	0	0	0
2156	Moist	91	0	0	1	0	0	8
	Warm-dry	84	1	10	3	0	0	0

Alternative 3 Percentage of Structural Stage by PAG for the Four Subwatersheds								
		Structure Stage						
YEAR	PAG	OFMS	OFSS	SECC	SEOC	SI	UR	YFMS
2006	Moist	27	16	0	1	0	0	56
	Warm-dry	33	2	28	28	0	2	7
2016	Moist	26	16	0	0	40	1	17
	Warm-dry	36	3	13	16	19	6	8
2026	Moist	26	16	0	0	40	1	16
	Warm-dry	36	5	11	1	18	6	23
2036	Moist	26	16	40	1	0	0	16
	Warm-dry	45	6	13	13	7	1	16
2046	Moist	43	16	40	1	0	0	0
	Warm-dry	60	7	11	12	7	1	2
2056	Moist	59	0	41	0	0	0	0
	Warm-dry	78	0	1	11	8	1	0
2066	Moist	59	0	41	0	0	0	0
	Warm-dry	78	0	0	11	8	2	0
2076	Moist	59	0	0	1	0	0	40
	Warm-dry	78	0	2	1	7	1	11
2086	Moist	59	0	0	1	0	0	40
	Warm-dry	78	0	3	0	7	0	11
2096	Moist	59	0	0	1	0	0	40
	Warm-dry	78	0	10	11	0	0	0
2106	Moist	99	0	1	0	0	0	0
	Warm-dry	75	0	10	1	0	0	14
2116	Moist	99	0	1	0	0	0	0
	Warm-dry	73	3	10	0	0	0	14
2126	Moist	99	0	1	0	0	0	0
	Warm-dry	83	3	10	0	0	0	3
2136	Moist	99	0	0	1	0	0	0
	Warm-dry	86	0	10	3	0	0	0
2146	Moist	56	35	0	1	0	0	8
	Warm-dry	25	60	10	3	0	0	0
2156	Moist	56	35	0	1	0	0	8
	Warm-dry	25	60	10	3	0	0	0

Appendix B-8. Salvage Unit List

Alternative 2 Salvage Unit Summary					
UNIT	LOG_SYS	SILV_RX	SLASH_TRT	REGEN_RX	Acres
1	GB	Leave any green	LS	Plant	46
2	GB	Leave any green	LS	Plant	103
3	H	Leave any green	LS	Plant	4
4	H	Leave any green	LS	Plant	9
5	H	Leave any green	LS	Plant	24
6	GB	Dead	YT	Plant	123
7	GB	Dead	YT	Plant	4
8	H	Dead	JP	Plant	5
9	H	Dead	JP	Plant	2
11	H	Dead	JP	Plant	67
12	GB	Dead	YT	Plant	12
13	H	Dead	JP	Plant	54
14	GB	Dead	LS	Plant	12
16	H	Dead	JP	Plant	56
17	H	Dead	LS	Plant	25
18	H	Dead	LS	Plant	4
19	H	Dead	JP	Plant	57
20	H	Dead	JP	Plant	8
21	H	Dead	JP	Plant	60
22	H	Dead	JP	Plant	110
23	H	Dead	JP	Plant	96
24	GB	Dead	YT	Plant	64
25	H	Dead	JP	Plant	20
26	H	Dead	JP	Plant	7
27	H	Dead	JP	Plant	41
28	H	Dead	JP	Plant	7
29	H	Dead	JP	Plant	70
30	H	Dead	JP	Plant	1
			LS	Plant	62
31	H	Dead	LS	Plant	13
32	GB	Dead	YT	Plant	15
33	H	Leave any green	LS	Plant	5
36	H	Dead	LS	Plant	143
37	H	Dead	JP	Plant	222
38	H	Leave any green	LS	Plant	4
39	GB	Leave any green	LS	Plant	5
40	GB	Leave any green	LS	Plant	6
41	GB	Leave any green	LS	Plant	2
42	GB	Leave any green	LS	Plant	2
43	GB	Leave any green	LS	Plant	11
44	H	Leave any green	LS	Plant	150
45	H	Leave any green	LS	Plant	187
46	H	Leave any green	LS	Plant	331

Alternative 2 Salvage Unit Summary					
UNIT	LOG_SYS	SILV_RX	SLASH_TRT	REGEN_RX	Acres
47	H	Leave any green	LS	Plant	162
48	H	Leave any green	LS	Plant	78
49	H	Dead	LS	Plant	93
50	H	Dead	JP	Plant	24
51	H	Dead	LS	Plant	69
52	H	Dead	LS	Plant	56
53	GB	Leave any green	LS	Plant	18
54	H	Leave any green	LS	Plant	17
75	H	Dead	JP	Plant	52
76	H	Dead	JP	Plant	56
77	H	Dead	LS	Plant	25
78	H	Dead	JP	Plant	13
79	H	Dead	JP	Plant	21
80	H	Dead	JP	Plant	3
81	H	Leave any green	LS	Plant	31
82	GB	Leave any green	LS	Plant	38
84	GB	Leave any green	LS	Plant	5
85	H	Leave any green	LS	Plant	196
86	GB	Leave any green	LS	Plant	13
87	H	Leave any green	LS	Plant	8
88	GB	Leave any green	LS	Plant	17
89	H	Leave any green	LS	Plant	422
90	H	Leave any green	LS	Plant	20
91	H	Leave any green	LS	Plant	132
92	H	Leave any green	LS	Plant	23
93	H	Dead	JP	Plant	52
94	H	Dead	JP	Plant	13
					3907

Alternative 3 Salvage Unit Summary					
UNIT	LOG_SYS	SILV_RX	SLASH_TRT	REGEN_RX	ACRES
1	GB	Leave any green	LS	Plant	46
2	GB	Leave any green	LS	Plant	103
3	H	Leave any green	LS	Plant	4
4	H	Leave any green	LS	Plant	9
5	H	Leave any green	LS	Plant	24
6	GB	Dead	YT	Plant	123
7	GB	Dead	YT	Plant	4
8	H	Dead	JP	Plant	5
9	H	Dead	JP	Plant	2
11	H	Dead	JP	Plant	67
12	GB	Dead	YT	Plant	12
13	H	Dead	JP	Plant	54
14	GB	Dead	LS	Plant	12
16	H	Dead	JP	Plant	56

Alternative 3 Salvage Unit Summary					
UNIT	LOG_SYS	SILV_RX	SLASH_TRT	REGEN_RX	ACRES
17	H	Dead	LS	Plant	25
18	H	Dead	LS	Plant	4
19	H	Dead	JP	Plant	57
20	H	Dead	JP	Plant	8
21	H	Dead	JP	Plant	60
22	H	Dead	JP	Plant	110
23	H	Dead	JP	Plant	96
24	GB	Dead	YT	Plant	64
25	H	Dead	JP	Plant	20
26	H	Dead	JP	Plant	7
27	H	Dead	JP	Plant	41
28	H	Dead	JP	Plant	7
29	H	Dead	JP	Plant	70
30	H	Dead	JP	Plant	1
			LS	Plant	62
31	H	Dead	LS	Plant	13
32	GB	Dead	YT	Plant	15
33	H	Leave any green	LS	Plant	5
36	H	Dead	LS	Plant	143
37	H	Dead	JP	Plant	222
38	H	Leave any green	LS	Plant	4
39	GB	Leave any green	LS	Plant	5
40	GB	Leave any green	LS	Plant	6
41	GB	Leave any green	LS	Plant	2
42	GB	Leave any green	LS	Plant	2
43	GB	Leave any green	LS	Plant	11
44	H	Leave any green	LS	Plant	150
45	H	Leave any green	LS	Plant	187
46	H	Leave any green	LS	Plant	331
47	H	Leave any green	LS	Plant	162
48	H	Leave any green	LS	Plant	78
49	H	Dead	LS	Plant	93
50	H	Dead	JP	Plant	24
51	H	Dead	LS	Plant	69
52	H	Dead	LS	Plant	56
53	GB	Leave any green	LS	Plant	18
54	H	Leave any green	LS	Plant	17
					2769

Appendix B-9. Salvage Harvest Tree-Marking Guidelines

The purpose of these marking guides is to implement the salvage harvest prescriptions for the TFSR Project.

The objectives of the salvage harvest prescription are to remove merchantable trees killed by fire, or by secondary effects, including bark beetles. Most of the time it will not be difficult to determine if an individual tree would be considered dead. Blackened boles and the complete absence of needles, or with crowns having all brown needles, or with crowns having “fading” or “dry-appearing” (off-color) green needles throughout the crown are considered dead trees.

At other times, a series of estimations will be needed to determine the survivability of fire-injured trees with partially or completely green crowns. To determine a survival prediction for fire-injured trees, the “Rating Guide for Tree Survival” section is included below.

Snag management and retention criteria are included in the project design features, and are included in these marking guidelines by reference.

Three salvage prescriptions are applicable to this project:

- Salvage obvious dead trees only – applies to units or parts of units mapped in the very high burn severity category only. Any tree with any green needles will be retained, regardless of its likelihood of survival. Snag retention requirements apply here as in all other units.

- Salvage dead trees as indicated in the rating guides for tree survival (low probability of survival) – applies to units or parts of units mapped in the high, moderate and low burn severity category. Marking guidelines include the use of tree survival guidelines to include trees to be removed that are not likely to survive.

- Danger tree removal – applies to all roadside danger tree units and applies the danger tree identification guidelines incorporated by reference.

PREDICTING TREE SURVIVAL

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

Use the “Scoring Guide for Rating Tree Survival for the TFSR Project” to determine a probability for tree survival.

SCORING GUIDE FOR RATING TREE SURVIVAL FOR THE TFSR Project.

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

Additional tree mortality might occur after marking, but prior to the salvage timber harvest. If the additional mortality is in excess of snag requirements, it is acceptable to remove it.

MARKING PROCEDURE

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

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

The “Scoring Guide for Rating Tree Survival for the TFSR Project” in the Predicting Tree Survival section shows how the composite rating score will be interpreted as a survival probability rating (low, moderate or high). Then use the following criteria to make a final determination about whether the tree is expected to survive over the next few years.

If it is between the low and moderate probability to survive categories, use the low category,

Cover the remainder of the unit, designating all trees predicted to survive and additional snags as required. Distribute the snags across the unit, leaving no areas larger than ap-proximately 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 would be preferable to just retaining large-diameter snags in one limited area. Tally the number of trees by live and dead categories (including trees predicted to die using the survival guidelines) and by size classes: 9-21 inches DBH, and greater than 21 inches DBH.

APPENDIX B-10. BEST SCIENCE CONSIDERATIONS. VEGETATION

Several responses to scoping requested the Forest to consider a number of reports, papers, and opinion pieces. Following are discussions on these papers.

Beschta et al. Reports

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

A similar version (Beschta et al. 2004) was subsequently published in the peer-reviewed journal Conservation Biology. This version was peer reviewed and is available from a credible source.

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

The Beschta reports are often mentioned during public scoping. The Beschta report respondents generally advocate that natural recovery of burned landscapes, with little or no human intervention, is the optimal policy for public forests, and that this policy is supported by other literature such as American Lands Alliance (2005), DellaSala et al. (2006), Donato et al. (2006), Lindenmayer et al. (2004), and McIver and Starr (2000, 2001a).

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

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

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

The Thorn 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 reforest burned sites.

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

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

American Lands Alliance "After the Fires" Report

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

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

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

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

The Thorn Fire Salvage Recovery Project includes an alternative that would react to the burned forest in a manner similar to what is recommended by the American Lands Alliance (2005) – the No Action alternative.

Our discussion about the Beschta et al. (1995, 2004) reports and their relevance to the Thorn Fire Salvage Recovery Project, specifically the No Action alternative, also pertains to the ALA report.

McIver and Starr Salvage Logging Literature Synthesis and Review

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

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

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

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

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

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

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

Any of the McIver and Starr salvage studies from areas outside the interior Pacific Northwest, the geographical region of the western United States containing the Thorn Fire area, are likely to include site and ecosystem conditions differing from those found in the Thorn Fire area.

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

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

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

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

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

ICBEMP Scientific Assessment for Ecosystem Management

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

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

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

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

<u>Relevance to the Forest Vegetation portion of the Thorn Fire Salvage Recovery Project</u>. A review of the ICBEMP salvage timber sales section (Quigley et al. 1996) referenced by the respondent leads to a judgement that this section is not relevant to the Thorn Fire Salvage Recovery Project for four reasons:

1. The purpose and need for the salvage timber harvest component of the Thorn Fire Salvage Recovery Project does not include "ecosystem-based management" objectives;
2. The proposed action for the Thorn Fire Salvage Recovery Project does not include any removal of smaller green trees, as was recommended by the ICBEMP salvage section;
3. The Thorn 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 Thorn Fire Salvage Recovery Project is not formulated or proposed in the context of the Taylor Salvage Law (PL 104-19), and most of the ICBEMP discussion deals with provisions or implementation characteristics associated with the Taylor salvage bill.

Donato et al. Article

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

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

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

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

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

1. The Thorn Fire action alternatives (alternatives B and C) include artificial regeneration (tree planting) for all areas that would be affected by the salvage timber harvest activity. The Donato study showed that postfire logging reduced natural regeneration by 71% (Donato et al. 2006a, 2006b), so the tree planting portion of the Thorn Fire proposed action would help mitigate for any salvage-caused loss of naturally regenerated seedlings.

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

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

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

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

Lindenmayer et al. Salvage Harvest Article

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

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

The Thorn Fire Salvage Recovery Project includes an alternative that would respond to the burned forest in a manner similar to what is recommended by Lindenmayer et al. (2004) – the No Action alternative.

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

Society for Conservation Biology Scientific Panel Report

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

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

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

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

This report includes one topic or issue area that obviously pertains to the Thorn Fire Salvage Recovery Project: the “forest management after wildfire” topic. This topic includes 10 key findings, six of which apply to forest vegetation, and each of those will be discussed individually.

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

   <u>Response</u>: although this key finding provides no explicit definition or criteria for what constitutes natural recovery, it is our judgment that the Thorn Fire Salvage Recovery Project

includes an alternative that would respond to the burned forest in a manner similar to what is reported here: the No Action alternative. The No Action alternative adopts a passive management approach emphasizing natural recovery of burned landscapes and little or no human interaction with ecosystem recovery processes.

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

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

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

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

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

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

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

   Response: although this key finding provides no explicit definition or criteria for what constitutes "sites managed with a major ecological focus", it is our judgment that the Thorn Fire Salvage Recovery Project includes ecologically appropriate regeneration recommendations

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

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

Comments About the Scott Guidelines

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

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

Waring Report. The Waring report describes an evaluation of the Scott Guidelines for the Easy and High Roberts salvage sales on the Malheur National Forest.

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

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

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

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

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

He found that trees in the 100% basal-heating class, which experienced cambium kill over an average of 95% of the circumference at their base, had higher midday xylem pressure potentials (i.e., less stress) than non-girdled trees (Ryan 2000).

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

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

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

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

It is appropriate that the Thorn Fire Salvage Recovery Project adopted the Scott Guidelines to help predict which of the fire-affected trees might succumb to their injuries over a specific period of time.

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

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

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

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

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

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

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

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

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

(5) Although dead trees are used to meet the snag and down wood requirements, most of the Eastside Screens amendment applies to live trees ;

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

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

It is our observation that using the Scott Guidelines for the Thorn Fire Salvage Recovery Project is consistent with similar projects in the Pacific Northwest Region of the USDA Forest Service; the Scott Guidelines have recently been used with several fire salvage projects.

Critics of the Scott Guidelines contend that they overestimate tree mortality when compared with alternative tree mortality prediction models. Alternative models include McHugh and Kolb (2003), Peterson and Arbaugh (1986), Ryan and Reinhardt (1988), Stephens and Finney (2002), and Thies et al. (2006).

In the context of the Thorn Fire Salvage Recovery Project, our opinion is that the Scott Guidelines are more appropriate for predicting tree mortality than any of the alternative models individually. The basis for this opinion is that a comprehensive assessment of tree injury, and any associated prediction of fire-caused tree mortality, must consider the effect of fire injuries on the whole tree rather than just one or more of its parts

As Jiminez (2004) observed: "It is possible for a tree to survive if the cambial tissue is destroyed on only a portion of its circumference . But the combined effects of root, crown, and stem damage may kill a tree, even if the stem itself is not completely".

It is well established in the scientific literature that a comprehensive model of post-fire tree mortality should account for injuries to fine roots caused by smoldering combustion during duff consumption .

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

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

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

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

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

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

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

The rationale for selecting the Scott Guidelines for use with the Thorn Fire Salvage Recovery Project, rather than one or more of the suggested alternatives is explained below.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

It is our judgment that the Thies et al. (2006) model is inappropriate for use with the Thorn Fire Salvage Recovery Project for five reasons:

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

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

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

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

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

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

Brown et al paper

One respondent requested that the Brown et al paper be considered. Conservation Biology published "Forest Restoration and Fire: Principles in the Contact of Place" in August, 2004. This paper suggests that there is concern that active management through thinning and prescribed fire is urgently needed in many forest of the western United States. But, that the types of thinning and fire, and where they are applied are subjects of debate. The authors proposed that low thinning is the most appropriate type of thinning practices. Large fire resistant trees are important components of these systems. The authors further suggest that the context of place is critical in assigning priority for treatments, and that areas of low-severity fire regimes are a high priority for treatments.

The paper summarizes the restoration potential of active management and principles related to fire resiliency that should be applied when considering active management, and emphasizes the context of place in the planning process. The paper concludes by listing several items that credible restoration efforts will achieve or consider.

A review of the paper leads to a firm conclusion that is it directed entirely toward restoration of stands and landscapes before wildfires take place: it does not include recommendations of any kind pertaining to burned landscapes. This paper has limited applicability in the context of this project.

Filip, et al. (2007)

In early 2007, the Western Journal of Applied Forestry published “Understanding and Defining Mortality in Western Conifer Forests”, authored by Gregory M. Filip and others (Filip, et al. 2007). This paper is a literature synthesis; it does not report research results from new work. It does compile substantial information concerning conifer mortality in a single place, allowing for a better understanding of the mortality processes. The paper suggests a practical definition of a dead tree. This paper is an opinion piece.

The Filip paper applies directly to the Thorn Fire Salvage Recovery Project because it examines many of the fire effect that ultimately cause mortality for fire-injured conifers, and it discusses the fire effects that have been found to be most useful in predicting whether or not tree mortality is imminent (within 5 years).

Table Comparison of Post-Fire Tree Mortality Models.

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

McHugh and	Peterson	Ryan and Reinhardt	Scott et al. (2002, 2003)	Stephens and	Thies et al.

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

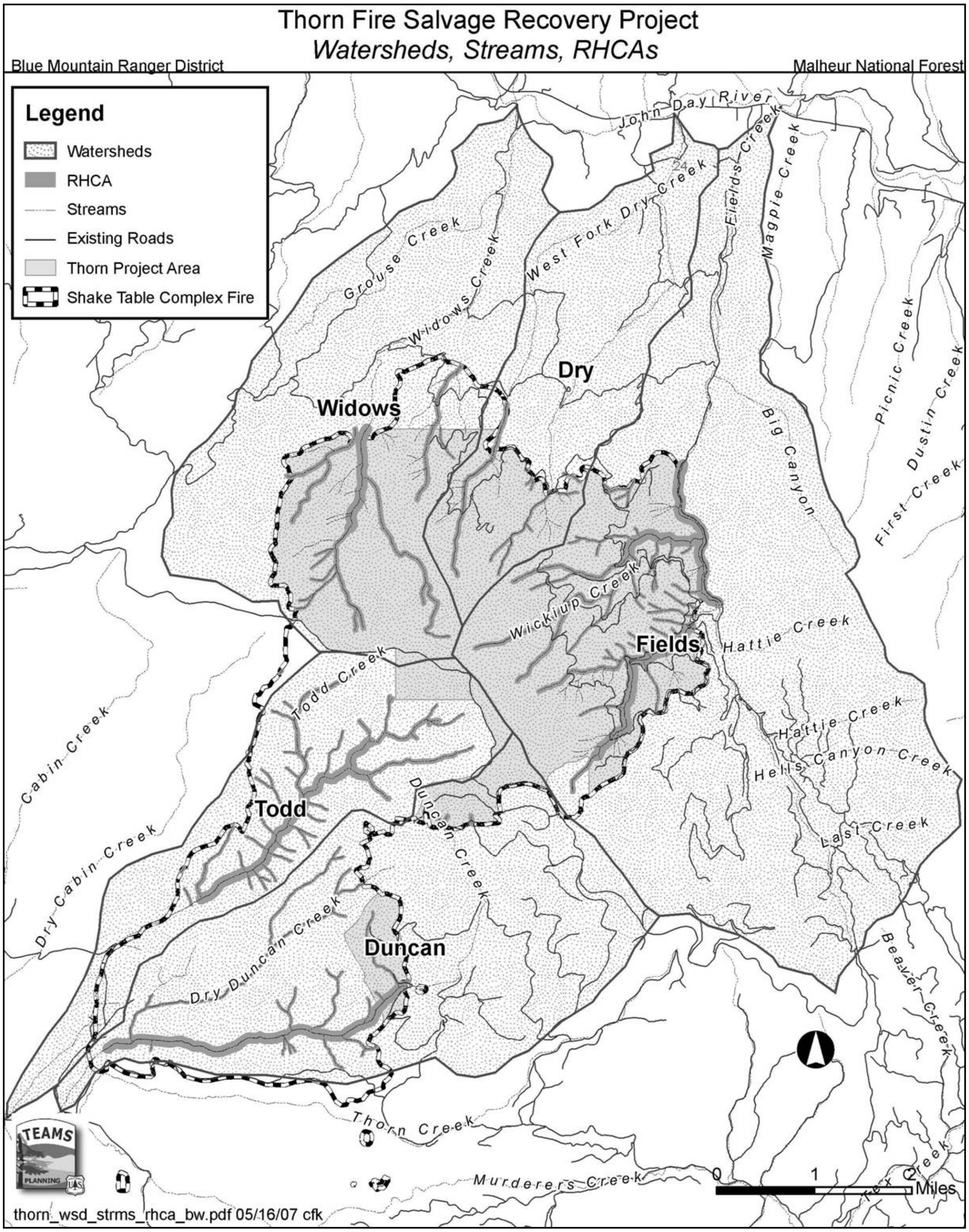
Sources: McHugh and Kolb (2003), Peterson and Arbaugh (1986), Ryan and Reinhardt (1988), Scott et al. (2002, 2003), Stephens and Finney (2002), and Thies et al. (2006).

APPENDIX C – FUELS / AIR QUALITY

This section reserved and left intentionally blank

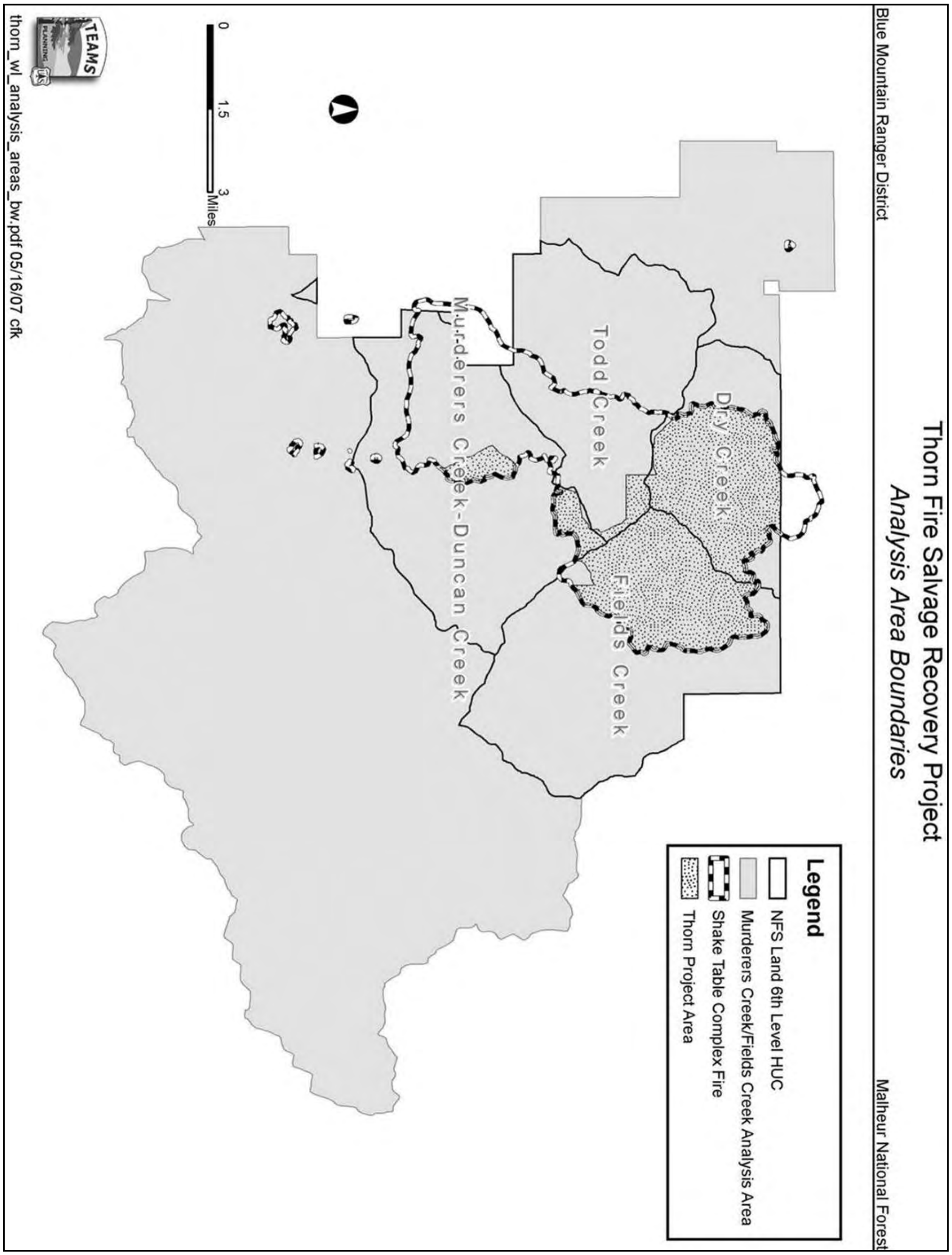
APPENDIX D – SOILS / WATERSHED

Map Figure D-1: Watersheds, Streams and RHCAs

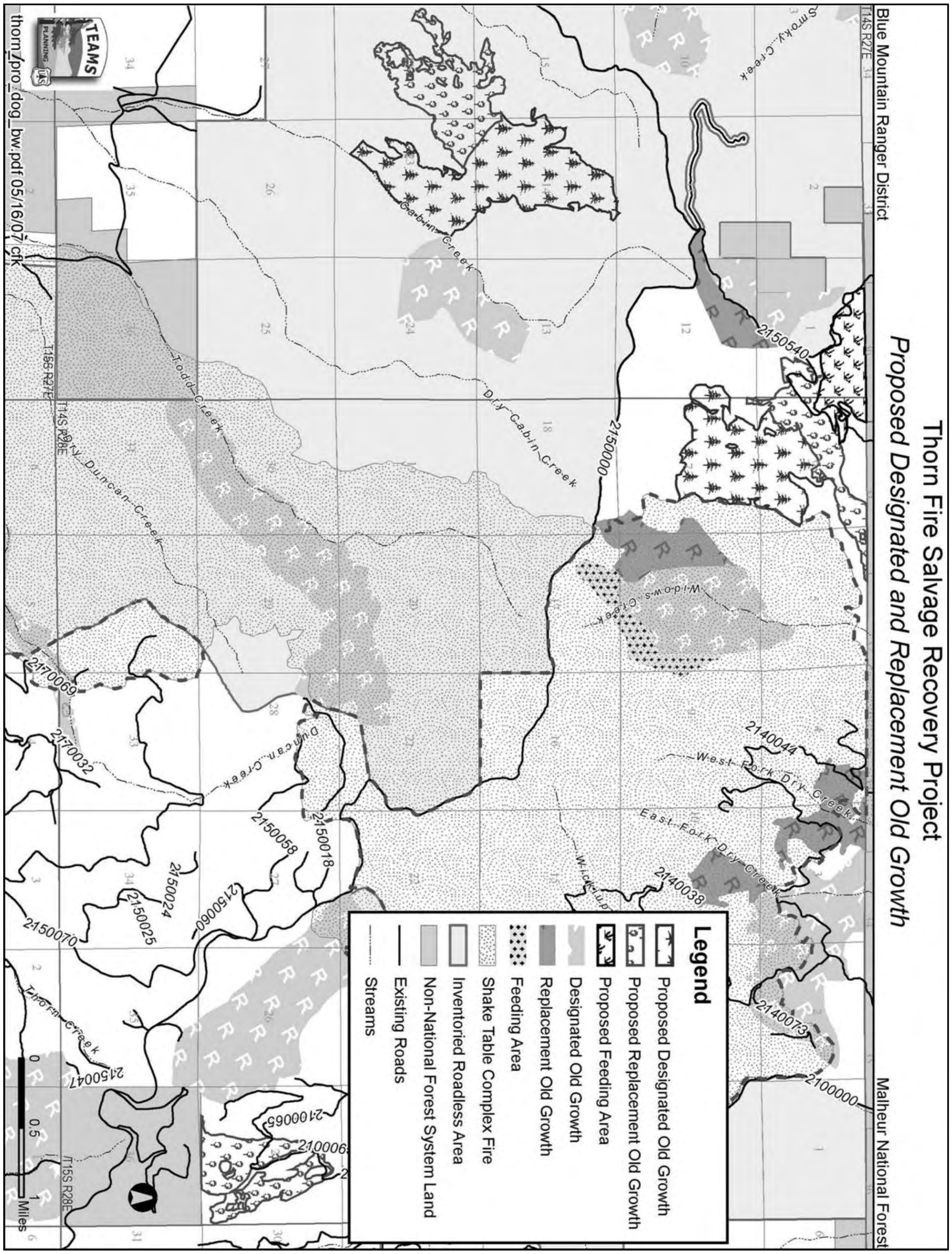


APPENDIX E – WILDLIFE

Appendix E-1: Wildlife Analysis Areas



Appendix E-2: Old Growth DOGs, ROGs and PWFA Map



APPENDIX F – FISHERIES

Appendix F-1. General Water Drafting Guidance for Road Maintenance and Non-emergency Fire Use for Watersheds with Anadromous Fish in the Blue Mountain Tri-Forest Area

Within the Blue Mountain Tri-Forest area (Malheur National Forest, Umatilla National Forest, and Wallowa Whitman National Forest), water drafting regularly occurs to accomplish road maintenance activities as well as control fires. Because of the wide distribution of Endangered Species Act (ESA) listed anadromous salmonids within the Tri-Forest area, and frequency of drafting water for Federal activities, there is potential for water drafting activities interfering with ESA listed anadromous salmonids. This is particularly true in northeast Oregon where streams used for water are small and support ESA-listed anadromous salmonids.

Water drafting for road maintenance activities can happen at any time of the year, though the largest water withdrawals typically occur in spring. Water is used to soften soil for road shaping, grading, and rocking. These activities usually involve tanker trucks ranging from 500 gallons to 3500 gallons which fill their tanks from local surface water sources and distribute water on roads as they drive. Most tankers used for this application are equipped with power take off (PTO) pumps which are powered by the vehicles engine. PTO pumps for these types of tankers typically range from about 150 gallons per minute (gpm) (approximately 0.3 cubic feet per second (cfs)) to about 550 gpm (approximately 1.2 cfs) and are often not capable of varying pump rates. Because these types of pumps are capable of removing large volumes of water at high rates, and streams available for water drafting are often small, it is important to avoid or minimize the potential to harm or harass ESA listed anadromous salmonids.

Water drafting for prescribed fire use can vary from use of small pumps (less than 40 gpm/ 0.1 cfs) for direct use with hoses to larger pumps as described above for filling tanks or water tenders.

Regardless of pump rate, physical damage to redds, spawning adults, or juveniles can occur from incorrect placement of water drafting equipment. Proper equipment handling and placement in sensitive areas is important to reduce the likelihood of direct harm of ESA listed anadromous salmonids.

This document provides guidance for water drafting activities mainly associated with road maintenance and non-emergency fire suppression activities in the Blue Mountain Tri-Forest area (Umatilla, Malheur, and Wallowa Whitman National Forests). The goal is to create an understandable and workable protocol that will allow water drafting to occur while avoiding or minimizing risks to Endangered Species Act (ESA) listed fish.

The following guidance is intended to minimize or avoid adverse effects to listed fish in the Blue Mountain Tri-Forest area when engaging in water drafting activities. As with any activity, site specific or project specific information may require more stringent or relaxed criteria to avoid adverse effects. In addition, compliance with these criteria may not minimize adverse effects to avoid take of listed fish in all cases, and therefore does not preclude the need for consultation. Projects will be reviewed on a case by case basis to ensure that guidance is reasonable, prudent, and adequately avoids or minimizes adverse effects to listed species.

1. Any intake used for drafting water will be screened according to NOAA Fisheries Juvenile Fish Screen Criteria For Pump Intakes for salmonid fry (see Appendix B).

2. Non-stream water (i.e. ponds) sources will be used prior to the use of stream sources whenever feasible.

3. When non-stream sources are unavailable, streams with the greatest flow will be used whenever feasible.

4. Water withdrawal will not reduce stream flow by more than 1/10th. In order to accomplish the lowest reduction of flow from marginal water sources (sources in which water drafting will reduce flows by more than 5percent), the lowest drafting rate on pumps that have adjustable draft rates, and the smallest volume tender appropriate for the project will be used. Whenever feasible, marginal water sources will be avoided.

5. During drafting, streams will be monitored for reduced flows. If a flow concern is identified, operators will reduce pumping rates to ensure that flow reduction is not more than 1/10th of the existing stream flow is being removed or discontinue drafting.

6. If marginal water sources are used, withdrawal from single marginal sites will be limited to 18,000 gallons per day.

7. No more than one high-volume pump per site will be used, except sites in which the use of multiple pumps will not measurably decrease stream flows.

8. To avoid disturbing fish that may be spawning, No drafting will occur from any pools which contain adult salmonids.

9. Operators will avoid direct effects to redds or pre-emergence alevins by placing the intake hose in the deepest part of a drafting pool (where redds are unlikely to be present) and will avoid placing equipment on areas that redds are known or suspected to be. Operators will also ensure that tailout areas of pools that are known or suspected to have redds will not be dewatered.

10. Blading, shaping, aggregate placement, and dust control should be performed in spring and early summer when flows are high, to take advantage of available road soil moisture content to minimize the need for water drafting. Exceptions during the low-flow period will be limited to roads receiving heavy summer through fall traffic creating hazardous road surface conditions that require maintenance for human safety reasons. Essential maintenance during low-flow conditions will be deferred, when possible, until fall precipitation reduces the need for water drafting. Spring and fall blading and shaping will minimize demands for water usage, will minimize dust production, and will reduce sediment generated from surface erosion.

11. NOAA Fisheries may periodically review drafting activities to ensure that these measures are adequate for the protection of listed fish.

Appendix F-2. NMFS Juvenile Fish Screen Criteria for Pump Intakes

Developed by: National Marine Fisheries Service, Environmental & Technical Services Division,Portland, Oregon, May 9, 1996

The following criteria serve as an addendum to current National Marine Fisheries Service gravity intake juvenile fish screen criteria. These criteria apply to new pump intake screens and existing inadequate pump intake screens, as determined by fisheries agencies with project jurisdiction.

Definitions used in pump intake screen criteria

Pump intake screens are defined as screening devices attached directly to a pressurized diversion intake pipe. Effective screen area is calculated by subtracting screen area occluded by structural members from the total screen area. Screen mesh opening is the narrowest opening in screen mesh. Approach velocity is the calculated velocity component perpendicular to the screen face. Sweeping velocity is the flow velocity component parallel to the screen face with the pump turned off.

Active pump intake screens are equipped with a cleaning system with proven cleaning capability, and are cleaned as frequently as necessary to keep the screens clean. Passive pump intake screens have no cleaning system and should only be used when the debris load is expected to be low, and

1. If a small screen (less than 1 CFS pump) is over-sized to eliminate debris impingement, and
2. Where sufficient sweeping velocity exists to eliminate debris build-up on the screen surface, and
3. If the maximum diverted flow is less than .01percent of the total minimum streamflow, or
4. The intake is deep in a reservoir, away from the shoreline.

Pump Intake Screen Flow Criteria

The minimum effective screen area in square feet for an active pump intake screen is calculated by dividing the maximum flow rate in cubic feet per second (CFS) by an approach velocity of 0.4 feet per second (FPS). The minimum effective screen area in square feet for a passive pump intake screen is calculated by dividing the maximum flow rate in CFS by an approach velocity of 0.2 FPS. Certain site conditions may allow for a waiver of the 0.2 FPS approach velocity criteria and allow a passive screen to be installed using 0.4 FPS as design criteria. These cases will be considered on a site-by-site basis by the fisheries agencies.

If fry-sized salmonids (i.e. less than 60 millimeter fork length) are not ever present at the site and larger juvenile salmonids are present (as determined by agency biologists), approach velocity shall not exceed 0.8 FPS for active pump intake screens, or 0.4 FPS for passive pump intake screens. The allowable flow should be distributed to achieve uniform approach velocity (plus or minus 10percent) over the entire screen area. Additional screen area or flow baffling may be required to account for designs with non-uniform approach velocity.

Pump Intake Screen Mesh Material

Screen mesh openings shall not exceed 3/32 inch (2.38 mm) for woven wire or perforated plate screens, or 0.0689 inch (1.75 mm) for profile wire screens, with a minimum 27 percent open area. If fry-sized salmonids are never present at the site (by determination of agency biologists) screen mesh openings shall not exceed 1/4 inch (6.35 mm) for woven wire, perforated plate screens, or profile wire screens, with a minimum of 40 percent open area.

Screen mesh material and support structure shall work in tandem to be sufficiently durable to withstand the rigors of the installation site. No gaps greater than 3/32 inch shall exist in any type screen mesh or at points of mesh attachment. Special mesh materials that inhibit aquatic growth may be required at some sites.

Pump Intake Screen Location

When possible, pump intake screens shall be placed in locations with sufficient sweeping velocity to sweep away debris removed from the screen face. Pump intake screens shall be submerged to a depth of at least one screen radius below the minimum water surface, with a minimum of one screen radius clearance between screen surfaces and adjacent natural or constructed features. A clear escape route should exist for fish that approach the intake volitionally or otherwise. For example, if a pump intake is located off of the river (such as in an intake lagoon), a conventional open channel screen should be considered, placed in the channel or at the edge of the river. Intakes in reservoirs should be as deep as practical, to reduce the numbers of juvenile salmonids that approach the intake. Adverse alterations to riverine habitat shall be minimized.

Pump Intake Screen Protection

Pump intake screens shall be protected from heavy debris, icing and other conditions that may compromise screen integrity. Protection can be provided by using log booms, trash racks or mechanisms for removing the intake from the river during adverse conditions. An inspection and maintenance plan for the pump intake screen is required, to ensure that the screen is operating as designed per these criteria.

Appendix F-3. Relevant Project Design Elements for Road Maintenance Activities

The following road maintenance activities and the relevant project design elements were described in the Malheur National Forest (MNF) Road Maintenance Biological Assessment and are contained in: National Marine Fisheries Service. 2005. Endangered Species Act - Section 7 Informal Consultation and Management Act Essential Fish Habitat Consultation for the MNF Road Maintenance Activities 2005-2009 – dated January 24, 2005.

Road Reshaping and Blading

Forest roads can be hydrologically connected to fish bearing waters. Precipitation and snow melt can create runoff that, in turn, can create sediment depositions and delivery to those hydrologically connected roads and streams. Maintenance of the road prisms and the water flow controls incorporated in the roadways are vital to minimizing the deterioration of the ability of the water controls to keep sediment from entering stream systems. Reshaping road surfacing is intended to remove irregularities from the road surface, which can cause the concentration of runoff in amounts, which result in soil and aggregate displacement through rills, ruts, and pot holes. Maintenance Level III and IV roads open to travel on an annual basis and possessing crushed aggregate in the base or surface are shaped at least once a year if funding is available.

Road maintenance activities occur primarily from June 15 to October 15 depending on the actual condition of the road and the moisture level. If rutting will occur, the standard practice is to delay maintenance until the road is dry enough to allow equipment to the site without damaging the road. These activities within RHCA's including bull trout and steelhead waters will be completed after July 15 and/or prior to August 15. Proposals to work outside this window will be reviewed by Level 1 prior to taking action to take advantage of moist road surfaces and to document if there is a concern with spawning.

Design Elements

- Side casting of materials will not occur where these materials could be directly or indirectly introduced into a stream, or where the placement of these materials will contribute to destabilization of the slope.
- Before working in a RHCA, all heavy equipment or other machinery will be inspected for hydraulic or other leaks. Leaking or faulty equipment will not be used. Equipment with accumulations of oil, grease, or other toxic materials will be cleaned in pre-approved sites outside RHCA's.
- Undercutting of cut slopes will be avoided during ditch maintenance activities.
- Fuel storage and fueling of equipment will not occur within RHCA's.
- Disposal materials will be deposited in approved disposal areas.
- Grader operators will backslope away from areas adjacent to streams where there is a potential for sediment delivery into streams. Sediment control devices will be placed to trap sediment in hot spots where sediment could reach a stream.
- Grassy areas are maintained around culverts to minimize the potential for sediment delivery to streams from road grading. Sediment control devices will be placed to trap sediment in hot spots where sediment could reach a stream.
- Sloughing material is deposited in a disposal site away from any stream and left to vegetate naturally. If the annual amount of slough is substantial and the road has become narrowed by loss of material from cut banks or by machine removal of the slough, the slough material is hauled to an approved stable waste site where it is deposited and seeded.

Drainage Structure Maintenance

Drainage maintenance is one of, if not, the most important item of maintenance. Drainage maintenance is performed in order to disperse runoff and minimize road-generated sediment and delivery to surface waters. Drainage maintenance includes the maintenance of drainage structures including culverts, water bars, drain dips, and ditches. Actions include removal of coarse and fine materials and brush from catch basins, inlets, outlets, outlet channels, leadoff ditches, trash racks, drop inlets, water bars, open-top culverts, and rolling dips.

Drainage structure work accomplished under maintenance includes opening plugged culverts, adding water bars to road surfaces, maintaining and forming drivable drainage dips into road surface, adding ditch relief culverts, replacing plugged or damaged ditch relief culverts, and cleaning drainage ditches. These proposed actions will be reviewed by Level 1 prior to taking action if they occur within Category 1 or in Category 2 streams where sediment could enter fish habitat.

Plugged culverts are opened using hand shovels or power equipment. The material removed by hand is spread away from drainage so it will not fall or wash back into the drainage channel or structure. When cleaned with backhoe, the material is hauled to a disposal area by dump truck away from areas subject to erosion or discharge into streams. These proposed actions will be reviewed by Level 1 prior to taking action if they occur within PACFISH/INFISH Category 1 or in Category 2 streams where sediment could enter fish habitat unless they are emergency situations and are consulted on under emergency consultation procedures.

Roadside ditches and lead off ditches shall be cleaned of any material, which would obstruct the flow of water. When possible, grassed ditches are not disturbed, except where necessary to re-establish functional drainage.

Water bars are used on roads to disperse water at variable intervals to slow the velocity and decrease the volume of water traveling on the road prism, thus decreasing the risk of sedimentation due to erosion. These water bars are cut into the road surface at spacing intervals, which control the accumulation of water volumes and velocities. Backhoes and excavators are generally used to perform drainage repair or replacement.

Design Criteria

- Waste materials removed during maintenance activities and cleaned materials from culverts and open tops will be deposited in approved disposal areas outside flood plains in pre-approved disposal sites.

- Before working in a RHCA, all heavy equipment or other machinery will be inspected for hydraulic or other leaks. Leaking or faulty equipment will not be used. Equipment with accumulations of oil, grease, or other toxic materials will be cleaned in pre-approved sites outside RHCA’s.

- Berms, sediment basins, or sediment traps will be constructed where required to contain sediment from the damage/repair site.

Ditch Relief Culvert Replacement, Installation or Removal

Ditch relief culverts remove water from roadside ditches, decreasing sedimentation to streams by reducing the concentration of water exiting roadside ditches. Replacement, removal, or installation of ditch relief culverts can occur outside RHCA’s or in RHCA’s, although culverts located in RHCA’s are not located in a streambed. Backhoes and excavators are generally used to perform ditch relief culvert construction activities. Ditch relief culvert construction activities outside of RHCA’s would occur as part of this consultation but would be limited to dry conditions and would use appropriate sediment control measures to ensure sediment does not reach streams. Ditch relief culverts construction activities occurring inside RHCA's will occur only during dry conditions. Sediment controls will ensure that sediment will not enter streams. The proposed activities will be reviewed by MNF fisheries biologist and will receive approval from the Level 1 Team before being carried out. Culvert removal, replacement, or installation in perennial or intermittent streams will be consulted on separately as a separate project.

Design Criteria

- Work would be done only during dry conditions.
- During installation, efforts are taken to prevent the escapement of soil into streams.
- Sediment filters, hay bales, or other devices will be installed at the culvert outlet if natural filters are not present.
- Culvert work inside RHCA's will be reviewed with engineering and hydrology or fisheries staff and designed to conform the project design criteria, standards, guides, and best management practices of this BA. These activities are subject to review and approval of Level 1.

Sign Maintenance and Construction

When selecting sign locations, sites adjacent to fish bearing streams will be avoided if at all possible to avoid disturbance and potential for sediment delivery to the stream and to prevent the need for brushing for visibility.

Sign maintenance includes: straightening rock basket and sign post, cleaning the sign face, brushing for sign visibility, installing hazard markers that denote road hazards, and replacing missing lag screws. When a sign degenerates to an unacceptable degree it will be replaced. When not applicable to the public, signs will be removed, covered, hinged, turned, or supplemented with another sign that indicates periods of time that signing is applicable. When signs are installed in rock baskets, the rock basket shall be no less than 113 inches circumference and 32 inches high. For posts twelve feet or higher, baskets shall be no less than 151 inches in circumference and 52 inches high. All posts shall be placed to the proper height and be thoroughly tamped in. They shall in no case be less than two feet or a quarter of the post height in the ground, or which is greater. Multiple post installation shall be used on signs 40 inches or more in width. The elevation of the lowest marker (an arrow symbol) will be four feet from near edge of road surface to bottom of sign. Reassurance markers or other single route markers will also be four feet. Destination and warning (any signs other than route markers) should be a minimum of five feet.

Road Snag or Danger Tree Felling

Road maintenance requires snags and danger trees to be felled on all open and seasonally opened roads. Trees are felled to comply with OSHA regulations and to maintain safe driving conditions. Snag falling is the cutting of dead trees, which have either lost their bark or their bark is loosened and there are signs of rot. The snags must be sufficiently tall to reach the traveled way and are leaning toward the road before they become necessary to fall. Danger tree falling is the cutting of a large standing green tree which has either root-sprung, contains butt rot, or has a severe lean in the direction of the travel way. The tree is of such length that it will hit the traveled way if it falls. Much of this work is accomplished through timber sale contracts. These situations will require a review by the Level 1 Team to ascertain if the proposed action is within the NLAA effects determination covered in this BA. All trees will be felled with normal stump heights. When feasible, trees shall be felled so that they land outside the road clearing limits. Trees falling inside the clearing limits shall be treated in the same manner as shown under logging out (see next section) or cleaning and grubbing specifications.

Danger trees within a riparian habitat conservation area (RHCA) will be felled and left onsite.

Logging Out

Logging out is the bucking, removal, and disposal of downed trees, logs, and debris, which have fallen on or across the road bed or lie within the traveled way, thus presenting safety and access concerns. Logging out is performed to provide safe travel for the road users and provide adequate room to achieve road maintenance activities with maintenance equipment. All roads except Maintenance Level I roads require logging out as part of the road maintenance program, unless funding or priorities determine differently. It is intended for all arterial and main collectors to be logged out as early in the year as possible.

Logging out removes fallen trees, snags, or protruding trees that extend into the travel way. Additional width shall be cleared if needed for maintenance. Any wood, slash or debris over four inches in diameter and two feet long either existing or created from logging out operations, will be removed from ditches, drainage channels, traveled way, shoulders, and turnouts and scattered on the downhill slope away from drainage. Trees within the travel way shall be cut, limbed, and placed outside the travel way and turnouts and out of drainages and ditches. Trees standing outside travel way but having branches extending into the area shall be limbed to a height of 14 feet. Trees that are blocking ditches or drainage structures may be cut. Some slash will be used as sediment filters at outlets for cross road drainage. Some of the slash will be chipped and placed on cut or fill slopes or disturbed areas. The chipped material provides sediment control, holds in moisture improving sprouting of native seed, and is incorporated more rapidly into the duff layer.

Any portion of a tree, which has fallen into a RHCA will be left in place outside of the roadway. Merchantable logs outside the RHCA shall be cut and removed from the traveled way to facilitate safe passage and proper maintenance. Non-merchantable logs may be cut any length to facilitate safe removal. If these logs are decked to provide designated firewood to the forest users, the deck will not be adjacent to live streams in order to prevent fuel contamination.

When removing downed logs in the road, which extend into a stream, any material on the fill slope and in the stream will be retained to provide for instream woody debris recruitment. If the woody debris is endangering nearby culverts, bridges, or road fill, the debris will be relocated in its original condition to the fill slope or stream channel downstream of the structure.

Design Criteria

When removing down logs, which extend into a stream, from a road, any material on the fill slope and in the stream will remain (not be removed) to provide for woody debris recruitment, except in cases where the retention of this material would result in a safety concern (i.e. downstream facilities). Any felled danger trees or blow down in RHCA's will be left in the RHCA and off the roadway.

Roadside Brushing

Roadside brushing is performed to provide visibility, safe stopping distance, clearance for maintenance equipment, unimpeded travel and unobstructed flow of water by the removal of standing vegetation in ditches which may divert water out of the intended course of flow within the clearing limits. Safety and drainage issues will be the primary need for brushing.

On designated open roads, maintenance Level III to V, brush is removed when it reaches a damage threshold described below.

The threshold for roadside vegetation is exceeded when:

- Growth hinders ones view of regulatory and warning signs by blocking the symbol within 200 feet on level III roads, 275 feet on level IV roads, and 375 feet on level V roads.
- Growth interferes with the use of a travel way
- Growth blocks the view of oncoming traffic to the degree that a driver could not determine the speed or existence of an oncoming vehicle thus affecting adequate stopping distance.
- Growth interferes with the steady flow of water in ditches or through drainage structures.

Roadside brushing on Level II roads will consist of cutting and disposing of vegetative growth to provide at lease twelve feet of continuous traveled way and eight feet of turnout width where they exist plus any additional width needed for maintenance. All vegetation shall be cut within two inches of the traveled way. Limbing may be done with a chainsaw or hand tools. Limbs are cut flush to the tree trunk. Debris from cutting operations shall be removed from the brushed area and scattered or chipped. Some slash from cutting operations will be used as sediment filters at outlets for cross road drainage. Some of the slash will be scattered or chipped and placed on cut or fill slopes or disturbed areas. The chipped material provides sediment control, holds in moisture improving sprouting of native seed, and is incorporated more rapidly into the duff layer.

Level III, IV, and V roadside brushing consists of cutting and disposing of vegetative growth including trees less than six inches in diameter. The area to be brushed includes cut slopes, fill slopes, ditches, roadbed, turnouts and vertical clearance. Additional area shall be brushed on the inside of curves as necessary to achieve adequate sight distance. Trees outside the roadbed or ditch, but within the brushing limits, which are over six inches in diameter will be limbed in lieu of cutting. Trimming or limbing may be done with a chainsaw or hand tools. Limbs are cut flush to the tree trunk. Debris from cutting operations shall be removed from the brushed area and scattered or chipped. Some slash from cutting operations will be used as sediment filters at outlets for cross road drainage. Some of the slash will be scattered or chipped and placed on cut or fill slopes or disturbed areas. The chipped material provides sediment control, holds in moisture improving sprouting of native seed, and is incorporated more rapidly into the duff layer.

Design Criteria

- In road segments that parallel stream courses, brushing operations will maintain stream shade along with safety considerations. This may necessitate hand brushing, partial brushing, or limbing, with consideration for providing growth for future shade.
- Brush removal will occur within RHCA’s where safety is an issue. Options other than complete "removal" will be considered in order to leave ground cover to help control water and sediment flow off the road surface into the RHCA and stream channels on sites where brush removal would cause sediment to be delivered to a stream.
- When brush cutting is necessary at stream crossings, it will be cut only to a minimum height of six inches above the ground to prevent sediment delivery to a live stream and will be left in ditches. Brush and other standing vegetation provide shade and filtering of dust delivery to streams and will be maintained except where public safety is an issue.
- Roadside brushing that involves more than minimal removal of vegetation (i.e., limbing of trees or removal of brush) in RHCA’s will be reviewed by an MNF fish biologist or hydrologist and will require approval of the Level 1 Team.

Dust Abatement

During the summer months some roads will receive dust abatement treatment. Dust abatement is the application of a product, which either bonds dust particles and fines to larger matter or makes them heavier so they tend not to rise with the passage of vehicles. The purpose of dust abatement is to prevent loss of surface fines, enhance vehicle safety, and in some cases, prevent pollution and provide vehicle occupant comfort. Water is the only agent that will be used for dust abatement.

Water source development is not part of the proposed action of this BE. Where water can be drafted from designated water sources, it can occur only as long as supply is adequate to provide for both fish and withdrawal. Screens are attached to intake hoses to prevent pulling fish and other small matter. NOAA FISHERIES developed criteria for pump intake screens will be used on all water pump intakes as described in the attached "Appendix B, Juvenile Fish Screen Criteria For Pump Intakes" (NMFS, May 9, 1996). Screen mesh openings shall not exceed 3/32 inch for woven wire or perforated plate screens, or 0.0689 inch for profile wire screens, with a minimum 27 percent open area. Trucks will be maintained to prevent oil leaks. Loading is done in a manner to minimize overflowing and discharge of wash into stream.

Storage water will be pumped or gravity fed into a holding tank or pond, using less than ten percent of the stream volume. All systems will have screened intake pipes and return systems will be designed that prevents sediment from entering the stream. The maximum withdrawal from one site in an 8-hour period will be 18,000 gallons of water.

Water drafting guidelines prepared by NOAA Fisheries are included in Appendix A and will be implemented as needed under this BE.

Snow Removal

Removal of snow from roads is needed to facilitate logging operations and access for project work (e.g., reforestation). As snow plowing is done in connection or association with timber harvest and/or reforestation, it will be included as an activity with those projects for consultation.

Snow removal is also done to ensure safe and efficient transportation and to prevent unacceptable erosion damage to roads, streams, and adjacent lands. Removal includes the entire road width and turnouts. Snow slides, minor earth slides, fallen timber, and boulders that obstruct normal road surface width, including turnouts, are also removed. If culverts and ditches are restricted by snow or ice, they will be opened to allow proper drainage.

Design Criteria

Any type of equipment may be used to remove snow, providing:

- Type or use of equipment is not restricted in contract or permit clauses or Forest Road Rules document.

- Equipment is of the size and type commonly used to remove snow and will not cause damage to the road.

- The use of dozers to remove snow requires written Forest Service approval. All equipment shall be equipped with shoes or runners, unless agreed otherwise, that are designed to leave 4-6” of snow on roadway. Snow will not be completely removed.

- Berms shall be opened (surface trenches or drainage holes) to prevent the accumulation of runoff during melt off. Drainage holes will be spaced as required to obtain satisfactory surface drainage without discharge on erodible fills and will be placed above vegetation filters.

- Side casting of snow will be avoided in areas adjacent to streams where there is potential to cause snow or ice damming.

- Side cast material will not include dirt and gravel.
- Damage from, or as a result of snow removal, will be restored in a timely manner.

Road Closures

Road closure actions in this BE will include the installation of a physical device to restrict vehicle traffic. A closed road is an operating facility on which motorized traffic has been removed (year long or seasonally). These roads remain on the Forest Road Transportation System. Closed roads may not be drivable because they are usually not logged out or brushed out. They are closed to vehicles except for emergency or permitted use. One objective of road closures is to limit motorized vehicle traffic on native surface roads to reduce erosion. The roads are left in a stable condition and are maintained on an “as needed” basis. Inspections are made following a storm event or at least every five years.

Roads are most commonly closed with pole gates, steel gates, or closure signs, or earth berms as applicable for effective closure. These roads will be treated to provide self-maintenance prior to closure. Self-maintenance includes a variety of actions. Ditch relief culverts will be removed behind roads closed using earth-berms. Earth berms will not be used on roads with culverts at channel crossings still installed. Water bars will be installed with appropriate skew, outlet, and spacing. Sediment barriers of available woody material such as slash, brush, etc., will be placed at water bar outlets. Side ditches will be bladed where needed; culverts will be cleaned to drain; catch basins will be functional and free of debris. Drain dips, grade sags, and cross ditches will be reconstructed/rocked as necessary to assure proper functioning. All actions will be considered on a site-specific basis with each road or road segment actions suited to the needs and condition of the road and related resources.

Road closure actions, whether the initial closure or re-closing a breached road will occur only during sufficiently dry conditions to prevent damage and runoff. Road closure are also confined to time periods such that key fish or spawning areas are not impacted and soil movement is not likely to occur. All road closure activities will be reviewed by a fisheries biologist and who will inspect the site for adequate design criteria. The Forest will consult separately on road decommissioning projects of any type and on self-maintenance closures, which contribute sediment delivery to water. This would entail removing the road from the transportation system, contouring when needed, and rehabilitation of the area to as natural a condition as possible.

Material Sources

The Forest maintains an inventory of all active rock material (quarry) sources and many closed, inactive, and unopened sources. Over twenty-eight years ago, the Forest began locating centralized sources to provide rock material needs, especially for those projects that required large quantities of material. A primary goal of centralized sources is to limit the magnitude of surface disturbances while extracting quality materials to meet demand. Most roads which access developed sources have aggregate surfaces.

Some of the larger sites have been designed to impound water. These sites provide storage for rain and runoff, which may be used as water sources for road maintenance activities, dust abatement, and fire suppression. An associated benefit of these ponds is use by wildlife and grazing animals.

Most sources are located in rocky terrain and are at a sufficient distance from any drainages or RHCA’s so as to have no impact on sediment contribution. A few sources have been developed in the past, which are located within RHCA buffers. The portions of sources within RHCA’s will not be expanded into the RHCA’s.

USFS engineers are responsible for following all Forest Plan Standards and Guidelines, PACFISH Standards and Guidelines, and PACFISH Riparian Management Objectives. Dust abatement will be used as needed, and safety guidelines will be used.

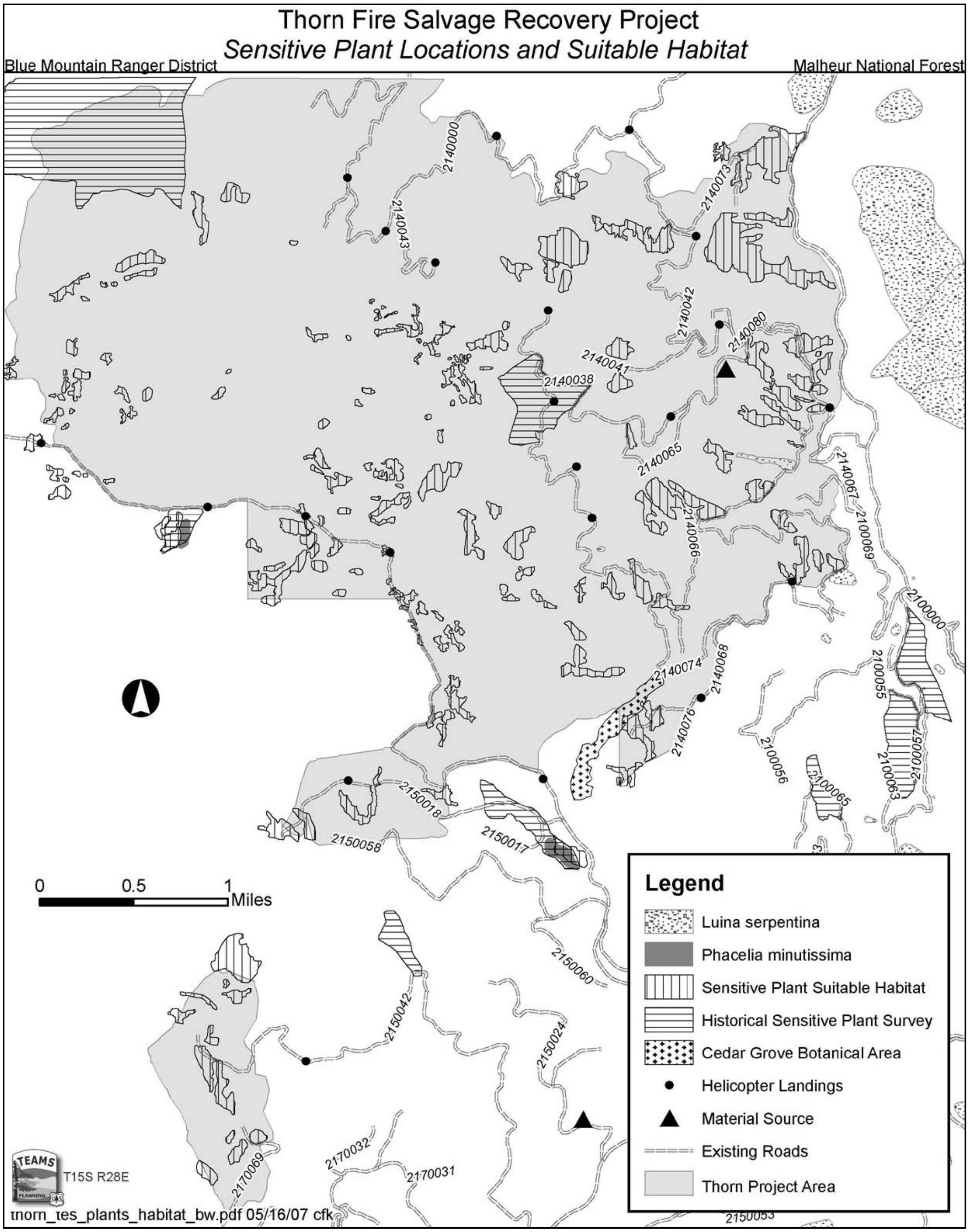
This page left intentionally blank

APPENDIX G – SENSITIVE PLANTS

Appendix G-1: List of Sensitive Plants Documented or Suspected to Occur on the Malheur NF

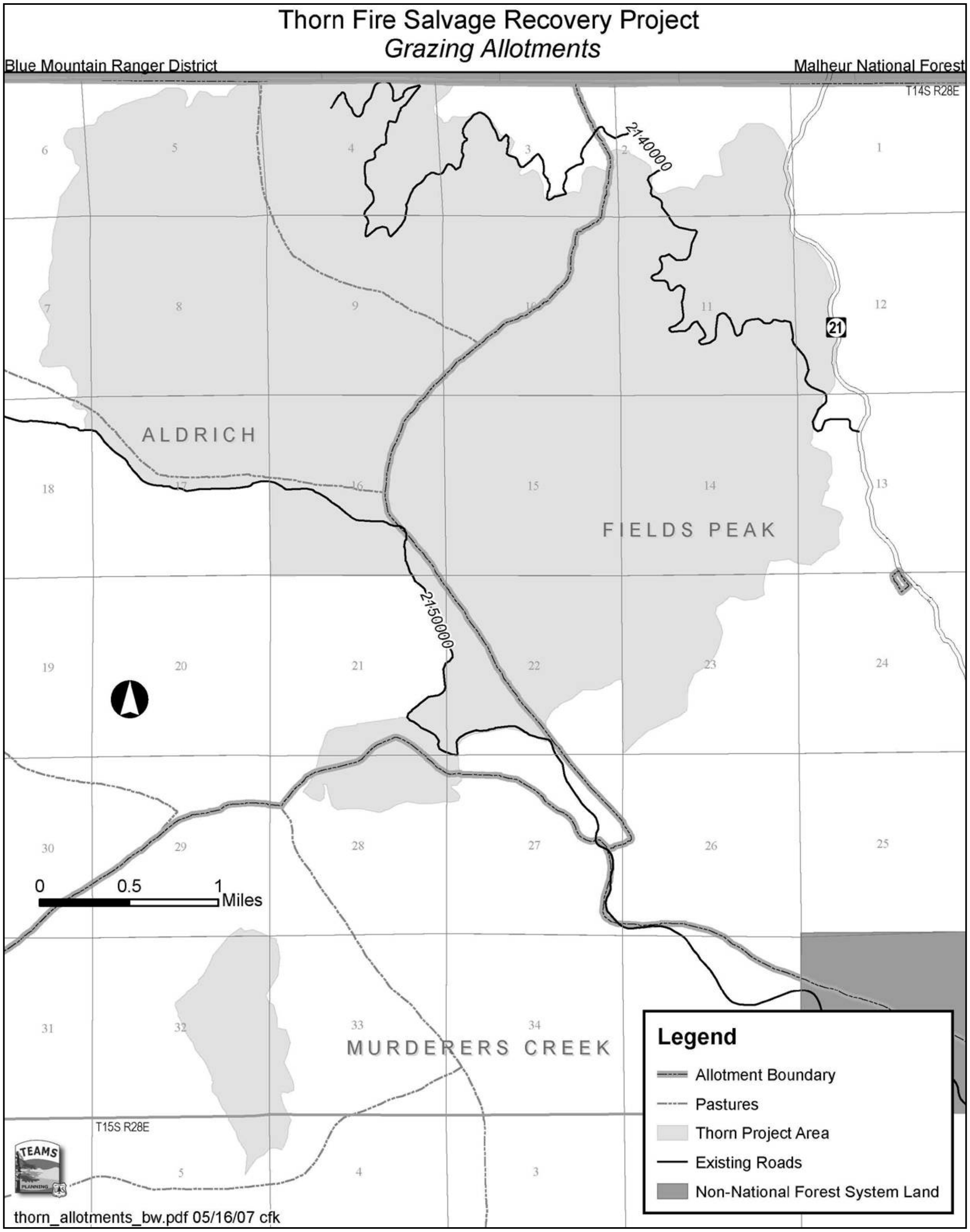
SENSITIVE SPECIES	Documented or Suspected	Habitat Type
Leptogium burnetiae var. *hirsutum*	S	Bark, moss, rocks in wet forest
Achnatherum hendersonii	S	Lithosolic substrate, scablands
Achnatherum wallowaensis	S	Lithosolic substrate, scablands
Astragalus diaphanus var. *diurnus*	S	Arid sagebrush
Astragalus tegetarioides	D	Sagebrush basins
Botrychium ascendens	D	riparian
Botrychium crenulatum	D	riparian
Botrychium lanceolatum	D	riparian
Botrychium minganense	D	riparian
Botrychium montanum	D	riparian
Botrychium pinnatum	D	riparian
Calochortus longebarbatus var. *peckii*	D	Riparian, southern Blue Mts
Camissonia pygmaea	S	Riparian, southern Blue Mts
Carex backii	D	Riparian in PIPO/SYAL; PSME/SYAL
Carex interior	D	Seeps, riparian
Carex parryana	D	Moist-Dry meadows
Cypripedium fasciculatum	S	Moist bottomland, riparian
Listera borealis	D	cool-wet forest, springs
Lomatium erythrocarpum	S	alpine
Lomatium ravenii	D	Lithosolic substrate, scablands
*Luina serpentina**	D	Talus, rock outcrops
Mimulus evanescens	D	Moist gravelly, rocky areas in sagebrush –juniper zone
Pellaea bridgesii	S	Limestone rock outcrops
*Phacelia minutissima**	D	Upper montane meadows, balds
Pleuropogon oregonus	S	Wet meadows
Thelypodium eucosmum	D	Juniper, sagebrush
Dermatocarpon luridum	S	Aquatic, bedrock, boulders

Appendix G-2: Map Sensitive Plant Locations and Suitable Habitat in the TFSR Project Area.

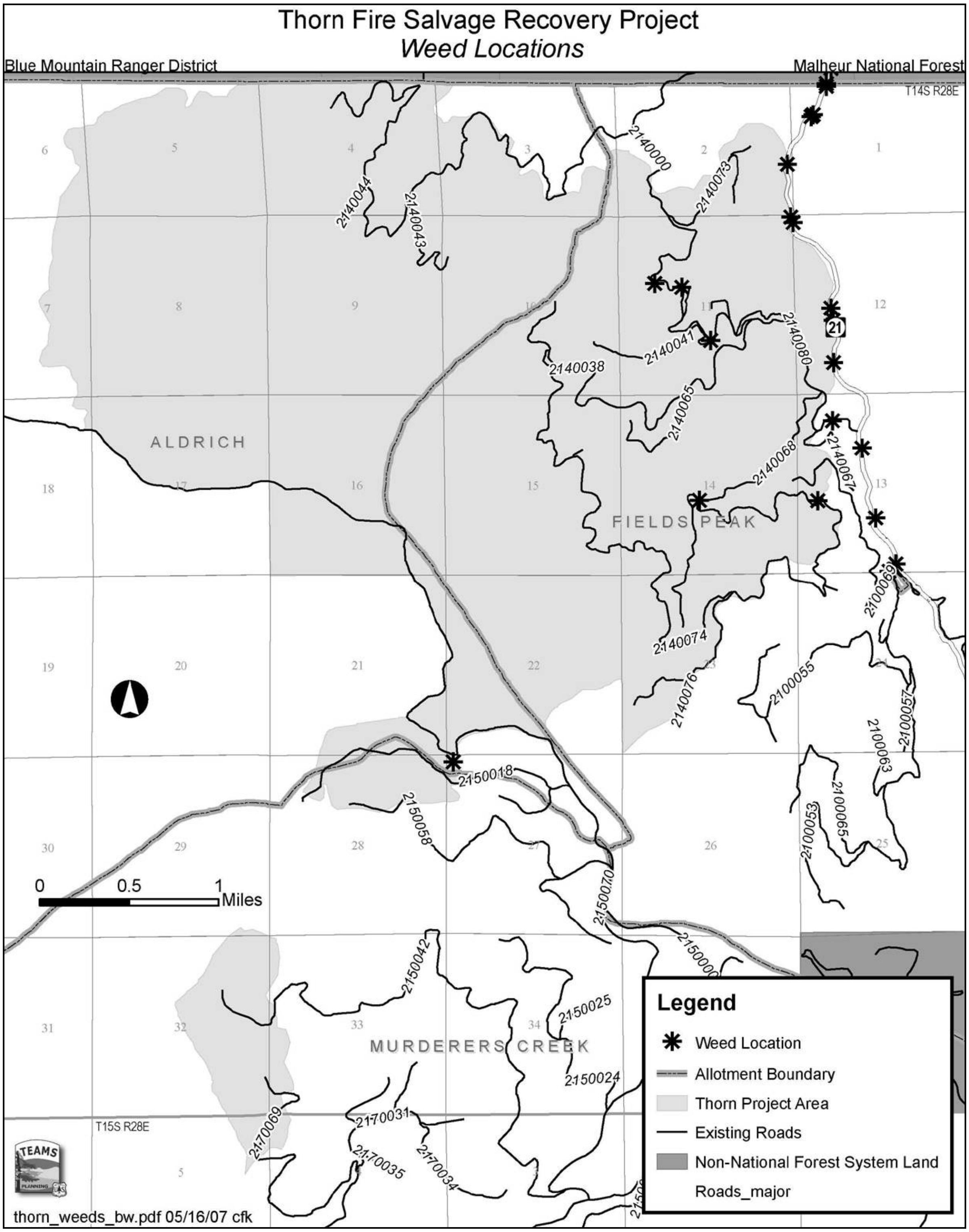


APPENDIX H – RANGE / NOXIOUS WEEDS

Appendix H-1: Map of Grazing Allotments



Appendix H-2: Map of Noxious Weed Locations



Appendix H-3: Pre-Fire Grazing And Allotment Data

Grazing Allotment	Pasture Name	Total Pasture Acres	Recent Grazing	Grazing Season	Ground Cover (Percent of Pasture)	Acres Within Shake Table Fire	Acres By Burn Severity			
							High	Med.	Low	Unburned
Aldrich	Widows Creek Basin	4,669	Not Grazed		76percent Elk Sedge	2,111	1,439	381	256	35
	Widows Creek Burn	1,412	100 cow calf pairs	July 20 to August 30	75percent Elk Sedge	1,197	434	489	240	34
	Aldrich Ridge	6,602	Not Grazed		77percent Elk Sedge	2,715	1,120	946	567	82
	Cabin-Todd	4,272	Not Grazed		76percent Elk Sedge	698	92	156	317	133
Fields Peak	Fields Peak	12,075	240 cow calf pairs	August 30 to September 25	58 percent Elk Sedge, 17 percent Pinegrass	3,541	464	900	1,859	318
	Horseshoe Pasture	68	See Above			9	0	0	1	8
Murders Creek (North Herd)	Martin Corrals (part of North Herd)	4,301	North Herd - 175 cow calf pairs	May 16 to October 15	35percent Bunchgrass, 32percent Elk Sedge	761	0	47	549	165
	Red Rock (part of North Herd)	3,113	See Above	See Above	37percent Elk Sedge, 15percent Bunchgrass, 12percent fescue, 10percent pinegrass	2,350	7	344	1,600	399
	Oregon Mine (part of North Herd)	10,338	See Above	See Above	50 percent Elk Sedge, 50percent pine Grass	143	0	13	114	16
	Dans Creek (part of North Herd)	3,703	See Above	See Above	Unburned	0	0	0	0	0
Murders Creek (South and Middle Herds)	Frenchy Butte	13,063	South and Middle Herds 700 cow calf pairs 300 cow calf pairs 5 Saddle Horses	May 15 to June 30 July 1 to October 15 May 15 to October 30	Unburned	0	0	0	0	0
	Deer Creek	13,854	See Above	See Above	Unburned	0	0	0	0	0
	John Young Meadows	707	See Above	See Above	Unburned	0	0	0	0	0

Grazing Allotment	Pasture Name	Total Pasture Acres	Recent Grazing	Grazing Season	Ground Cover (Percent of Pasture)	Acres Within Shake Table Fire	Acres By Burn Severity			
							High	Med.	Low	Unburned
	Horse Mountain	4,085	See Above	See Above	Unburned	0	0	0	0	0
	Lucer/Blue Ridge	7,776	See Above	See Above	Unburned	0	0	0	0	0
	Timber Mountain	5,268	See Above	See Above	Unburned	0	0	0	0	0

Appendix H-4: Post-fire Grazing and Allotment Data

Allotment	Pasture Name	Establishment of Grazing (by Pasture)	Rationale
Aldrich	Widows Creek Basin	3-5 Growing Seasons	Approximately 45percent of the pasture burned. 39percent with moderated or high severity.
	Widows Creek Burn	3-5 Growing Seasons	Approximately 85percent of the pasture burned. 65percent of pasture burned with moderated to high intensities. 75percent elk sedge ground cover.
	Aldrich Ridge	3-5 Growing Seasons	Approximately 41percent of the pasture burned. 31percent of with moderate or high severity.
	Cabin-Todd	2-3 Growing Seasons	Approximately 16percent of the pasture burned. Less than 100 acres burned with high severity. Approximately 6percent of the pasture burned with moderate or high severity
Fields Peak	Fields Peak	Unburned – Graze in 2007 (control grazing to unburned areas in lower elevations) Rest burned area 1-2 years	Approximately 29percent of the pasture burned. Approximately 11percent burned with moderate or high intensity. 75percent of pasture is elk sedge or pine grass ground cover. Moderate and high intensity burn areas are located in the higher elevations which receive limited grazing pressure.
	Horseshoe Pasture		
Murders Creek (North Herd)	Martin Corrals (part of North Herd)	Summer or Fall 2008	Approximately 18percent of the pasture burned. No acres of high severity burn. Less than 1percent moderate severity. 35percent Bunchgrass, 32percent Elk Sedge.
	Red Rock (part of North Herd)	Summer 2008 (or 2009 Grazing season) -Depending on recovery of moderately burned areas and areas with bunchgrass ground cover.	Approximately 75percent of the pasture burned. 11percent of pasture burned moderated to high severity. Less than 10 acres of high severity. 15percent Bunchgrass
	Oregon Mine (part of North Herd)	Spring 2007	Approximately 1percent of the pasture burned. No acres of high severity burn. Less than 1percent burned with moderated to high severity. 100percent Elk sedge or pine grass ground cover.
	Dans Creek (part of North Herd)	No Rest	Unburned
Murders Creek (South and Middle Herds)	Frenchy	No Rest	Unburned
	Maggot Springs	No Rest	Unburned
	Deer Creek	No Rest	Unburned
	John Young Meadows	No Rest	Unburned
	Horse Mountain	No Rest	Unburned
	Lucer/Blue Ridge	No Rest	Unburned
	Timber Mountain	No Rest	Unburned

Appendix H-5: Malheur NF Post-Fire Grazing Guideline Direction

POST-FIRE GRAZING INTERIM GUIDELINES
MALHEUR NATIONAL FOREST
December 2, 2003

The Authorized Officer, Forest Supervisor and or District Ranger (this authority can not be delegated), has the responsibility of determining when to resume grazing on areas burned during wildfire or prescribed fire. These guidelines establish the minimum timeframes that an area will be rested from grazing following fire. Other resource concerns may require resting the burned area from grazing for longer periods to allow the area to recover sufficiently.

When making that decision to resume grazing after fire, some factors that should be considered are (list not all inclusive):

- Amount of acres burned (suitable for grazing and non-suitable).
- Amount and spatial arrangement of moderate and high intensity burned areas in relation to the whole burn and surrounding non-burned area.
- History of past grazing use.
- Vegetation community type and its condition prior to the burn. The vegetation community and its condition will influence the amount of time necessary for it to recover from the affects of fire.
- How much effective ground cover is available and are needed to resume grazing.
- Aquatic resource values.
- Condition of range improvements, have they been damaged and, if so, have they been reconstructed.

Resumption of grazing following prescribed fire or wildfire is dependent upon the length of time it takes the vegetation to recover sufficiently to withstand grazing (Sanders 2000). Some vegetation types, such as elk sedge (Carex geyeri)/pine grass (Calmagrostis rubescens); require little or no recovery time after a light burn. Because elk sedge sprouts from underground rhizomes, it has a high degree of resistance to fire, often increasing after a fire; however, severe fire may cause a decrease in elk sedge cover. Burning can improve elk sedge production. Pine grass has rhizomes buried in the top inches of mineral soil, allowing plant survival when the duff is not completely consumed. Low to moderate severity fires are best for pine grass enhancement in Douglas-fir/pine grass associations of the Blue Mountains (information obtained from the Fire Effects Information System).

Other vegetation types, such as bunch grasses, require long recovery periods even after a light burn (prescribed or wildfire) (Brown and Smith 2000, p. 151-152). Carbohydrates manufactured by the plants provide the energy for metabolism and growth (Trlica 1977: in Brown and Smith 2000 p. 28). The underground plant parts that remain after fire usually provide carbohydrates until sufficient growth occurs to allow photosynthesis. Grazing and browsing can delay recovery if the demand on the plant reserves is excessive. Heavy post fire grazing is most likely to cause harm during the first year post fire (Trlica 1977: in Brown and Smith 2000 p. 28). After a light burn by either prescribed fire or wildfire, plant recovery is usually rapid with ground cover returning to pre-burn status in one or two growing seasons (Johnson 1998), but seed production usually doesn't resume until the second growing season. Because seed production might not occur the first season after a prescribed fire or light intensity wildfire, grazing generally would not resume until after the first year seed was produced, probably the second growing season. Recovery after moderate to severe burning can take three or more years (Johnson, pers. comm. February 2003; Johnson 1998). Therefore, grazing generally would not resume until ground cover had recovered and was near or at its pre-fire condition.

In areas where elk sedge and pine grass are the dominant ground cover and 10percent or less of the burned area is occupied by native bunchgrasses, grazing may occur in the same year as a light-intensity (intensity as described in Johnson 1998 or as mapped by the Burned Area Emergency Recovery [BAER] Team) fire if:

Burning occurs before vegetative green-up, then grazing may occur in the area of the burn without any timing restriction; or

The burn occurs after vegetative green-up, grazing may occur after range has been determined to be ready and the percent ground cover of elk sedge and pine grass is the same as prior to the burn, or grazing may occur in the fall (Sept./Oct.) without a range-readiness determination.

For a light (or low) intensity fire in areas where bunchgrass occupies more than 10percent of the burned area, grazing may occur the second growing season after the burn, but only after seed has set. If the bunchgrass areas can be adequately protected from grazing, such as by electric fencing, then grazing may resume in the remainder of the burned area during the first growing season post burn.

For moderate to high intensity (intensity as described in Johnson 1998 or as mapped by the BAER Team) fire in all areas suitable for grazing, as defined by the Forest Plan, grazing may resume after the vegetation has recovered to the percent ground cover that existed prior to the fire as described for the appropriate plant association type in Plant Association of the Blue and Ochoco Mountains (Johnson and Clausnitzer 1992). A team consisting of at least two resource specialists, such as a range conservationist, botanist, ecologist, silviculturist, or hydrologist, will conduct the monitoring to determine if the percent ground cover has been reestablished. The method and results will be documented and submitted to the authorized official who will decide when to resume grazing. If monitoring is not done, grazing may resume after three full grazing seasons after the fire occurred, because research indicates that vegetation usually recovers within this timeframe (C. G. Johnson, pers. Comm., February 2003). However, grazing would not resume prior to two growing seasons after the fire, even if monitoring verified that the percent ground cover was the same as the pre-fire condition, to allow for plants to set seed.

Brown, J. K. and J. K. Smith, Eds. 2000. Wildland fire in ecosystems: effects of fire on flora. Gen. Tech Rep. RMRS-GTR-42-vol. 2. Ogden, UT: S. S. Dept. of Agric., Forest Service, Rocky Mountain Research Station. 257 p.

Johnson, C. G., Jr. 1998. Vegetation response after wildfires in national forests of Northeastern Oregon. R6-NR-ECOL-TP-06-98. US. Dept. Agric., Forest Service, Pac. Northwest Region.

Johnson, C. G., Jr. and R. R. Clausnitzer. 1992. Plant Association of the Blue and Ochoco Mountains. US Dept. Agric., Forest Serv., Pacific Northwest Region, Wallowa-Whitman National Forest, R6-ERW-TP-036-92

Sanders, K. D. 2000. How long should rangelands be rested fro livestock grazing following fire: a viewpoint. Unpubl. Rep. Rangeland Ecology and Management, University of Idaho.

APPENDIX I – RECREATION

Figure I-1: Recreation Opportunity Spectrum

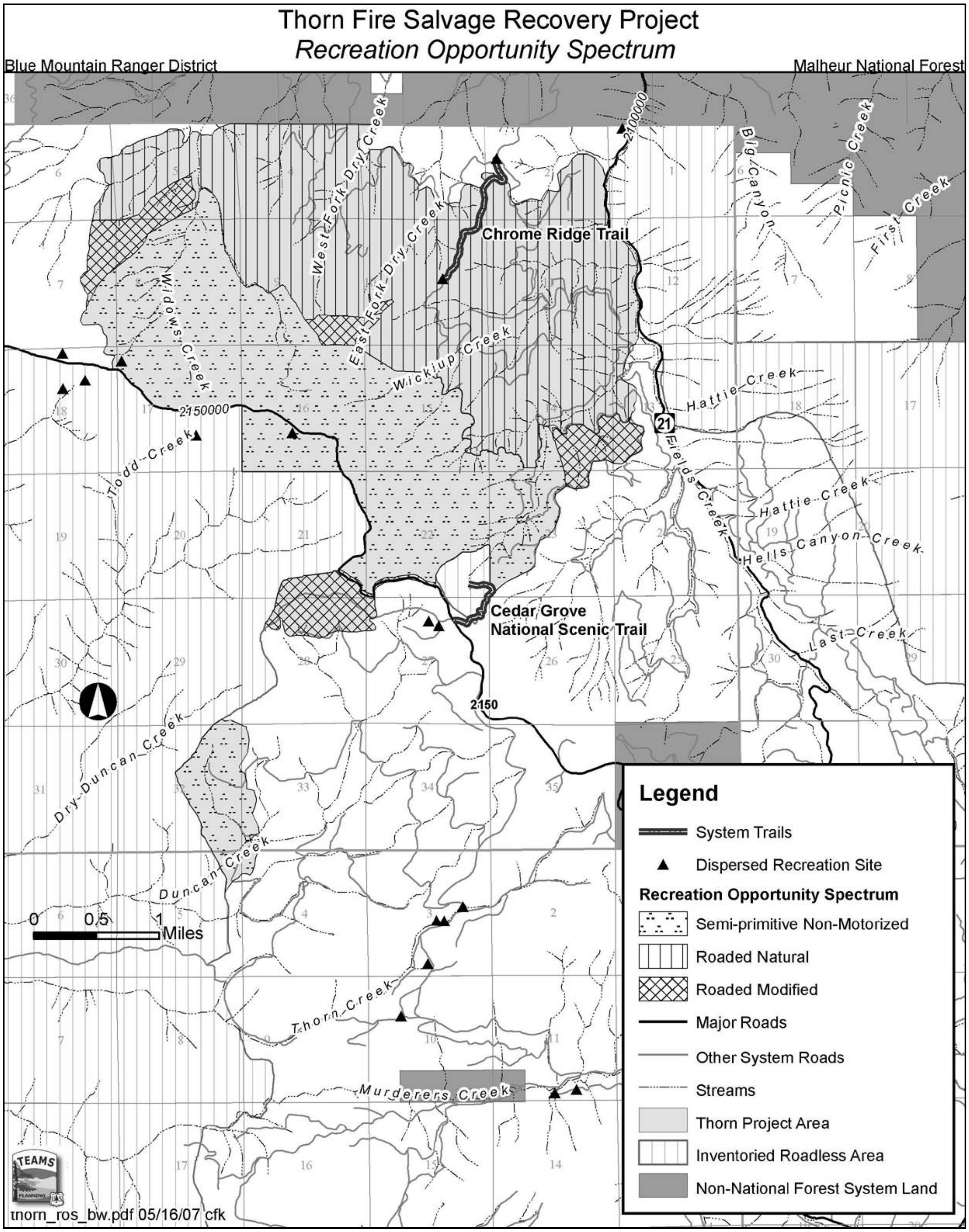


Figure I-2: Alt #2 and Recreation Opportunity Spectrum

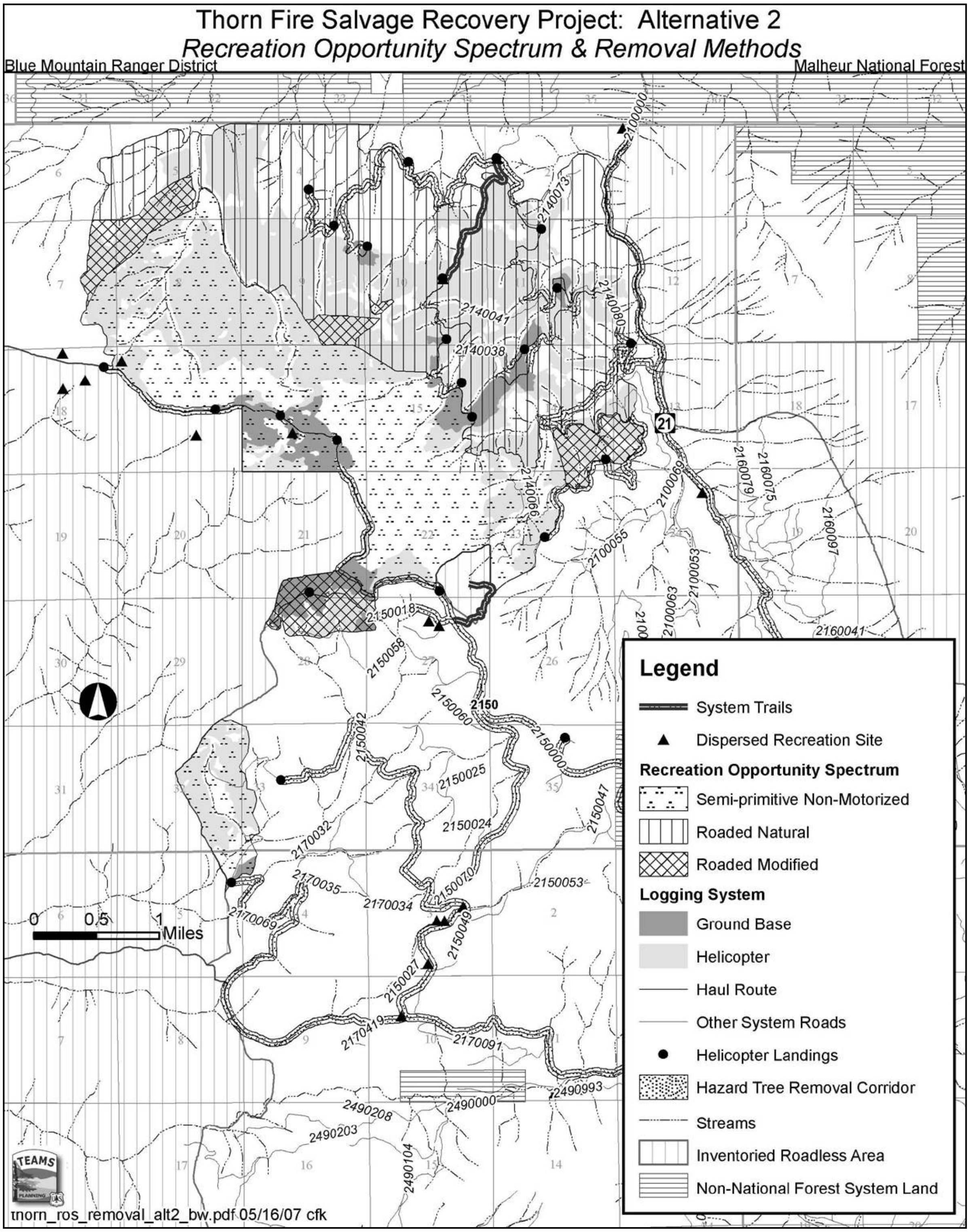
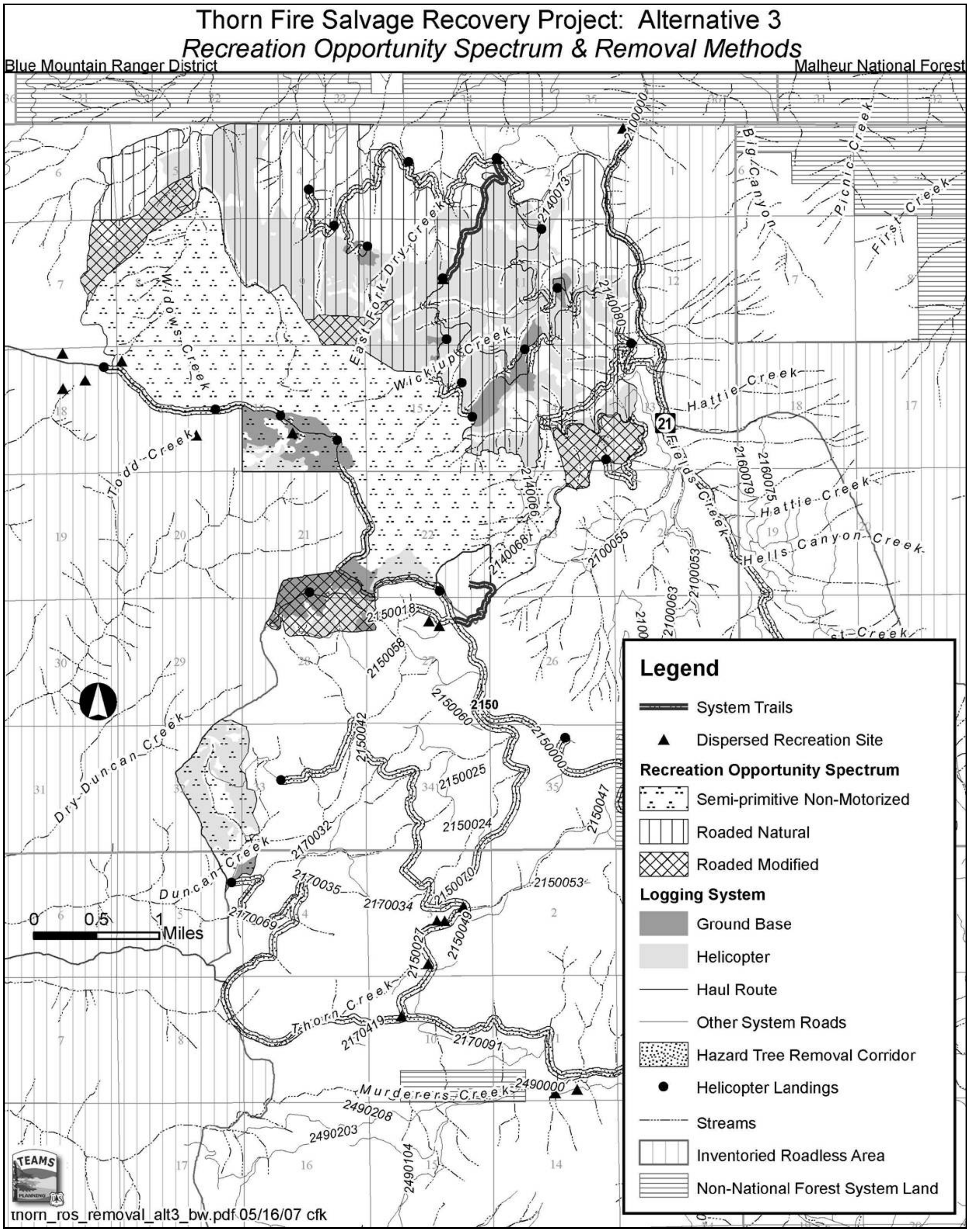


Figure I-3: Alt #3 and Recreation Opportunity Spectrum



APPENDIX J – VISUALS

Figure J-1: Visual Quality Objectives

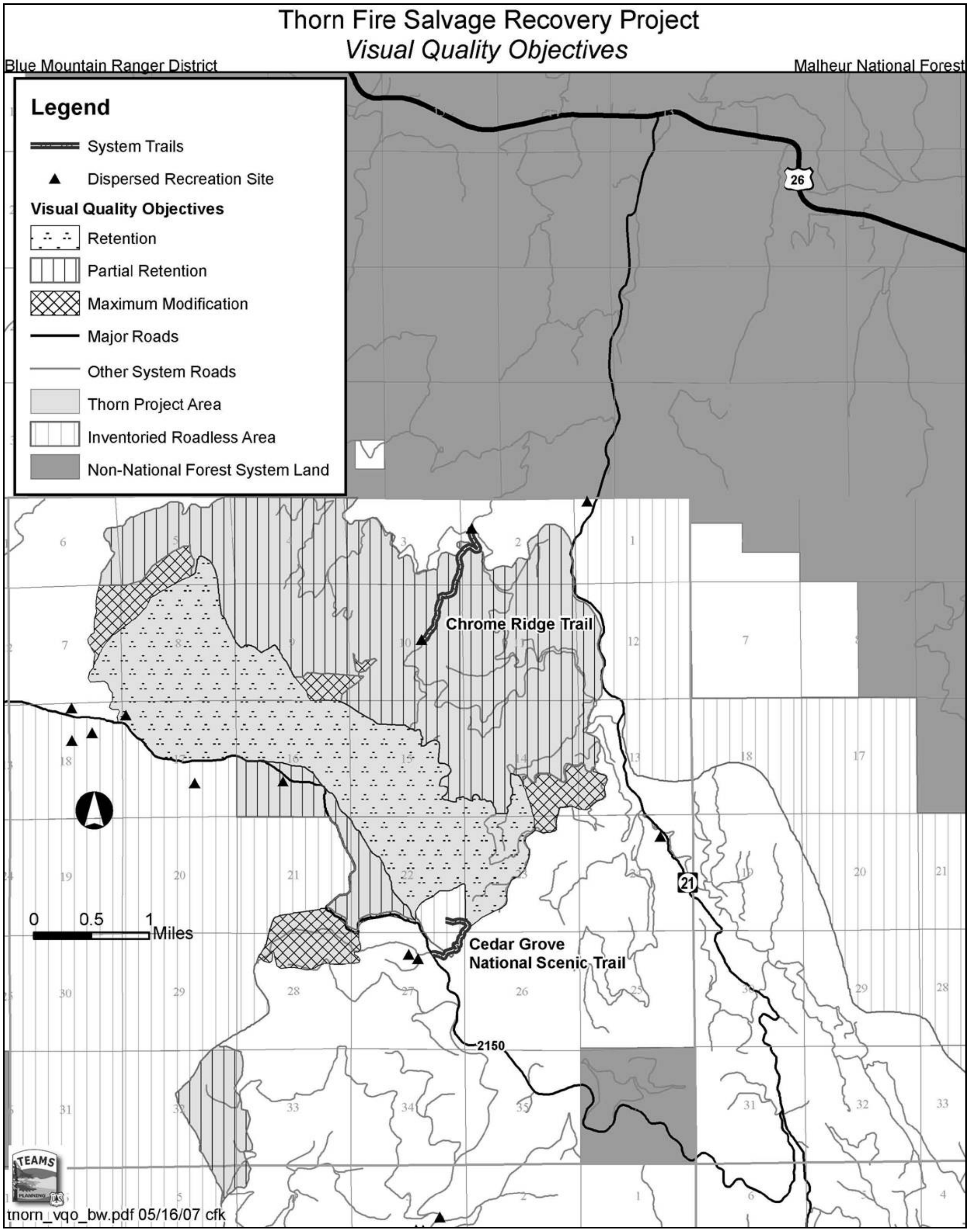


Figure J-2: Alternative 2 and Visual Quality Objectives

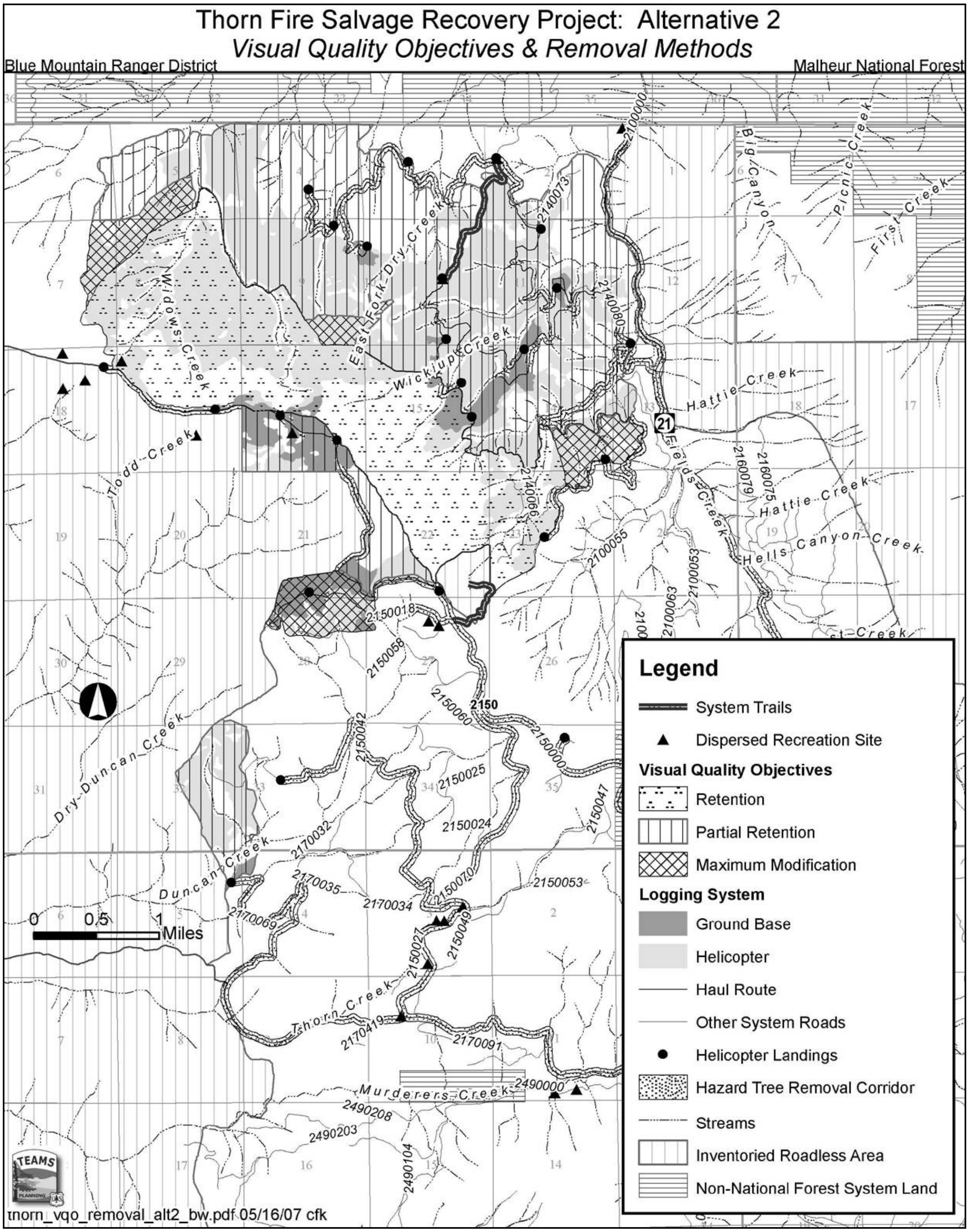
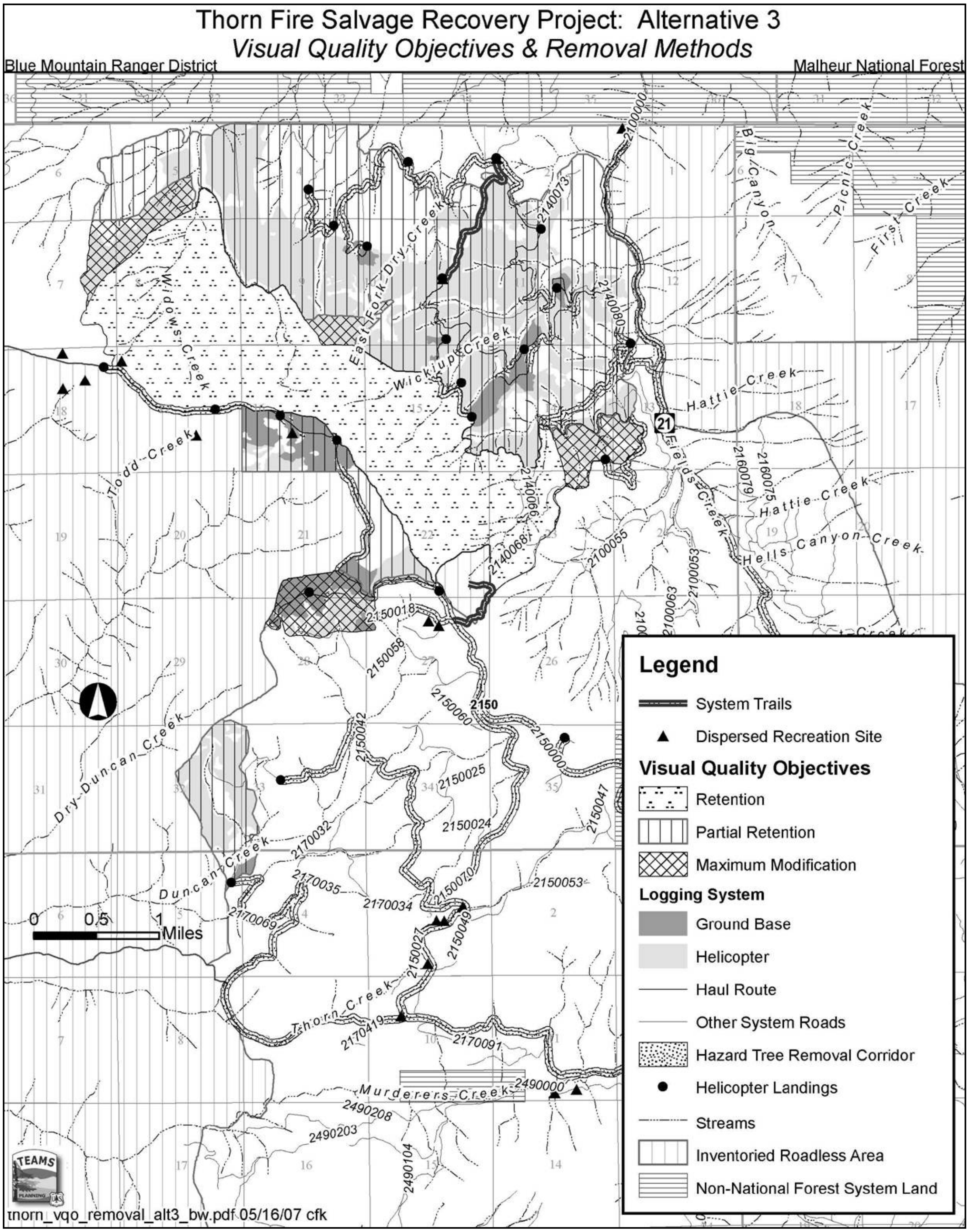


Figure J-3: Alternative 3 and Visual Quality Objectives



APPENDIX K – CULTURAL RESOURCES

This section reserved and left intentionally blank

APPENDIX L – ECONOMICS / SOCIAL

This section reserved and left intentionally blank

APPENDIX M – TRANSPORTATION

Appendix M-1. Proposed Action Road List Table

OPER_MAINT_LEVEL	RTE_NO	HAUL_ROUTE	ALT_2	AMP_PABND	Miles
1 - BASIC CUSTODIAL CARE (CLOSED)	2140065	Y	Y	IN	0.576403
1 - BASIC CUSTODIAL CARE (CLOSED)	2140043	Y	Y	IN	0.800306
1 - BASIC CUSTODIAL CARE (CLOSED)	2140038	Y	Y	IN	0.200409
1 - BASIC CUSTODIAL CARE (CLOSED)	2170000	Y	Y	OUT	1.034775
1 - BASIC CUSTODIAL CARE (CLOSED)	2140068	Y	Y	IN	0.097442
1 - BASIC CUSTODIAL CARE (CLOSED)	2170032	Y	Y	OUT	1.102997
1 - BASIC CUSTODIAL CARE (CLOSED)	2170069	Y	Y	OUT	1.316033
1 - BASIC CUSTODIAL CARE (CLOSED)	2140068	Y	Y	IN	0.011446
1 - BASIC CUSTODIAL CARE (CLOSED)	2140068	Y	Y	IN	0.558572
1 - BASIC CUSTODIAL CARE (CLOSED)	2140000	Y	Y	IN	2.091822
1 - BASIC CUSTODIAL CARE (CLOSED)	2140000	Y	Y	OUT	0.391261
1 - BASIC CUSTODIAL CARE (CLOSED)	2140000	Y	Y	OUT	0.7244
1 - BASIC CUSTODIAL CARE (CLOSED)	2140000	Y	Y	IN	0.120994
1 - BASIC CUSTODIAL CARE (CLOSED)	2140074	Y	Y	IN	0.332536
2 - HIGH CLEARANCE VEHICLES	2150018	Y	Y	IN	0.415141
2 - HIGH CLEARANCE VEHICLES	2170000	Y	Y	OUT	0.586608
2 - HIGH CLEARANCE VEHICLES	2170000	Y	Y	OUT	0.066321
2 - HIGH CLEARANCE VEHICLES	2150020	Y	Y	OUT	0.202188
2 - HIGH CLEARANCE VEHICLES	2140038	Y	Y	IN	2.505108
2 - HIGH CLEARANCE VEHICLES	2140068	Y	Y	IN	0.21529
2 - HIGH CLEARANCE VEHICLES	2140072	Y	Y	IN	0.067642
2 - HIGH CLEARANCE VEHICLES	2140074	Y	Y	IN	0.725121
2 - HIGH CLEARANCE VEHICLES	2140039	Y	Y	IN	0.217946
2 - HIGH CLEARANCE VEHICLES	2140000	Y	Y	IN	1.132835
2 - HIGH CLEARANCE VEHICLES	2140000	Y	Y	IN	0.586646
2 - HIGH CLEARANCE VEHICLES	2150042	Y	Y	OUT	3.443854
2 - HIGH CLEARANCE VEHICLES	2140068	Y	Y	IN	0.210937
2 - HIGH CLEARANCE VEHICLES	2140000	Y	Y	IN	0.335484
2 - HIGH CLEARANCE VEHICLES	2140000	Y	Y	OUT	0.357365
2 - HIGH CLEARANCE VEHICLES	2140068	Y	Y	IN	2.742899
2 - HIGH CLEARANCE VEHICLES	2140068	Y	Y	OUT	0.598447
2 - HIGH CLEARANCE VEHICLES	2140000	Y	Y	OUT	0.356711
2 - HIGH CLEARANCE VEHICLES	2140000	Y	Y	IN	1.261624
2 - HIGH CLEARANCE VEHICLES	2150018	Y	Y	OUT	0.694412
2 - HIGH CLEARANCE VEHICLES	2150018	Y	Y	IN	0.609583
2 - HIGH CLEARANCE VEHICLES	2140074	Y	Y	IN	0.300459
3 - SUITABLE FOR PASSENGER CARS	2150000	Y	Y	OUT	5.955499
3 - SUITABLE FOR PASSENGER CARS	2150070	Y	Y	OUT	3.890133
3 - SUITABLE FOR PASSENGER CARS	2170000	Y	Y	OUT	0.128577
3 - SUITABLE FOR PASSENGER CARS	2170000	Y	Y	OUT	1.980884
3 - SUITABLE FOR PASSENGER CARS	2170000	Y	Y	OUT	0.577591
3 - SUITABLE FOR PASSENGER CARS	2170000	Y	Y	OUT	1.330969
3 - SUITABLE FOR PASSENGER CARS	2150000	Y	Y	OUT	0.052526

OPER_MAINT_LEVEL	RTE_NO	HAUL_ROUTE	ALT_2	AMP_PABND	Miles
3 - SUITABLE FOR PASSENGER CARS	2150000	Y	Y	IN	4.30399
3 - SUITABLE FOR PASSENGER CARS	2150000	Y	Y	OUT	0.237988
4 - MODERATE DEGREE OF USER COMFORT	2100000	Y	Y	OUT	0.13981
4 - MODERATE DEGREE OF USER COMFORT	2100000	Y	Y	OUT	3.374462
4 - MODERATE DEGREE OF USER COMFORT	2100000	Y	Y	OUT	6.5089
AMP = Access Management Plan					
PABND = Project Area Boundary					

Appendix M-2. Alternative #3 Road List Table

OPER_MAINT_LEVEL	RTE_NO	HAUL_ROUTE	ALT_3	AMP_PABND	Miles
1 - BASIC CUSTODIAL CARE (CLOSED)	2140065	Y	Y	IN	0.576403
1 - BASIC CUSTODIAL CARE (CLOSED)	2140043	Y	Y	IN	0.800306
1 - BASIC CUSTODIAL CARE (CLOSED)	2140038	Y	Y	IN	0.200409
1 - BASIC CUSTODIAL CARE (CLOSED)	2170000	Y	Y	OUT	1.034775
1 - BASIC CUSTODIAL CARE (CLOSED)	2170032	Y	Y	OUT	1.102997
1 - BASIC CUSTODIAL CARE (CLOSED)	2170069	Y	Y	OUT	1.316033
1 - BASIC CUSTODIAL CARE (CLOSED)	2140000	Y	Y	IN	2.091822
1 - BASIC CUSTODIAL CARE (CLOSED)	2140000	Y	Y	OUT	0.391261
1 - BASIC CUSTODIAL CARE (CLOSED)	2140000	Y	Y	OUT	0.7244
1 - BASIC CUSTODIAL CARE (CLOSED)	2140000	Y	Y	IN	0.120994
1 - BASIC CUSTODIAL CARE (CLOSED)	2140074	Y	Y	IN	0.332536
2 - HIGH CLEARANCE VEHICLES	2150018	Y	Y	IN	0.415141
2 - HIGH CLEARANCE VEHICLES	2170000	Y	Y	OUT	0.586608
2 - HIGH CLEARANCE VEHICLES	2170000	Y	Y	OUT	0.066321
2 - HIGH CLEARANCE VEHICLES	2150020	Y	Y	OUT	0.202188
2 - HIGH CLEARANCE VEHICLES	2140038	Y	Y	IN	2.505108
2 - HIGH CLEARANCE VEHICLES	2140072	Y	Y	IN	0.067642
2 - HIGH CLEARANCE VEHICLES	2140074	Y	Y	IN	0.725121
2 - HIGH CLEARANCE VEHICLES	2140039	Y	Y	IN	0.217946
2 - HIGH CLEARANCE VEHICLES	2140000	Y	Y	IN	1.132835
2 - HIGH CLEARANCE VEHICLES	2140000	Y	Y	IN	0.586646
2 - HIGH CLEARANCE VEHICLES	2150042	Y	Y	OUT	3.443854
2 - HIGH CLEARANCE VEHICLES	2140000	Y	Y	IN	0.335484
2 - HIGH CLEARANCE VEHICLES	2140000	Y	Y	OUT	0.357365
2 - HIGH CLEARANCE VEHICLES	2140068	Y	Y	IN	2.742899
2 - HIGH CLEARANCE VEHICLES	2140068	Y	Y	OUT	0.598447
2 - HIGH CLEARANCE VEHICLES	2140000	Y	Y	OUT	0.356711
2 - HIGH CLEARANCE VEHICLES	2140000	Y	Y	IN	1.261624
2 - HIGH CLEARANCE VEHICLES	2150018	Y	Y	OUT	0.694412
2 - HIGH CLEARANCE VEHICLES	2150018	Y	Y	IN	0.609583
2 - HIGH CLEARANCE VEHICLES	2140074	Y	Y	IN	0.300459
3 - SUITABLE FOR PASSENGER CARS	2150000	Y	Y	OUT	5.955499
3 - SUITABLE FOR PASSENGER CARS	2150070	Y	Y	OUT	3.890133
3 - SUITABLE FOR PASSENGER CARS	2170000	Y	Y	OUT	0.128577
3 - SUITABLE FOR PASSENGER CARS	2170000	Y	Y	OUT	1.980884
3 - SUITABLE FOR PASSENGER CARS	2170000	Y	Y	OUT	0.577591
3 - SUITABLE FOR PASSENGER CARS	2170000	Y	Y	OUT	1.330969
3 - SUITABLE FOR PASSENGER CARS	2150000	Y	Y	OUT	0.052526
3 - SUITABLE FOR PASSENGER CARS	2150000	Y	Y	IN	4.30399
3 - SUITABLE FOR PASSENGER CARS	2150000	Y	Y	OUT	0.237988
4 - MODERATE DEGREE OF USER COMFORT	2100000	Y	Y	OUT	0.13981
4 - MODERATE DEGREE OF USER COMFORT	2100000	Y	Y	OUT	3.374462
4 - MODERATE DEGREE OF USER COMFORT	2100000	Y	Y	OUT	6.5089
AMP = Access Management Plan					
PABND = Project Area Boundary					

APPENDIX N – LIST OF POTENTIAL CUMULATIVE ACTIONS

This section summarizes the list of potential cumulative effects actions known as of May, 2007 to be considered for cumulative effects analysis for the Thorn Fire Salvage Recovery Project. These activities are located within the Dry Creek, Fields Creek, Murderers Creek/Duncan Cr, and Todd Creek subwatersheds located all or partially within the Shake Table Fire Complex. The year listed on the table is the year the activity was implemented or proposed for implementation. Cumulative actions relevant to this project occurring after this date will be disclosed and considered in the Final EIS. Each resource analysis section in Chapter 3 discloses the specific cumulative effects for that particular resource area. Refer to those sections for a specific discussion of cumulative effects.

PAST ACTIVITIES

Table N- 1. Past Timber Sales

Subwatershed	Year	Sale Name	Harvest Acres	Harvest Type	* Harvest Prescription	Acres Shake Table Fire	TFSR Unit
Dry Creek	1983	Widows Creek Burn 1	1,135	Tractor	HSV	1,038	
Dry Creek Total			1,135			1,038	
Fields Creek	1997	Billy 100	23	Helicopter	HTH	23	
	1997	Billy 95	26	Helicopter	HTH	26	
	1997	Billy 96	26	Tractor	HTH	26	
	1997	Billy 70	43	Helicopter	HTH	0	
	1997	Billy 56	52	Helicopter	HSH	0	
	1997	Billy 50	50	Helicopter	HSH	0	
	1997	Billy 45A	42	Tractor	HSA	0	
	1997	Billy 45B	5	Tractor	HSA	0	
	1997	Billy 07	31	Helicopter	HSL	0	
	1991	Fields 05	47	Tractor	HFR	0	
	1991	Fields 14	39	Tractor	HFR	0	
	1989	Fields 12	25	Tractor	HFR	0	
	1991	Fields 22	67	Tractor	HFR	0	
	1991	Fields 62	39	Skyline	HSP	0	
	1991	Fields 21	12	Skyline	HFR	0	
	1989	Fields 28	25	Tractor	HFR	0	
	1991	Fields 29	32	Skyline	HFR	0	
	1989	Fields 44	46	Tractor	HFR	0	
	1994	Fields Hazard SSTS 44	46	Tractor	HTH	0	
	1993	Hattie 05	47	Tractor	HSV	0	
	1993	Hattie 06	38	Tractor	HSV	0	
	1993	Hattie 05A	10	Tractor	HSV	0	
	1993	Hattie 01	111	Tractor	HSV	0	
	1993	Hattie 07	11	Tractor	HSV	0	
	1993	Hattie 02	87	Tractor	HSV	0	
	1993	Hattie 08	5	Tractor	HSV	0	
	1993	Hattie 04	42	Tractor	HSV	0	

Subwatershed	Year	Sale Name	Harvest Acres	Harvest Type	* Harvest Prescription	Acres Shake Table Fire	TFSR Unit
	1991	RC03C	74	Helicopter	HPR	74	
	1990	RC11C	51	Helicopter	HOR	51	
	1990	RC20C	79	Skyline	HOR	79	
	1990	RC15C	47	Helicopter	HCR	47	
	1990	RC84C	48	Helicopter	HFR	48	
	1990	RC21C	9	Helicopter	HSH	9	
	1992	RC50C	57	Helicopter	HFR	0	
	1992	RC51C	43	Helicopter	HFR	0	
	1992	RC42C	114	Helicopter	HFR	89	
	1992	RC43C	40	Helicopter	HFR	40	
	1992	RC39C	77	Helicopter	HOR	77	
	1992	RC41C	61	Helicopter	HFR	61	
Fields Creek Total			1,727			650	
Murders Creek/Duncan Cr.	1992	Thorn 65	43	Tractor	HSL	3	
	1992	Thorn 68	28	Tractor	HPR	0	
	1992	Thorn 63	17	Tractor	HSL	0	
	1992	Thorn 51	19	Tractor	HPR	0	
	1993	Thorn 59	44	Tractor	HPR	0	
	1992	Thorn 52	39	Tractor	HFR	0	
	1992	Thorn 50	43	Tractor	HSH	0	
	1992	Thorn 56	54	Tractor	HPR	0	
	1993	Thorn 47	25	Tractor	HSL	0	
	1991	Thorn 77	35	Tractor	HOR	0	
	1993	Thorn 43	35	Skyline	HSL	0	
	1993	Thorn 16	18	Tractor	HPR	0	
	1993	Thorn 35	33	Skyline	HSH	0	
	1993	Thorn 18	60	Skyline	HOR	0	
	1992	Thorn 39	26	Tractor	HOR	0	
	1993	Thorn 30	26	Skyline	HOR	0	
	1993	Thorn 12	33	Skyline	HSH	0	
	1993	Thorn 21	104	Tractor	HOR	0	
	1993	Thorn 27	17	Skyline	HOR	0	
	1993	Thorn 26	68	Skyline	HPR	0	
	1993	Thorn 09	38	Tractor	HSH	0	
	1993	Thorn 05	55	Tractor	HSH	0	
	1993	Thorn 04	24	Tractor	HOR	0	
	1993	Thorn 01	16	Tractor	HOR	0	
Total Murders Creek/Duncan Cr.			900			0	
Todd Creek		None	0			0	

*Harvest Prescription Definition
Commercial Thinning (HTH) -

- Regeneration Harvest: even aged management; the stands naturally or artificially regenerated.
  (HCC)- clearcut
  (HSH) Shelterwood
  (HCR) - seedtree
- Overstory Removal (HOR)- Harvest overstory removal

- Final Removal (HFR)- final removal of mature overstory to release established immature crop tree that were not a result of a prescribed regeneration cut.
- Partial Removal (HPR) - Partial overstory removal
- Salvage (HSV)- Harvest of tree mortality
- Sanitation (HAS)- Harvest intermediated cut
- Special Cut (HSL)
- Strip Harvest (HSP)-

Table N- 2. Murders Creek Wildhorse Territory

Subwatershed	Total Acres Wildhorse Territory	Acres Shake Table Fire
Dry Creek	0	0
Fields Creek	0	0
Murders Creek/Duncan Creek	10,672	3,439
Todd Creek	3,121	398
Total	13,793	3,837

* Approximately 436 horses in the Murders Creek Wild Horse Territory were counted in 2006. With an estimated recruitment rate of 30percent and a mild winter, there may be as many as 566 horses in 2007. Monitoring indicated very limited use of the Shake Table Fire area pre-fire.

Table N- 3. Grazing Allotments

Allotment	Pasture Name	Total Pasture Acres	Recent Grazing	Grazing Season	Ground Cover (Percent of Pasture)	Acres Within Shake Table Fire	Acres By Burn Severity			
							High	Med.	Low	Unburned
Aldrich	Widows Creek Basin	4,669	Not Grazed		76percent Elk Sedge	2,111	1,439	381	256	35
	Widows Creek Burn	1,412	100 cow calf pairs	July 20 to August 30	75percent Elk Sedge	1,197	434	489	240	34
	Aldrich Ridge	6,602	Not Grazed		77percent Elk Sedge	2,715	1,120	946	567	82
	Cabin-Todd	4,272	Not Grazed		76percent Elk Sedge	698	92	156	317	133
Fields Peak	Fields Peak	12,075	240 cow calf pairs	August 30 to September 25	58 percent Elk Sedge, 17 percent Pinegrass	3,541	464	900	1,859	318
	Horseshoe Pasture	68	See Above			9	0	0	1	8
Murders Creek (North Herd)	Martin Corrals (part of North Herd)	4,301	North Herd - 175 cow calf pairs	May 16 to October 15	35percent Bunchgrass, 32percent Elk Sedge	761	0	47	549	165
	Red Rock (part of North Herd)	3,113	See Above	See Above	37percent Elk Sedge, 15percent Bunchgrass, 12percent	2,350	7	344	1,600	399

Allotment	Pasture Name	Total Pasture Acres	Recent Grazing	Grazing Season	Ground Cover (Percent of Pasture)	Acres Within Shake Table Fire	Acres By Burn Severity			
							High	Med.	Low	Unburned
					fescue, 10percent pinegrass					
	Oregon Mine (part of North Herd)	10,338	See Above	See Above	50 percent Elk Sedge, 50percent pine Grass	143	0	13	114	16
	Dans Creek (part of North Herd)	3,703	See Above	See Above	Unburned	0	0	0	0	0
Murders Creek (South and Middle Herds)	Frenchy Butte	13,063	South and Middle Herds 700 cow calf pairs 300 cow calf pairs 5 Saddle Horses	May 15 to June 30 July 1 to October 15 May 15 to October 30	Unburned	0	0	0	0	0
	Deer Creek	13,854	See Above	See Above	Unburned	0	0	0	0	0
	John Young Meadows	707	See Above	See Above	Unburned	0	0	0	0	0
	Horse Mountain	4,085	See Above	See Above	Unburned	0	0	0	0	0
	Lucer/Blue Ridge	7,776	See Above	See Above	Unburned	0	0	0	0	0
	Timber Mountain	5,268	See Above	See Above	Unburned	0	0	0	0	0

Table N- 4. Past Wildfires

Subwatershed	Year	*Fire Name	Total Fire Acres	Acres within the Shake Table Fire Complex
Dry Creek	1939	Widows Creek Burn	1,225	1,028
Todd Creek	2005	Dry Cabin	270	45
Todd Creek, Dry Creek, Murders Cree/Duncan Creek, Fields Creek	2006	Thorn Creek (Part of the Shake Table Fire Complex)	13,536	13,452

*Records for larger wildfires (over 10 acres). Additional small fires have occurred and been suppressed throughout the subwatersheds.

Table N- 5. Outfitter Guide Permits

Year	Outfitter	Permit	Outfitter Type	Hunt Unit
2001-2005	Jeff Zennie	Annual Temporary Permit	Archery and Rifle Deer and Elk Hunts	Murders Creek Unit. Hunts primarily the Aldrich Ridge Area.
2006	Jeff Zennie	5 year Permit	Archery and Rifle Deer and Elk Hunts	Same as above.
2001-2006	John Cole	Annual Temporary Permit	Archery and Rifle Deer and Elk Hunts	Murders Creek Unit. Hunts Primarily the Murders Cr. Guard Station Area.
2006	John Cole	1 Year Temporary Permit	Bighorn Sheep	Aldrich Hunt Unit. Hunted the Aldrich Lookout Area
2006	Craig Marten	1 Year Temporary Permit	Bighorn Sheep	McClellan Unit. Hunted the Fields Peak Area.

Table N- 6. Fire Suppression Rehabilitation and BAER actions.

Year	Activity	Description
2006	Shake Table Fire	Rehabilitation of fire suppression activities (i.e. handlines, dozer lines, safety zones, etc.). Dozer Line Rehabilitation: 29.9 miles Hand Line Rehabilitation: 25.4 miles Grand Total: 55.2 miles Approximately 29.9 miles of dozer line and 25.4 miles of hand line was constructed and rehabilitated.
2006	Shake Table Fire	Felling of danger trees (Immediate Hazards) along main roads
2006	Shake Table Fire	Burned Area Emergency Rehabilitation (BAER): • Aerial seeding of winter wheat for erosion control on approximately 3,200 acres (2154 acres inside project area) receiving a high severity burn. Location included upper Widows Creek, Fields Creek, and Todd Creek. • Approximately 8 miles of tree felling in riparian areas to capture sediment and maintain stream channel stability. Steep drainage areas (moderate to high burn severity) in West Fork Dry Creek and Widows Creek. • Helicopter straw mulching on approximately 400 acres of soils having a very high erosion hazard. All mulching was completed in the upper basin of Widows Creek which experienced a high burn severity. • Conifer seeding on approximately 1.150 acres (614 of the 1,150 inside project area. • Aerial seeding of native species on 1500 acres of high intensity burn areas in upper Widows Creek, Fields Creek, and Todd Creek. Species seeded included bluebunch wheatgrass in the lower elevations and mountain brome in the higher elevations; mixed with Idaho fescue, sandberg bluegrass, Western Yarrow, antelope bitterbrush, and prairie junegrass. • Road drainage and culvert removals addressing spring runoff and safety concerns.

Table N- 7. Noxious Weed Sites and Control

Year	Activity	Inventoried Sites In Or Near the Shake Table Fire Complex Area (See BAER Report for more detail)	Weed Types	Total Acres of Inventoried Sites
1960's to Present	Annual Treatments	• Sites Within the Fire Area • 6 Sites Adjacent to the Fire Area	Diffuse Knapweek, Spotted Knapweed, Tansy Ragwort, Yellow Starthistle, Butter and Eggs, Dalmation Toadflax, St. Johnswort, Suphur cinquefoil, Mudeusahead	• 1.6 acres – Within Fire Perimeter • 611.2 acres- Adjacent to Fire Perimeter (approximately 600 acres located on private lands)

* Major road systems (21 Road, 2150, and 2140) have been monitored and manually treated over the last several years.

Table N- 8. Other Past Activities

Year	Activity	Description
Late 1800s	Mining	One abandoned mine is located in T. 14. S, R. 28 E. Sec. 10. Called the Glasscock Claim.
Early 1900's	Firewood Cutting	Firewood cutting access is limited throughout most of the Fire area.
1900's until present	Summer Recreation	Dispersed camping, Cedar Grove Special Interest Botanical Area and Trail, visits to Aldrich Mountain Lookout. Fishing at Aldrich Ponds located on State ownership Northwest of the Fire Area).
1900's until present	Fall Recreation (Hunting and Camping). Majority of Dispersed camp sites are located along the 2150 road near the top of the ridge. Old existing trails are still used but are not maintained by the Forest Service.	Big Game Hunting for Deer, Elk, Bear, Cougar and Bighorn Sheep. The fire area is entirely within the Murders Cr. Hunting Unit. In 2005 and 2006 the following tag numbers were issued for the Murders Creek Unit: -Deer (Murders Creek Controlled Hunt) – Late Sept. to Early October (2005 – 1,080 Buck Tags; 2006- 1,199 Buck Tags) -Elk (Murders Creek Controlled Hunt) - Late October (2005 – 385 Tags- Bull Elk; 2006- 385 Tags-Bull Elk). -Elk (West Murders Cr. Controlled Hunt) – Early to Mid November (2005 – 292 Tags – One elk; 2006 – 292 Tags- One elk). -Elk (East Murders Cr. Controlled Hunt)- Early to Mid November (2005- 263 Tags – One elk; 2006 – 268 tags one elk) - General Bow Seasons (Deer and Elk) – Late August to Mid September (Unlimited Tags) - Bighorn Sheep (Murders Creek and Aldrich Controlled Hunts) Hunting for blue grouse.
1920's until present	Forest Service road building	First road building was for access for fire fighting. Developing transportation system provided access cattle and sheep ranchers.
1920's until present	Use and maintenance of National Forest Roads	Use and maintenance of approximately open roads on National Forest System lands. Road maintenance includes cleaning of culverts, blading of existing roads, brushing of right-of-ways.
1930's until present	Construction of State Highway 26	Highway was constructed in the 1930s. Highway 26 is located South of the Fire area outside the National Forest Boundary.
1980's	Winter Recreation Snowmobiling	No Groomed snowmobile use in the Shake table Fire Area. The

Year	Activity	Description
until present		Shake Table Fire area is used by local snowmobilers – primarily on open main roads. Access is Fields Creek Road (21 Road) with snowmobile parking is in the vicinity of Billy Fields Campground, depending on snow level. The 21 Road is a groomed snowmobile route (trail number S5117). It ties into the 2190 road (also a groomed route). The 2190 road ties into the groomed trail system to the east.
1990's	Road Closures	A decision was signed 4/27/91 to close roads 2140, 2140-064, 2140-072, 2140-073, and section of road 2140-038; located in T.14.S., R. 28E., Sections 3,4,9, 10 and 11. The decision states that the roads would be closed by closing Road 2140 in the proximity of a saddle located in the northern part of Section 11. Closure of these roads was primarily for wildlife habitat enhancement, soil and water protection and reduced road maintenance costs.
1970's to Present	Travel Management	Part of the Fire area is contained in the Murders Creek-Flagtail Cooperative Travel Management Area ("Green Dot" area). Period of Restriction: September 27 through October 11; October 22 through November 12. These periods coincide with antlered deer and bull elk seasons. During these periods motorized vehicles are restricted to designated roads to minimize adequate buck and bull escapement and to promote quality hunting.
1972 to present	Phillips Snider Cooperative Wildlife Area (State Lands)	State managed wildlife area located near the project area. Provides key big winter range habitat. Yearly noxious weed control. Current emphasis is on Medusa Head Control. Multi-year shrub planting with Oregon Hunters Association Volunteers. Annual Grazing- Dayville Grazing Association Grain Food Plots for upland birds
*****	Communication Site	Communications tower and building (located on National Forest Lands)– Located in the vicinity of the Aldrich Fire Tower. Maintained and operated by the State Police.
******	Aldrich Fire Tower	Located at the end of the 2150 Road. The Fire tower is located on National Forest Land and is owned by the BLM. The tower is staffed during the summer by Oregon State Forestry.
1979-1980	Wildlife Habitat Improvements	Wildlife guzzlers (Thorn Creek Drainage)

PRESENT / ONGOING ACTIVITIES (2007)

Table N- 9. List of Present and Ongoing Activities

Present Activity	Description
Firewood cutting	Same as in past; however, limited in the project area (with permission by the District Ranger).
Livestock grazing	Resting of burned grazing pastures. Repair fences and water developments burned in the fire.
Summer and winter recreation	Same as in past. Area closure to motorized vehicles (Shake Table Fire Area).
Use and maintenance of National Forest Roads	Same as in past. Some motorized vehicle restrictions in Shake Table Fire Area).
Fire Suppression	Same as in past
Travel Management	Murders Creek-Flagtail Cooperative Travel Management Area ("Green Dot" area).

Present Activity	Description
Outfitter Guide Permits	Same as in past. Some annual permits may not be issued in the Aldrich area in 2007 to due to logging activity and safety issues.
P. Schneider Cooperative Wildlife Area (State Lands)	Same as in past
Communication Site	Same as in Past
Aldrich Fire Tower	Same as in Past
Murders Creek Wild Horse Territory	Boundaries of the territory will remain the same. The fire area has damaged fences within the territory which may change horse access and movement. Changed forage conditions within the Shake Table Fire area for wild horses.
Noxious Weed Assessment and Control	Same as in the Past. BAER will fund additional post fire noxious weed assessment and control (See foreseeable activities).

No ongoing timber harvest or fuel treatment projects in the Dry Creek, Fields Creek, Murders Cr. Duncan Cr., Todd Cr. Subwatersheds

FORESEEABLE FUTURE ACTIVITIES

Table N- 10. Grazing Allotments

Allotment	Pasture Name	Establishment of Grazing (by Pasture)	Rationale
Aldrich	Widows Creek Basin	3-5 Growing Seasons	Approximately 45percent of the pasture burned. 39percent with moderated or high severity.
	Widows Creek Burn	3-5 Growing Seasons	Approximately 85percent of the pasture burned. 65percent of pasture burned with moderated to high intensities. 75percent elk sedge ground cover.
	Aldrich Ridge	3-5 Growing Seasons	Approximately 41percent of the pasture burned. 31percent of with moderate or high severity.
	Cabin-Todd	2-3 Growing Seasons	Approximately 16percent of the pasture burned. Less than 100 acres burned with high severity. Approximately 6percent of the pasture burned with moderate or high severity
Fields Peak	Fields Peak	Unburned – Graze in 2007 (control grazing to unburned areas in lower elevations) Rest burned area 1-2 years	Approximately 29percent of the pasture burned. Approximately 11percent burned with moderate or high intensity. 75percent of pasture is elk sedge or pine grass ground cover. Moderate and high intensity burn areas are located in the higher elevations which receive limited grazing pressure.
	Horseshoe Pasture		
Murders Creek (North Herd)	Martin Corrals (part of North Herd)	Summer or Fall 2008	Approximately 18percent of the pasture burned. No acres of high severity burn. Less than 1percent moderate severity. 35percent Bunchgrass, 32percent Elk Sedge.
	Red Rock (part of North Herd)	Summer 2008 (or 2009 Grazing season) -Depending on recovery of moderately burned areas and areas with bunchgrass ground cover.	Approximately 75percent of the pasture burned. 11percent of pasture burned moderated to high severity. Less than 10 acres of high severity. 15percent Bunchgrass
	Oregon Mine (part of North	Spring 2007	Approximately 1percent of the pasture burned. No acres of high severity burn. Less than 1percent

Allotment	Pasture Name	Establishment of Grazing (by Pasture)	Rationale
	Herd)		burned with moderated to high severity. 100percent Elk sedge or pine grass ground cover.
	Dans Creek (part of North Herd)	No Rest	Unburned
Murders Creek (South and Middle Herds)	Frenchy	No Rest	Unburned
	Maggot Springs	No Rest	Unburned
	Deer Creek	No Rest	Unburned
	John Young Meadows	No Rest	Unburned
	Horse Mountain	No Rest	Unburned
	Lucer/Blue Ridge	No Rest	Unburned
	Timber Mountain	No Rest	Unburned

Table N- 11. Other Foreseeable Activities

Year	Approved	Foreseeable Activity	Description
Annual	Yes	Firewood cutting	Same as in the past
Annual	Yes	Summer and winter recreation	Same as in past
Annual	Yes	Use and maintenance of National Forest Roads	Same as in past
Annual	Yes	Fire Suppression	Same as in the past
Annual	Yes	Road Maintenance	Same as in the past
Annual	Yes	Aldrich Communication Site	Same as in Past
Annual	Yes	Aldrich Fire Tower	Same as in Past
Annual BAER Rehabilitation	Yes Yes	Noxious Weed Treatment Assessment and Control over the next 3 year	Same as in Past and Ongoing Mechanical and manual treatments
See descriptions	Some Permits	Outfitter Guide Permit	Jeff Zennie 5- year permit (issued in 2006). John Cole – May be issued a 5 year permit in 2007 or 2008. Other outfitter guide permits may be issue on an annual basis, including big horn sheep permits.
2007 or 2008	Yes – State Lands	Phillips Snider Cooperative Wildlife Area	Juniper removal on approximately 160 acres in the Aldrich Pond Area. Currently have a Blue Mt. Elk Initiative Grant for this Project. Thinning of conifers to enhance big game habitat and to improve forest health. Current proposal is 315 acres in the Bridge Creek Area.

Year	Approved	Foreseeable Activity	Description
2007	Yes	Shake Table Roadside Danger tree Removal	Removal of danger trees along main roads.
2007	No	Shake Table Fire – Reforestation Activities	Planting of areas that burned in the Shake Table Fire (outside the TFSR Project Area).
2007 or 2008	No	Wild Horse Removal Environmental Assessment	Removal of wild horses. Estimated that 500 horses could be removed over the next 3 to 4 years. Anticipated that the removal within the Shake Table Fire Area will be a priority.

No foreseeable future actions in the Dry Creek, Fields Creek, Murders Cr. Duncan Cr., Todd Cr. Subwatersheds in the following resource areas:

- Fish and Wildlife Habitat Improvement Projects.
- Fuel Treatment Projects
- Non-recreation special use permits
- Active mining claims