United States
Department of
Agriculture

Forest
Service

July, 2008

Finley HFRA Thin Environmental Assessment

USDA Forest Service
Okanogan and Wenatchee National Forests
Methow Valley Ranger District

Okanogan County, Washington

Responsible Official: Rebecca Lockett Heath
Forest Supervisor
215 Melody Lane
Wenatchee, Washington 98801

For Information Contact: John E. Newcom
District Ranger
24 West Chewuch Road
Winthrop, Washington 98862
509-996-4003

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, gender, religion. age, disability, political apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 14th and Independence Avenue, SW, Washington, DC 20250-9410 or call (202) 720-5964 (voice and TDD). USDA is an equal opportunity provider and employer.

Finley HFRA Thin
Environmental Assessment

Table of Contents

Chapter 1, Purpose and Need 1-1
- Introduction 1-1
- Purpose and Need 1-7
- Proposed Action 1-8
- Decision Framework 1-8
- Public Involvement and Consultation 1-8

Chapter 2, Alternatives 2-1
- Introduction 2-1
- Alternative Formulation 2-1
- Alternatives Considered but Eliminated 2-1
- Proposed Action 2-1
  - Details 2-1
  - Forest Plan Amendments 2-5
  - Mitigation Measures 2-6
  - Monitoring 2-12
- Comparison of Alternatives 2-13

Chapter 3, Environmental Consequences 3-1
- Setting the Stage 3-2
- Fire/Fuels 3-2
- Forest Vegetation 3-17
- Soils 3-26
- Hydrology 3-40
- Aquatic Habitat 3-48
- Botany 3-51
- Wildlife 3-53
- Range 3-74
- Invasive Weeds 3-77
- Scenery 3-89
- Recreation and Public Safety 3-94
- Inventoried Roadless/Undeveloped 3-96
- Transportation 3-96
- Heritage 3-99
- Economics 3-100
- Other Required Disclosures 3-103

Chapter 4, Consultation with Others 4-1

Appendices

Appendix A, References ____ A-1
Appendix B, Direction and Guidance ____ B-1

List of Photos

Photo 1-1: Representation of Typical Fuels Condition ____ 1-1
Photo 1-2: Historical Stand Conditions ____ 1-8
Photo 3-1: Fuel Model 10 ____ 3-7
Photo 3-2: Fuel Model 9 ____ 3-7

List of Maps

Map 1-1: Project Vicinity Map ____ 1-3
Map 1-2: Fuels Condition Class ____ 1-4
Map 1-3: Forest Plan Management Areas ____ 1-6
Map 2-1: Proposed Action – Finley HFRA Thin ____ 2-2

List of Tables

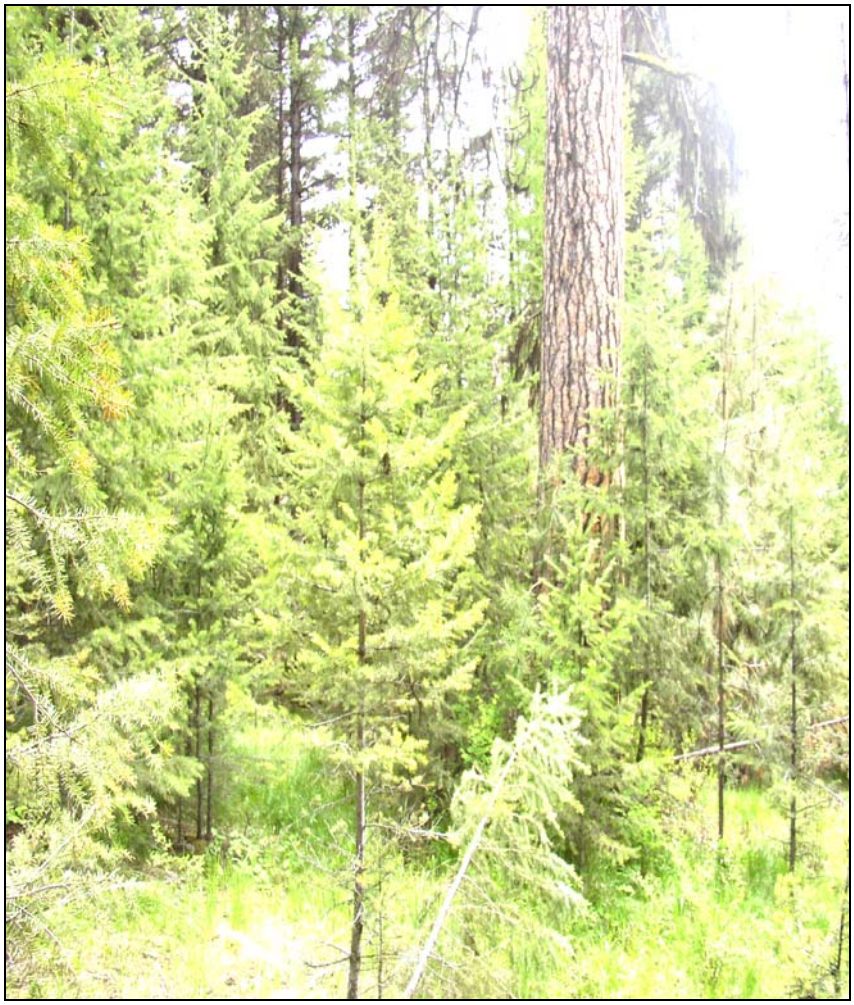
Table 2-1: Proposed Vegetation Treatments ____ 2-3
Table 2-2: Proposed Action Fuels Disposal ____ 2-4
Table 2-3: Waterbar Spacing Guide ____ 2-7
Table 2-4: Monitoring Actions ____ 2-13
Table 2-5: Comparison of Existing Condition and Proposed Action ____ 2-14
Table 3-1: Estimated Particulate Matter Emissions ____ 3-15
Table 3-2: Residual Tree Stocking; Hot/Dry ____ 3-21
Table 3-3: Residual Tree Stocking; Warm/Mesic ____ 3-22
Table 3-4: Soil-site Relationships (treatment units) ____ 3-28
Table 3-5: Representative Soil Series ____ 3-28
Table 3-6: Past Sale Activity ____ 3-32
Table 3-7: Relative Soil Interpretations ____ 3-32
Table 3-8: Proposed Action Treatment by Soil Mapunit ____ 3-34
Table 3-9: Direct/Indirect Effects Summary (By Harvest Unit) ____ 3-39
Table 3-10: Direct/Indirect Effects Summary (By Action) ____ 3-39
Table 3-11: Estimated Peak Stream Flows ____ 3-43
Table 3-12: Stream Class by Watershed ____ 3-43
Table 3-13: Road and Drainage Density ____ 3-44
Table 3-14: Estimated Created Openings ____ 3-44
Table 3-15: Current Delivered Sediment Production ____ 3-44
Table 3-16: Watershed Road Density ____ 3-46
Table 3-17: Management Indicator Species ____ 3-55
Table 3-18: Federally Listed T,E, and S Species ____ 3-63
Table 3-19: Current Pre-Project Open Road Density ____ 3-66
Table 3-20: During Project Open Road Density ____ 3-66
Table 3-21: Post Project Open Road Density ____ 3-21
Table 3-22: Invasive Classification and Strategy ____ 3-79
Table 3-23: Established, New and Potential Invaders ____ 3-79
Table 3-24: Invasive Weed Characteristics ____ 3-79
Table 3-25: New Invader Sites ____ 3-81
Table 3-26: Scenic Integrity Level ____ 3-90
Table 3-27: Current Open Road Density ____ 3-97
Table 3-28: During Project Open Road Density ____ 3-98
Table 3-29: Post Project Open Road Density ____ 3-98
Table 3-30: Cost Analysis ____ 3-102

Chapter 1
Purpose and Need

INTRODUCTION

The Finley HFRA Thin Project is proposed to reduce hazardous fuels in the Wildland-Urban Interface (WUI) in the Finley Canyon area of the Methow Valley Ranger District of the Okanogan-Wenatchee National Forest. Fire suppression over the past 75 years, favorable climatic conditions, vegetation growth and dead fuels resulting from insects and diseases have resulted in unacceptable risk of severe wildfire. The high density of trees contributes to mortality of trees because of competition for nutrients, water and sunlight. Insects and diseases are more likely to kill trees that grow in dense, crowded conditions. Diseased trees, insect killed trees, and down fuel are creating continuous fuel ladders from the ground to the tree crowns.

Photo 1-1: Representation of Typical Fuels Condition



The photo at the left illustrates a common situation with fuel ladders in the project area.

Methow Community Wildfire Protection Plan

The Methow Community Fire Plan Coordinating Group (MWCFPCG), along with land management agencies and the public developed the Methow Community Wildfire Protection Plan (CWPP) in February, 2006. The Methow CWPP declared the several communities in the Methow Valley as communities at risk. The Plan encourages the Forest Service along with other land management agencies and private forest land owners, to implement actions to reduce fuel loadings and wildfire risk within and around identified high risk areas in the Methow Community Wildfire Protection Plan Area, based on the economic values, fuel types, fire history and access. The Finley HFRA Thin Project is located in one of the high risk areas identified in the Methow CWPP. The project was specifically identified by the MWCFPCG as a project that would meet the objectives of the Methow CWPP in and identified high risk area. This plan was approved by both the Okanogan County Commissioners and the State Forester and has been incorporated into the Okanogan County Wildfire Protection Plan.

Okanogan County Community Wildfire Protection Plan

Subsequent to development of the Methow CWPP, a county wide planning committee developed the Okanogan County Community Wildfire Protection Plan, by incorporating individual community wildfire protection plans that have been developed in the county into a comprehensive Okanogan County Community Wildfire Protection Plan (OCCWP). This plan was completed and approved by in March of 2007. This plan identified all of Okanogan County as Wildland Urban Interface (WUI), or areas prioritized as at risk for wildfire that could impact developed communities.

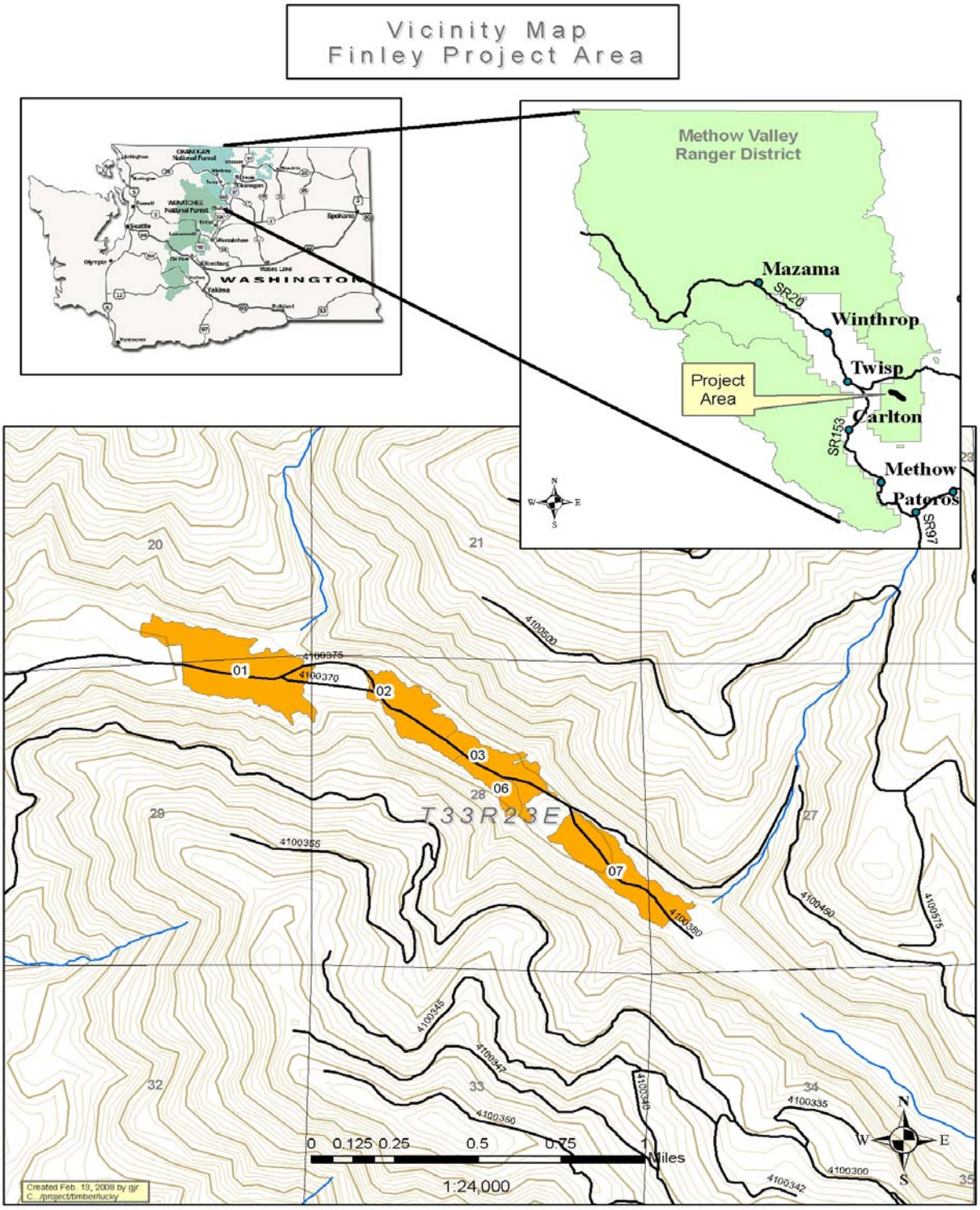
Location and Setting

The Finley HFRA Thin project encompasses approximately 300 acres of National Forest System Lands in the Finley Canyon Area. The project is located sections 20, 21, 27, 28, 29, and 34, T33N, R23E, Willamette Meridian. Elevations in the project area range from 2200 feet Finley Canyon bottom to 2400 above sea level; slopes are generally flat. Refer to Map 1-1, Project Vicinity Map on page 3.

The project area is adjacent to a developed residential area in the Finley Canyon area of middle Methow Valley occupied by several seasonal and permanent residences. This area is identified as WUI by the OCCWP and thus qualifies as WUI under the Healthy Forest Restoration Act (HFRA, 2003) as it exhibits basic infrastructure and is adjacent to Federal lands exhibiting timber stand conditions are conducive to large-scale wildland fire disturbance events that pose a substantial threat to both human life and property. The risk of wildland fire is based on the fact that many of the fuels surrounding the project area are Condition Class 3. Condition Class 3 circumstances exists when:

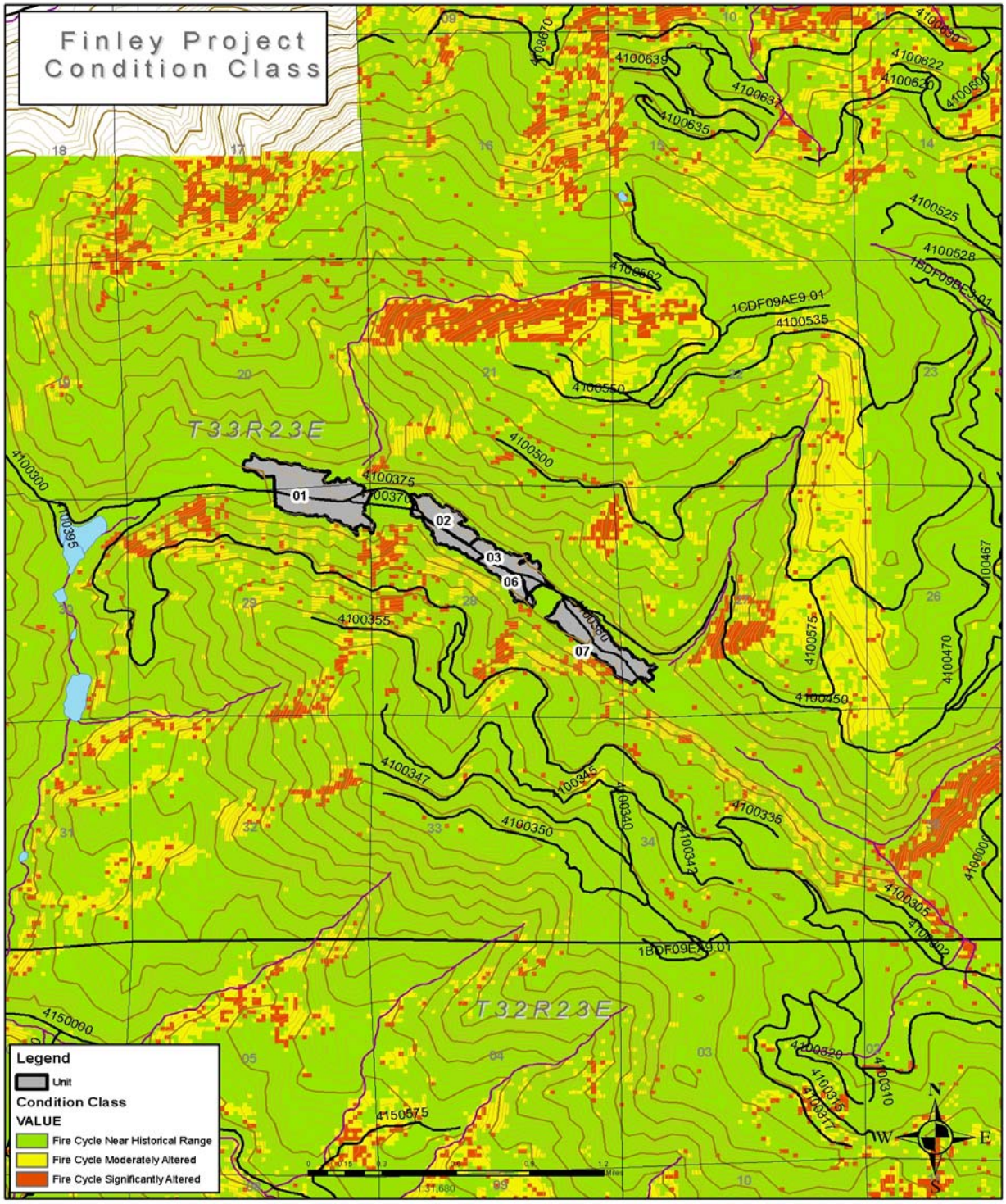
> there is a high risk of losing key ecosystem components from fire;
> fire frequencies have departed from historical frequencies by multiple return intervals, resulting in dramatic changes to the size, frequency, intensity, or severity of fires, or landscape patterns, and;
> vegetation attributes have been significantly altered from the historical ranges

Map 1-1: Vicinity Map



Map1-2 displays the condition classes in the project area:

Map 1-2: Fuels Condition Class



Condition Class 3 is described above. Condition Class 1 is found where fuel regime attributes are within their natural (historical) range, and Condition Class 2 is found where fire regime attributes are have been moderately altered from their historic range. Fire regime attributes include vegetation characteristics, fuel composition, and fire frequency and severity. More details regarding condition class are disclosed in the fire/fuels section of Chapter 3 of this document. The project area is characterized by dense tree stands with ladder fuels (see picture on page 1-1). Ladder fuels are those fuels that extend from the ground up to the canopy, thereby being capable of carrying fire into tree crowns and risking stand replacing fire.

Management Direction and Guidance

This project implements (is tiered to) the Okanogan National Forest Land and Resource Management Plan final Environmental Impact Statement (USDA Forest Service, 1989) as amended by the Regional Forester Amendment #2 - Revised Continuation of Interim Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales (USDA Forest Service, 1995), otherwise known as the "Eastside Screens"(only the ecosystem and wildlife standards are still in effect), and the Decision Notice and Interim Standards for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH, USDA Forest Service, 1995) Regional Forester Amendment #2 gives additional direction for retaining late and old structure and wildlife habitat for timber sales. PACFISH gives additional direction for activities in riparian habitat conservation areas (RHCAs). Together, these documents are referred to as the amended Forest Plan. The amended Forest Plan allocates the project area to two "zones" called management areas with similar management emphasis in each area:

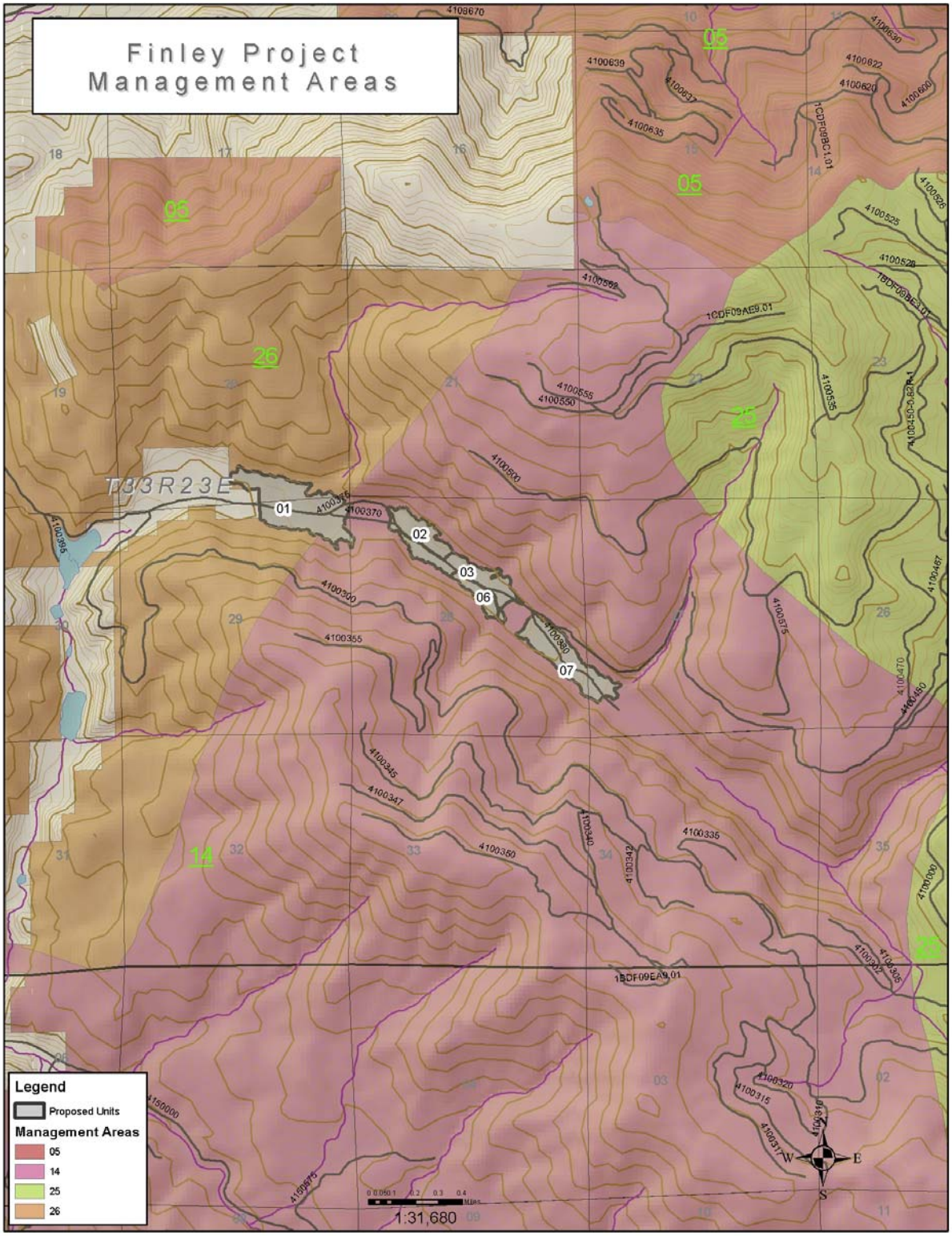
MA14 Wildlife Emphasis
MA26: Deer Winter Range Emphasis

Each discrete area is analyzed separately for application of some of the wildlife standards.

Additional guidance for the project area is provided by the Middle Methow Watershed Analysis (USDA Forest Service, 1997), the Okanogan and Wenatchee National Forest's Dry Site Strategy (USDA Forest Service, 2000) the Forest Health Assessment for the Okanogan-Wenatchee National Forest (USDA Forest Service, 2004), the Lynx Conservation Assessment Strategy (Ruediger, et al, 2000), and the National Fire Plan (USDA and USDI, 2000). Further details regarding these documents and their relationship to the Finley HFRA Thin project can be found in Appendix B of this Environmental Assessment.

Further discussion and elaboration on management direction can be found in Appendix B of this report.

Map 1-3: Forest Plan Management Areas



PURPOSE AND NEED

The purpose and need for the Finley HFRA Thin project is to reduce hazardous fuels to:

> reduce the risk of uncharacteristic wildfire on forest ecosystem components,
> improve sustainability of stands to withstand frequent fire,
> reduce risk of wildfire to homes, structures and infrastructure in the area, and
> increase firefighter safety during wildland fire

This purpose and need is based on a comparison of the existing conditions found in the Finley HFRA Thin area and the desired conditions provided in management direction and guidance for the area, a detailed description of which can be found in Appendix B of this document. In summary, stands in the Finley HFRA Thin area, historically, were open pine and Douglas fir stands that generally burned with low severity fire every 0-35 years (Fire Regime I), but that now have fuel loads substantially in excess of historic fuel loads (Condition Class III) as a result of fire suppression and past management activities. This condition results in uncharacteristic wildfire risk, where fire has the potential to kill entire stands through crown fire, rather than burning through the understory which generally does not kill overstory trees. These conditions also make controlling wildfire around developed areas difficult. These conditions persist into the RHCAS along intermittent stream channels in the area as well making attainment of PACFISH riparian management objectives (RMOs) uncertain.

The desired condition for the Finley HFRA Thin project area is based on the amended Forest Plan (USDA Forest Service 1989), PACFISH (USDA Forest Service, 1995) Middle Methow Watershed Analysis (USDA Forest Service, 1997), Okanogan-Wenatchee Dry Site Strategy (USDA Forest Service 2000), the National Fire Plan (USDA Forest Service 2000), and the Healthy Forest Restoration Act (2004). These documents give direction and guidance for the Finley HFRA Thin area to establish stand conditions that limit destructive crown fire risk, limit insect and disease mortality, reduce stand density and fuel loads, provide for public and fire fighter safety, and protect homes and other structures.

Photo 1-2, Historical Stand Conditions

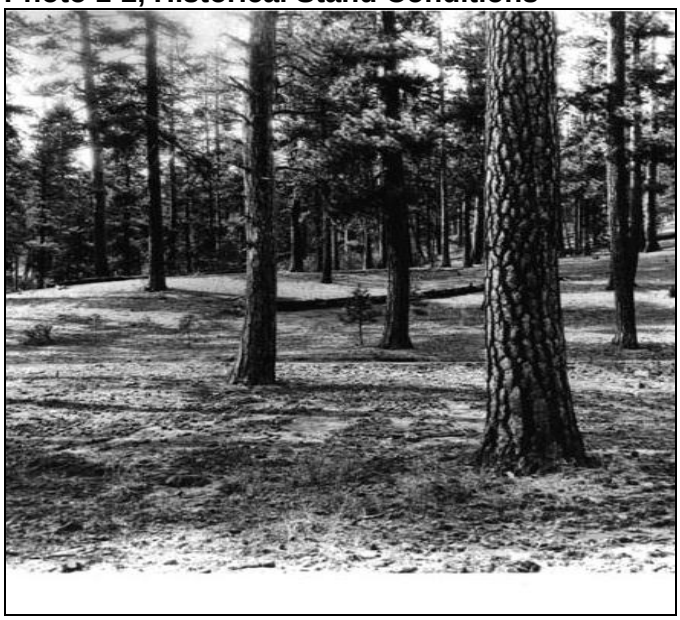


Photo of Historical stand conditions and range of variation representing desired future condition of Finley HFRA Thin project area.

One non-significant Forest Plan amendment is necessary in order to meet this purpose and need. To protect soils and riparian character, there is a need to allow winter logging in MA26 where harvest operations are normally restricted. Operational restrictions consistent with the amended Forest Plan would be inconsistent with the need to protect soils and riparian character where treatments are necessary to protect lives, homes, and structures.

PROPOSED ACTION

The Forest Supervisor of the Okanogan-Wenatchee National Forest proposes to reduce fuel loading on approximately 133 acres in the Finley Canyon Area in 2008. All 133 acres would be commercially thinned using ground based equipment. Stand thinning would primarily include removal of trees that are found below the main forest canopy, although some trees within the main canopy would be removed to reduce tree crown density. Commercial Thinning treatments would be followed surface fuel treatments including, pre-commercial thinning for ladder fuels reduction and a combination of handpiling and burning piles, excavator piling and burning piles and/or underburning. No new permanent road construction is planned, although some existing roads would be opened to provide access then closed after activities. Approximately 0.5 miles of temporary road would be constructed and decommissioned following harvest. Harvest and burning would occur in some RHCAs consistent with the requirements of PACFISH. The proposed action would site-specifically amend the Forest Plan for the Finley project only to allow for winter operations in Management Area 26.

DECISION FRAMEWORK

The Forest Supervisor of the Okanogan-Wenatchee National Forest will make the following decisions based on this interdisciplinary analysis:

Whether or not to reduce fuels in the Finley HFRA Thin area and if so:

What mitigation measures and monitoring measures, and or Forest Plan amendments are needed;

PUBLIC INVOLVEMENT AND CONSULTATION

Collaboration

The Methow CWPP recommends that Forest Service continue coordinating fuels reduction and forest health projects on lands adjacent to private lands within the CWPP area. This Plan was prepared by a group of local stakeholders and other interested agencies (including the Forest Service), identified as the Methow Community Fire Plan Coordinating Group (MCFPCG). The Methow CWPP plan has been incorporated into the Okanogan County Community Wildfire Protection Plan along with other Okanogan County Communities wildfire protection planning efforts. This project lies with the Wildland Urban Interface as identified in both plans and was specifically identified as a potential project to meet objectives in the Okanogan County Community Wildfire Protection Plan (Okanogan County 2006).

The following project specific collaborative efforts were undertaken on this project:

Representatives from the Methow Valley Ranger District participated in collaborative efforts to develop the Methow CWPP and Okanogan County CWPP. The Finley HFRA project was specifically identified and included as WUI in the Okanogan County CWPP.

A meeting was held with the chair of the MVFPCG, Lorah Waters, on January 17, 2008 to inform the group of initiation of the specific planning for this project as identified in the Okanogan County CWPP, and to organize future collaborative effort in the planning process.

The project was presented to the Okanogan County Wildfire Protection Planning Group by Lorah Waters. At that time interest was expressed by the Okanogan County Coordinating Group to continue collaboration with the Forest Service on this and other such projects. The Forest Service has and will continue to be represented in this groups planning and collaboration efforts.

A meeting was held on February 20, 2008 with local land owners and interested public involved in collaboration efforts, to present and develop the project plan for Finley HFRA Thin and other HFRA projects in the Methow Valley. At that meeting it was decided that this collaboration effort will continue as the project is prepared and implemented.

Consultation

Separate government-to-government consultation was conducted with the Yakama Indian Nation and the Confederated Tribes of the Colville Indian Reservation. Letters were mailed to both governments initially on April 3, 2006. Neither government raised any issues with the proposed project.

The State Historic Preservation Office was consulted with the findings relating to this project on December 5, 2005. No concerns were expressed.

Consultation with the U.S. Fish and Wildlife Service will be completed in summer 2008.

Scoping

The proposed action was developed by the District Interdisciplinary team following identification of the project area as a potential project to implement objectives of the MCWPP. Project scoping was conducted by:

Sending a scoping letter to Federal, State, and local agencies, adjacent property owners, and the public on January 18, 2008, along with an invitation to a public "open house" planned for February, 20, 2006.
Holding a public "open house" project collaboration meeting on February 20, attended by approximately 20 people who offered ideas, issues, concerns, and support for projects like Finley HFRA Thin.
Publishing a legal notice announcing a 30 day comment period on the proposal in the Wenatchee World Newspaper.

The proposed action presented in this document is the refined proposal developed subsequent to the scoping period and collaboration meetings.

Issues

Issues identified during scoping are normally addressed by developing alternatives to the proposed action; however, no alternatives are required for this HFRA project (see the alternative formulation section in Chapter 2). Instead, the project team considered all the comments received during collaboration and scoping and refined the proposal presented in Chapter 2 to address the following issues:

1. Prescribed burning may expose individuals to unhealthy smoke – State smoke dispersal approval requirements will limit this impact. Measured by:
   Qualitative discussion of anticipated smoke impacts in Twisp/Carlton area.
   Tons of particulate emissions from prescribed fire.

2. Mechanical treatments may adversely affect soil productivity – project design and mitigation measures were included in the proposal to maintain soil productivity. Measured by:
   Acres of detrimental soil condition.

3. Wildlife habitat values may be adversely affected by activities and treatments, specifically deer winter range habitat and snag habitat. Measured by:
   Qualitative discussion on impacts to identified wildlife habitat components.
   Resulting miles/miles^2 open road density.

4. Timber harvest and fuels treatments in RHCAs could degrade the quality of the riparian habitat. Measured by:
   Qualitative discussion of effects of timber harvest and fuels treatments on riparian habitat and meeting PACFISH Riparian Management Objectives (RMOs).

5. Commercial timber harvest in old growth could compromise old growth biological and structural diversity. By design the Project will not treat Forest Plan definition old growth stands. Measured by:
   Acres of commercial harvest in Late/Old stand structure.
   Qualitative discussion about short and long-term effects of harvest upon Late/Old stands structure.

6. Logging, fuels treatment and access may spread invasive weeds – an integrated weed management plan was prepared for the project, and prevention measures were included. Measured by:
   Qualitative discussion of potential for weed invasion.
   Acres of soil disturbance.

7. Public safety may be jeopardized by logging operations and associated impacts of mixed traffic, dust, winter travel, speed, etc. Measured by:
   Qualitative discussion of anticipated operational conflicts with public use.

Other comments received were already part of the project design, outside the scope of the project or not supported by scientific evidence. Documentation in the disposition of all comments received during scoping is located in the project file.

EA Publication

This EA will be published in June, 2008, and sent to all individuals and organizations who indicated an interest in the project to the Forest Service.

Chapter 2
Alternatives

INTRODUCTION

This chapter is intended to describe the alternatives and how they were formulated. This chapter is the heart of the document and provides readers and the Responsible Official with a summary of the entire project, displaying the proposed action, mitigation, monitoring requirements and a summary of effects of the proposed action. Alternatives considered, but eliminated from detailed study are also included.

ALTERNATIVE FORMULATION

Normally, issues identified during scoping are used to generate alternatives. However, because this project is being prepared under the Health Forest Restoration Act (HFRA) authorities, and all units are within the Wildland Urban Interface (WUI) and within 1½ miles of an at-risk community, no alternatives to the proposed action are required [HR 1904, Section 104(d)(2)]. Instead, the Interdisciplinary Team (IDT) considered all of the issues proposed during scoping (see scoping letters and issue tracking chart in the project file), and where feasible adjusted the original proposed action to resolve those issues the agency considered significant. In some cases this was handled by adding mitigation to the project and in other cases the design of the project was modified.

ALTERNATIVES CONSIDERED, BUT ELIMINATED FROM DETAILED STUDY

Although the HFRA does not require development of the No-Action alternative, the fire/fuels section in Chapter 3 begins with a discussion of the expected effects to fuels and vegetation should current conditions continue and the resulting risks involved to give readers and the deciding official enough information to understand the need for the project and why it fits HFRA authorities.

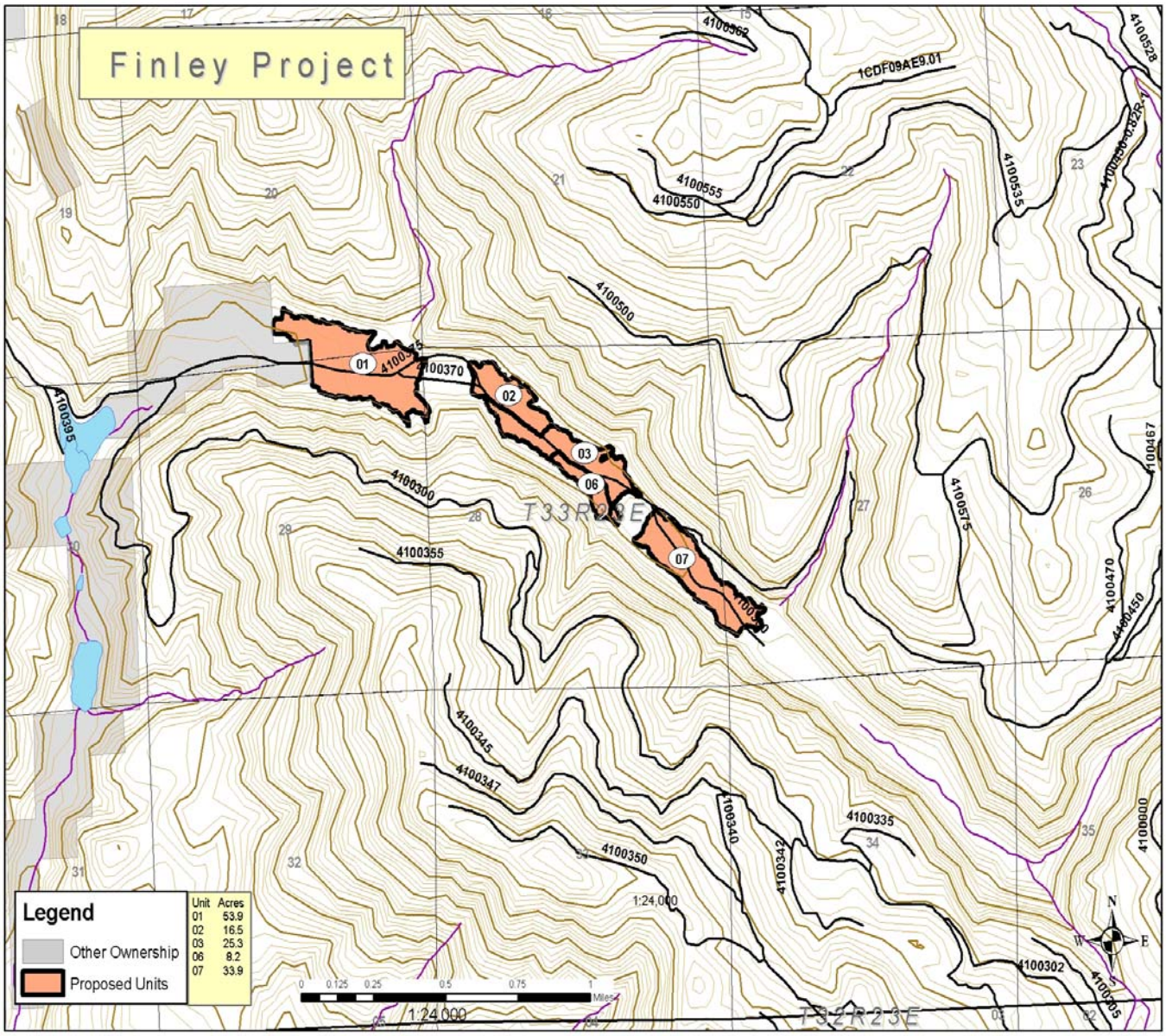
Rather than formulating a new alternative, the proposed action was adjusted, where feasible, to respond to issues received during collaboration and scoping, primarily through mitigation and by changing the types, design, or location of some treatments.

PROPOSED ACTION

The Proposed Action Details

The proposed action is designed to reduce fuel loading in the Finley HFRA Thin project area by reducing fuels in the three fuel layers: crown or canopy fuels, ladder fuels and surface fuels. Crown and ladder fuels would be reduced by commercial and non-commercial thinning treatments. Surface fuels would be reduced through hand or excavator piling and burning piles, and/or underburning. Underburning can also accomplish additional crown and ladder fuel reduction. Approximately 133 acres would receive treatment located as shown on Map 2-1:

Map 2-1: Proposed Action - Finley HFRA Thin



Commercial fuel reduction treatments would be accomplished by thinning generally small diameter trees. The focus of the thinning would be largely on smaller diameter trees found either below the main forest canopy or within the canopy where tree crown density would allow the spread of crown fire:

Mechanical treatments would remove vertical fuels that carry fire into the tree crowns and reduce stand density.
All live trees over 21" diameter at breast height (dbh) would be retained, except where removal is necessary for safety or operational constraints.
Commercial thinning of standing trees would focus on retaining a target basal area (BA)[1] of 40-60 on dry sites and 60-90 BA on moderate sites while emphasizing removal of trees greater than 7"dbh that constitute a fuels risk to the stands, in order to achieve canopy ladder fuel reduction objectives.
Trees removed having commercial value would be yarded from the forest by ground-based equipment.
Commercial treatments would be followed by pre-commercial thinning of small diameter trees less than 7"dbh to further reduce ladder fuels and the continuity of the tree crowns where needed.
Treatment units will be logged under winter (snow/frozen) ground conditions.

Specific stand treatments and surface fuel treatments by unit are described in the Table 2-1:

Table 2-1: Proposed Vegetation Treatments

Unit	Acres	Biophysical Environment./ Plant Assoc. Group	Fire Regime, Cond. Class	Harvest Treatment	Target Residual Stocking SDI, trees/ac (TPA). & BA/ac.	Postharvest Vegetation Treatment	Fuels Treatment
1	49	**Hot-dry/** Douglas-fir	I, 3	Commercial thin from below*	SDI 60-90 30-50 tpa 40-60 sq. ft./ac.	Pre-commercial thin / crop tree release**	Hand pile or Excavator pile and burn piles, Underburn
2	17	**Hot-dry/** & cool-dry Douglas-fir	I, 3	Commercial thin from below*	SDI 60-90 30-50 tpa 40-60 sq. ft./ac.	Pre-commercial thin / crop tree release**	Hand pile or Excavator pile and burn piles, Underburn
3	25	**Warm-mesic/** & cool-dry Douglas-fir	III, 3	Commercial thin from below* Maintain & enhance aspen.	SDI 80-120 40-70 tpa 60-90 sq. ft./ac.	Pre-commercial thin / crop tree release**	Hand pile or Excavator pile and burn piles, Underburn

[1] Basal area is a measure of tree density. It is determined by estimating the cross-sectional area of all trees at 4.5 feet above the ground. Basal area is expressed as square feet per acre.

Unit	Acres	Biophysi-cal Envir-onment./ Plant Assoc. Group	Fire Regime, Cond. Class	Harvest Treatment	Target Residual Stocking SDI, trees/ac (TPA). & BA/ac.	Postharvest Vegetation Treatment	Fuels Treatment
6	8	**Warm-mesic/** & cool-dry Douglas-fir	III, 3	Commercial thin from below* Maintain & enhance aspen	SDI 80-120 40-70 tpa 60-90 sq. ft./ac.	Pre-commercial thin / crop tree release**	Hand pile or Excavator pile and burn piles, Underburn
7	34	**Warm-mesic/** & cool-dry Douglas-fir	III, 3	Commercial thin from below* Maintain & enhance aspen	SDI 80-120 40-70 tpa 60-90 sq. ft./ac.	Pre-commercial thin / crop tree release**	Hand pile or Excavator pile and burn

* trees smaller than 21.0 inches DBH.
** trees smaller than 7 inches DBH.

All commercial timber removal would be done using ground based logging systems, including track mounted processors and/or feller-bunchers, track and rubber tired skidders, and forwarders.

Surface fuel disposal treatments determined necessary would be accomplished as indicated in Table 2-2:

Table 2-2: Proposed Action Fuels Disposal

Unit	Acres	Proposed Action Fuels Disposal Treatment
1	48.6	Following commercial entry, unit will be pre-commercially thinned (PCT) and excavator-piled (hand piling is an option with comparable costs). Once piles are burned, unit will be broadcast underburned, utilizing miles of machine fireline.
2	16.5	Following commercial entry, unit will be pre-commercially thinned (PCT) and excavator-piled (hand piling is an option with comparable costs). Once piles are burned, unit will be broadcast underburned, utilizing miles of hand fireline.
3	25.3	Following commercial entry, unit will be pre-commercially thinned (PCT) and excavator-piled (hand piling is an option with comparable costs). Once piles are burned, unit will be broadcast underburned, utilizing miles of hand fireline
6	8.2	Following commercial entry, unit will be pre-commercially thinned (PCT) and excavator-piled (hand piling is an option with comparable costs).
7	33.9	Following commercial entry, unit will be pre-commercially thinned (PCT) and excavator-piled (hand piling is an option with comparable costs). Once piles are burned, unit will be broadcast underburned, utilizing 3.0 miles of machine fireline.

Thinning and surface fuel treatments within Riparian Habitat Conservation Areas (RHCAs) along intermittent stream channels in units 6, and 7 are needed to restore desired vegetation characteristics consistent with historic fuel loads and to attain RMOs. RHCAs include the intermittent stream channel and the area to the outer edges of the riparian vegetation.

No new system roads would be constructed. Approximately 1.5 miles of existing open road (4100-370) would be maintained for stand treatments. Approximately 0.5 miles of currently open road (4100-380) would be closed following use for logging. Approximately 0.5 miles of temporary road will be necessary to access safe landing locations. These temporary roads would be closed immediately following use for logging.

Forest Plan Amendment

The Okanogan National Forest LRMP would be amended site-specifically for this project only to accomplish the above treatments.

The Forest Plan would be amended to allow winter logging in MA26 (unit 1) where winter harvest operations are normally restricted (FP standard MA26-20j). Operational restrictions consistent with the Forest Plan would be inconsistent with the need to protect soils and riparian character in this area where treatments are necessary to protect lives, homes, structures, and resources. Due to the limited use of this area by wintering deer, potential effects to deer were determined, by the district wildlife biologist, to be at levels that would not be detrimental.

This has been determined to be a non-significant amendment to the Forest Plan for the following reasons, based on criteria found in the Forest Service Land and Resource Management Planning Handbook (FSH 1909.12):

This is a non-significant amendment to the Forest Plan for the following reasons, based on criteria found in the Forest Service Land and Resource Management Planning Handbook (FSH 1909.12):

Timing: The timing factor examines at what point, over the course of the Forest Plan period, the plan is amended. Both the age of the underlying document and the duration of the amendment are relevant considerations. The Forest Service Handbook indicates that the later the time period, the less significant the change is likely to be. The Okanogan Forest Plan was approved in 1989, over 15 years ago, and is currently being revised.

- The new plan will incorporate new science regarding wildlife habitat and riparian management within high frequency fire regimes, and will likely provide direction that supersedes the current management direction.
- Winter logging would only be required on 49 acres in an area that is used only on a limited basis by wintering deer, as determined by District Wildlife Biologist.

Location and Size: These amendments only apply to this site-specific area of approximately 49 acres in MA-26 within the project area (unit 1) for the duration of about 2 years. The project area is in a high frequency fire regime. The Forest Plan requires limiting the number of acres burned by wildfire in a large portion of the project area.

- The winter operation amendment applies to about 49 acres in MA-26 within that area, in proposed treatment unit 1 for duration of approximately 2 years.

This does not change management direction for the rest of the 1.7 million acre Okanogan National Forest.

Goals/Objectives/Outputs:

- This amendment does not change any management prescriptions and furthers the desired future condition identified for Management Area 14 and 26 regarding riparian and habitat maintenance.

- Although the project would reduce security for wintering deer in MA-26 more sustainable deer habitat would be provided and open road density would be maintained within standards during the project and slightly reduced after the project. The goal of MA 26 to provide timber while providing for the protection of wildlife habitat and other resources would

Management Prescription:

- These amendments do not change any management prescriptions and furthers the desired future condition identified for Management Area 14 and 26 regarding riparian and habitat maintenance.

- Although the project would reduce security for wintering deer in 26 more sustainable deer habitat would be provided and open road density would be maintained within standards during the project and slightly reduced after the project. The goal of MA 26 to provide timber while providing for the protection of wildlife habitat and other resources would be met.

Mitigation Measures

The National Environmental Policy Act defines “mitigation” as avoiding, minimizing, reducing, eliminating or compensating project impacts. The following mitigation measures are an integral part of this proposed action and would be carried out if the project is implemented. The effects analysis in Chapter 3 is based on these mitigation measures being implemented.

Fire/Fuels

1. All federal, state, and local regulations pertaining to prescribed burning would be followed. In addition, steps would be taken to avoid, dilute, and reduce air pollution in an effort to reduce smoke emissions and impacts and from prescribed fire. Avoidance is a strategy of considering optimum meteorological conditions when scheduling burns in order to avoid intrusions of smoke into smoke-sensitive areas (highly effective). Dilution involves controlling the rate of emissions or scheduling for dispersion to assure a tolerable concentration of smoke in designated areas (moderately effective).

2. News releases will be distributed to the media and general public prior to the burning season to alert the public of the intent to burn within that proximity (moderately effective).

Soils

1. Seed areas of heavily disturbed soils including landings, main skid trails, decommissioned temporary roads, and constructed road cut and fill slopes; placing organic debris along margins of landings; and building water bars and erosion dips in skidding/forwarder trails and roads as needed to prevent soil erosion (highly effective). The appropriate certified weed free native plant seed mix, application rates, locations and time of seeding to meet erosion control and invasive plant competition objectives will be determined by the Invasive Plant Specialist and Botany Specialist.

2. Install waterbars on skid trails with bare soil or very thin vegetative cover following harvest operations or prior to entering into season shutdowns or a period of extended inactivity in order to prevent erosion (highly effective). Timely completion of waterbars is important to divert runoff from seasonal rain or snow melt. Water bar spacing and design requirements are as follows in Table 2-2 (Packer, 1967):

Table 2-3: Waterbar Spacing Guide

Percent grade	Average Spacing (feet)
2-10	150
11-20	120
21-34	90
35 or greater	80

Waterbar Design Criteria:

Constructed to a minimum of 1.5 to 2 feet in height (2 feet high on the steeper skid trails). Some variation in waterbar size may occur but they must be large enough to function properly.

Installed at a 45 degree angle to either the left or right of the trail so as to disperse water on the lower side of the trail. A herringbone pattern of alternating water bars may be necessary on steeper slopes.

Constructed into mineral soil at a minimum depth of 18 inches (not simply pushed up soils).

Contain no organic material unless logs are incorporated into waterbars and embedded in a trench and do not contact organic material inside a fire line.

Water bars used during burning will be angled into the burn area to catch any burning material that rolls down the fireline to direct it back into the fire. After underburns are declared out, the waterbars should be angled away from the burn area to direct water flow out of the burn to prevent erosion in the ash.

Driving on or damaging waterbars with heavy equipment, leaving them prone to failure will be avoided. If damage does occur, waterbars will be repaired to bring them back up to the minimum design height.

4. Utilize existing road systems and skidder/forwarder trails from prior harvest activities as much as possible to reduce the additional detrimental soil condition (highly effective).

5. Winter harvesting operations are required to limit detrimental soil compaction and displacement and to provide an alternative to the limitations and additional requirements of summer operations. To best ensure the snow pack is stable enough to support winter logging operations, the following conditions and methods of operation will be required:

   Compact snow or a combination of compacted snow and hard frozen ground totaling 8 inches. Prior to approval of winter logging operations, an assessment of suitable snow and soil conditions will be conducted by a Soil Scientist. Periodic assessments would be conducted during the winter operating period, especially during warming trends (highly effective).

   Overnight temperatures should drop to 25 degrees F. or lower and afternoon temperatures should stay below 35 degrees F. to maintain frozen conditions. Afternoon temperatures can exceed 35 degrees F. for short periods if previous night time temperatures are below 20 degrees F (moderately effective).

   Construct designated snow trails prior to operations. This promotes freezing of the ground beneath main skid trails to ensure stable operating conditions. If skid trails begin thawing and show signs of rutting and water runoff, relocate main skid trails to suitable snow and frozen soil conditions (moderately effective).

   Single and multiple-pass logging equipment trails must be located a minimum of 40 feet apart except where they converge at trail junctions and landings. Trail locations will be designated and approved prior to operating (highly effective).

6. Confine tractor skid/forwarder operations to slopes that are 35% or less except for pitches of 150 feet or less of steeper ground. No side hill travel of skidding/forwarder equipment will take place on these steeper pitches to avoid excess soil damage. Machinery will be excluded from any areas with extended pitches greater than 150 feet that exceed 35 percent. Operation on short steep pitches will only occur if adequate ground vegetation is present (moderately effective).

7. On detrimentally compacted soils on landings and/or detrimentally compacted skid trails (as determined by Soils Scientist), active restoration using an excavator will be required for fracturing and loosening compacted layers to a depth of at least 12 to 15 inches, roughening the soil surface and placing vegetation plugs and other organic material along detrimentally disturbed areas (moderately effective).

8. Keep coarse woody debris to levels consistent with soil properties and site conditions consistent with Regional Forester Amendment #2, PACFISH. This measure would help reduce the risk of dramatic reductions in nutrient capitol (reserves) and

accelerated surface erosion associated with high intensity fires, See Table 3-7, Relative Soil Interpretations. Where potential harvest units are at or below these recommended amounts, removal of additional surface CWD should be avoided (moderately effective).

9. Displaced soils, where 6 inches or more of rutting is present, will be pulled in to fill ruts, and/or slash may be placed in the rutted area. Soils will need to be de-compacted to avoid puddling. Displacement occurring on slopes over 35% will only need to be slashed, due to equipment operability limitations. This measure will help avoid soil puddling on low relief slopes and help prevent water channeling on steep slopes (moderately effective).

Aquatic Habitat/ Riparian (RHCAs, Pg. 2-5)

1. Harvest operations on all units will be done over snow and or frozen ground sufficient to support equipment and skidding without compacting or displacing the soil. (highly effective).

2. No new landings will be constructed within the RHCAs in Units 6, and 7. Existing landings in RHCAs would not be enlarged (moderately effective).

3. Trees growing within five feet of the stream channels in Units 6, and 7 would not be harvested to protect stream bank integrity (moderately effective).

4. No harvest equipment will be allowed to operate within 20 feet either side of stream channels to protect soils and riparian habitat (highly effective).

5. Where underburning will be done, no active lighting would occur within 20 feet of streams to limit impact to riparian vegetation. Fire would be allowed to back into or creep into area within 20 feet of streams (moderately effective).

6. Excavator piling of slash will not occur within 20 feet of intermittent stream channels. (moderately effective)

7. Road 4100-380 will be closed and hydrologically stabilized following post-harvest activities, in order to prevent future erosion hazard (moderately effective).

Wildlife Habitat

1. Wildlife biologist will complete surveys for goshawks and eagles before ground disturbing activities occur. Forest Plan standards for raptor nest stand protection measures will be applied to active nests located (highly effective).

2. Retain all trees greater than or equal to 21” dbh and all snags greater than 10” dbh, except when determined to be operational safety hazards (highly effective).

3. Retain four defective trees (see description and criteria below) greater than 10” dbh per acre. The goal of designating defective trees for retention is to provide habitat for cavity users as soon as possible since this is a deficient resource in the Finley area (highly effective).

Defective tree selection guide:

The following criteria will be used by marking crew to determine the priority defective trees to retain:

Four acres is the minimum measurement scale, so there could be a group within the corner of a four acre area that could account for all the snags needed for those four acres if they meet most of these criteria.

Consider operational safety and design. Select only trees not likely to impede safe logging operations

Select trees that have active nesting by cavity users

Select the largest defective trees between 10 and 21” dbh within 100 meter radius.

Favor ponderosa pine

Select spike top pine (*Commandra* rust hotel trees)

Select trees with substantial physical defect – especially broken tops, large broken limbs, and lightning scars.

4. Retaining all down logs greater than 12" small end diameter for down wood habitat (highly effective).

Vegetation

1. Protect genetic select trees from damage caused by mechanical treatments or from prescribed burning and pile burning by avoidance and slash pull away (moderately effective).

2. Designated skid trails will be used on all units with ground based yarding of merchantable material in order to minimize damage to residual trees (moderately effective).

Range

1. Protect existing water developments and fences that are currently functioning as intended. Should these improvements be damaged during activities, restore to original condition within 48 hours if livestock are present on the adjacent pastures. If cows are not present in the adjacent pastures, repair before livestock are moved onto the pastures (highly effective).

Invasive Weeds/Prevention Plan

1. Prior to moving equipment onto National Forest lands or after moving equipment off-site then back on-site, utilize cleaning procedures for off road ground disturbing equipment such as tractors and skidders used for harvest and prescribed fire to

reduce the potential for introducing new invaders. Equipment will be pressure washed to remove any soil and debris that may contain noxious weed seeds (highly effective).

2. Road reconstruction and maintenance equipment such as road graders will be pressure washed to remove any seed source prior to arriving on site (highly effective).

3. Road graders used for pre-haul maintenance should grade in the direction towards known noxious weeds where feasible. If there is not a good turn around area within ½ mile to allow the operator to grade in the direction of the noxious weed site, the operator will leave the material that is being moved (dirt, rocks, and debris located in front or behind the blade) within the boundaries of the noxious weed site. This material will not be moved beyond the current boundaries of the invasive weed site. Known invasive weed sites that are not eradicated prior to road work would be designated by district personnel in such a way that is obvious to the operator (moderately effective).

4. If gravel is needed to repair roads post treatment, any gravel pits proposed for use would be inspected by Forest Service personnel and determined to be weed free or treated under the existing Forestwide Integrated Weed Management decisions prior to use (moderately effective).

5. If dozer line is constructed, lines will be seeded to prevent erosion and invasive weed spread (highly effective).

Public Safety

1. District representatives from the Interdisciplinary Team will meet with available adjacent homeowners during sale preparation and prior to start of logging operations in all units directly adjacent to private lands to consider and resolve anticipated safety issues (highly effective).

Monitoring

Table 2-4: Monitoring Actions

Action	Method	Timing	Responsibility
Monitor and evaluate effectiveness of harvest and fuels treatments in meeting resource objectives.	Compare anticipated and actual results of harvest and fuels treatments. Report necessary adjustments to District Ranger.	Both pre- and post burn.	Fuels Specialist, Silviculturist, Wildlife Biologist.
Monitor and evaluate burning conditions, fuel consumption (for tracking smoke emissions), and fire effects where prescribed burning is done.	Fuels treatment inventory and results documentation.	Post burn	Fuels Specialist

Coordinate with state and federal agencies in smoke monitoring efforts.	Air quality and smoke emissions measurements.	Pre and Post burn	Fuels Specialist
Track relative costs of fuels treatments.	Maintain treatment cost spreadsheet.	Ongoing	Fuels Specialist
Monitor public acceptance and reactions of fuels treatments. Continue collaboration efforts during project preparation and implementation.	Document public concerns and comments regarding fuels treatments, prescribed burning, wildfire, or air quality. Follow-up with letters, phone calls, meetings, or personal contacts.	Ongoing	Fuels Specialist
Monitor effectiveness of grass seeding in the dozer firelines in managing invasive weeds.	Survey and documentation of effectiveness of seeding for weed prevention and control.	Post harvest and prescribed fire.	Fuels Specialist, Invasive Weed Coordinator
Monitor effects of vegetation treatments and prescribed burning within riparian areas.	Data Inventory and documentation of effects observations in RHCAs.	Post harvest and prescribed fire.	Fuels Specialist, Botanist, Soil Scientist,
Monitor effects of fuels reduction treatments on wildlife snag levels.	Snag inventory and documentation of effects of harvest and prescribed fire.	Both pre and post harvest and prescribed fire activities.	Wildlife Biologist, Fuels Specialist, Timber Sale Administrator

COMPARISON OF ALTERNATIVES

This section normally includes a comparison of alternatives. However, under HFRA, no alternatives other than the proposed action are required if the project is in the Wildland-Urban Interface and 1½ miles of an at-risk community, as is the case with this project. The comparison below (Table 2-5) is given to the existing condition information for project objectives (purpose and need) and issues.

Table 2-5: Comparison of Existing Condition and Proposed Action

Purpose or Issue	Existing Condition	Proposed Action Result
Purpose: Reduce the risk of uncharacteristic wildfire on forest ecosystem components and improve sustainability of stands to withstand frequent fire (Pg. 1-2).	Most units are condition class 3, where fire regimes and vegetation patterns have been substantially altered from historic ranges, the risk of loss of key ecosystem components from fire is high and fire frequencies have departed from historic frequencies in size/frequency/intensity/ severity and landscape patterns. Late/Old Structural (LOS) components at risk from infestations of insects, disease and tree density.	Approximately 133 acres of condition class 3 would be moved to conditions class 1, reducing risk of habitat loss due to wildfire. There would be no net loss of LOS structure components. Treated LOS and middle structure will be more resilient to natural disturbance without losing LOS components. Susceptibility to insects and disease would be restored to endemic levels. Tree density would be reduced to decrease stress and maintain or improve individual tree vigor under sustainable conditions.
Purpose: Improve	High fuel loads, condition class 3,	Fuel loads reduced on 133 acres of high

Purpose or Issue	Existing Condition	Proposed Action Result
protection capability for homes and structures in the project area and reduce fuels to aid future fire suppression efforts to improve firefighter safety (Pg. 1-2).	exist on NFS lands directly adjacent to developed lands that include many homes and structures. Current conditions make it difficult to protect from wildfire them from wildfire.	risk NFS lands directly adjacent to developed areas in WUI that include homes and structures. Stand treatments would help improve the capability of fire crews of suppressing fires stands before they reach homes and structures by providing defensible buffer.
Issue 1: Prescribed burning may expose residents to unhealthy smoke (Pg. 1-10).	Currently only limited smoke impacts to residents from wood fires in homes and campgrounds. Substantial risk of smoke from future wildfire in the area.	Smoke dispersal requirements and design restrictions would allow most smoke to settle out quickly after burning. Some smoke may linger in valley bottom in the Twisp and Carlton area as a short term impact. Prescribed burning will produce 17.75 Total Tons of Suspended Particulates; substantially less than would result from a wildfire in the same area.
Issue 2: Mechanical treatments may adversely affect soil productivity (Pg. 1-10).	Soil productivity may be damaged by future uncharacteristic severe wildfire that has high residence time in historically unprecedented fuel accumulations. CWD varies from 5-50+ tons per acre	Impacts to soil productivity will be limited through unit design and soil impact mitigations, including winter logging, skid trail design limitations, CWD requirements, etc. (Pg. 2-7 to 2-9). Limited soil productivity impacts may occur on about 133 acres where ground skidding is done. Total of 22 acres (14%) may be left in detrimental soil condition in areas of skid trails and landings. Passive restoration through natural grass growth and additional grass seeding is expected to help move soils toward desired conditions. CWD will be retained at 3-7 tons/acre, meeting standards for maintaining soil productivity.
Issue 3: Wildlife habitat values may be adversely affected by stand treatments and thinning/burning operations (Pg. 1-10).	Various wildlife species and habitats exist in the project area. Existing human use and past management activities, including roads have slightly altered habitat effectiveness for some species. Current open road density is 1.9 mi/mi² in MA14 and 0.8 mi/mi² in MA26 in project area. Forest Plan standard for open road density is 2.0 mi/mi² in MA14 and 1.0 mi/mi² in MA26.	Unit design and other mitigation measures are designed to minimize impacts from this project to all wildlife species. Wintering deer will not be adversely effected. Snag habitat will be protected and defective tree will be maintained (Pg. 2-8 to 2-9). Open road density in the area will be kept below forest plan standard. Resulting open road density will be 1.9 mi/mi² in MA14 and 0.8 mi/mi² in MA26 in project area.
Issue 4: Timber harvest and fuels treatments in RHCAs could degrade the quality of riparian habitat.	Riparian areas are present in units 6 and 7adjacent to intermittent streams. .	RHCAs in units 6 and 7 identified and protected by mitigations of winter harvest requirements and/or operational restrictions for harvest equipment with in RHCAs (Pg. 2-9).
Issue 5: Commercial harvest in old growth	No identified Forest Plan Old Growth is located in Finley	Proposed action will allow fuels reduction thinning that will include treatments in

Purpose or Issue	Existing Condition	Proposed Action Result
could compromise old growth biological and structural diversity (Pg. 1-10).	Canyon. LOS is represented in units 3, 6, and 7, totaling approximately 51 acres. Middle structure present on remaining 102 acres in treatment units.	LOS designed to reduce risk of loss of these stand components by wildfire on 51 acres. Treatments on remaining 102 acres of middle structure are designed enhance continued development of LOS. There would be no net loss of LOS within the biophysical environment as a result of proposed stand treatments.
Issue 6: Logging, fuels treatment and access may spread noxious weeds (Pg. 1-10).	All known populations have been or are being treated under Forestwide Invasive Weed EA.	About 133 acres of potential soil disturbance; 22 acres of detrimental soil condition. Mitigation measures including to pressure wash of logging and road maintenance equipment, directional grading, use of weed free gravel pits/landings/staging areas, grass seeding disturbed areas, road closures, and designating skid trails, and winter harvest requirements are expected to limit and prevent spread (Pg. 2-8 and 2-11).
Issue 7: The safety issues with mixed logging and public traffic may impact public safety (Pg. 1-11).	Currently residences are used all year however local public traffic is minimal; recreation use and resultant traffic increase is heaviest during fall months.	Traffic control enforcement measures included in timber sale contract will help minimize potential conflicts. Winter haul may pose public safety issues. This will be mitigated by required issue resolution meeting between FS and local residents (Pg. 2-11). Potential resolutions include traffic control measures such as road closures, haul scheduling, etc.

Chapter 3
Environmental Consequences

This chapter presents information about current resource conditions, and the direct, indirect and cumulative effects of implementing the proposed action based upon analysis using best available science. The information presented in this chapter summarizes and cites the specialist's reports that are found in the project analysis file. Full versions of these specialist's reports are available at the Methow Valley Ranger District office in Winthrop, Washington.

Each resource area discloses the direct, indirect and cumulative effects for that resource area. The National Environmental Policy Act defines these as:

Direct – effects which are caused by the action and occur at the same time and place

Indirect – effects which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable

Cumulative – impacts that result from the incremental impact of the action, when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions

The project IDT identified past, present, and reasonably foreseeable future actions that might have cumulative impacts with the proposed action early in the analysis process. Those actions are listed below. Each resource area considered different mixes of these actions, depending on the cumulative effects boundary for the resource area and the resource affected. For example, the cumulative effects boundary for lynx, a wide ranging predator, considers the Lynx Management Unit as the cumulative effects boundary, whereas hydrology considers the analysis watersheds as the cumulative effect boundary. Only those past, present and reasonably foreseeable actions that overlap the geographic analysis area boundary for each particular resource are considered, and only if those other actions are/are expected to have overlapping effects with the Finley HFRA project. Some past projects may still be having effects on one resource, but not another. Generally, agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions, without delving into the historical details of individual past actions (CEQ, 2005).

The suite of past, present and reasonably foreseeable future actions developed by the project IDT, and examined for overlapping effects with each resource in the Finley HFRA Thin project area include:

Past and ongoing grazing and allotment management in Finley Canyon and surrounding area.

Past and ongoing invasive weed management control activities, including herbicide use.

Past fire exclusion by fire suppression.

Finley Mountain Landscape Burn (5416 acres, 2001)

Finley Canyon Prescribed Burn (2000 acres, 2005).

Private logging on adjacent Mullins property (60 acres, 2004).

Past and ongoing private land development, including new homes and structures.

Past and ongoing limited road maintenance on Finley Canyon Road.

Past limited insect salvage timber removal from Finley Canyon bottom (1980's).
Past commercial thinning Timber Sales in Benson Cr. Watershed; Pond, Hook, Row, and Leecher Thin projects from 1995 to 2004.
Past and ongoing firewood cutting resulting snag losses and user created roads.
Past and ongoing recreation use - dispersed camping, hiking, mountain biking, and falconry, with primary use during fall hunting season.
Future fuels maintenance prescribed burning (10-15 years out).

Setting the Stage

Because the Finley HFRA Thin project is being prepared under the Healthy Forests Restoration Act, and is within the Wildland Urban Interface, the no-action alternative is not required to be developed. However, understanding what would occur should no-action be taken is not only important to gaining a comprehensive understanding of the effects of the proposed action, but also helps readers and the decision maker understand why the Finley HFRA Thin project fits the purpose of the Healthy Forests Restoration Act to:

> *…reduce the risk to communities,…and other at-risk Federal land through…implementing hazardous fuels reduction projects….and…protect, restore, and enhance forest ecosystem components…*

Both the Fire/Fuels and Forest Vegetation sections of this chapter give details on what is expected to occur over time without treatment.

Fire/Fuels

The section below summarizes the existing condition information, along with the direct, indirect and cumulative effects from the Finley HFRA Thin project, as documented in the Finley HFRA Thin Fire/Fuels Report, by District Fuels Specialist Michael Dunn, located in the analysis file (Dunn, 2008). Reference information is contained in the full specialists report.

Existing Condition

Historic and Present Day Fire

Historically (pre-European settlement) fire was a significant influence on the vegetation patterns and processes of east Cascade landscapes (Agee 1994). Before the advent of fire suppression, fire occurred at relatively frequent intervals within east Cascades forests (Agee and Edmonds 1992) as a result of both lightning and in some areas anthropogenic ignitions.

Finley Canyon was characterized by frequent underburns that eliminated most tree regeneration, thinned young stands, and perpetuated open stands dominated mainly by ponderosa pine and large-diameter Douglas-fir. Similar communities within the Methow Valley experienced low intensity fires every 7.6 years with the longest period between fire events being 18 years. 95% of all fires occurred within 15 years of one another (Ohlson 1996).

US Forest Service fire occurrence records within the South Summit area go back to 1920. Fire records over a 87 year period from 1920 to 2007 give numbers of fires (ignitions) per year and size class. Some Forest Service records were kept for fires on private and state ownerships in proximity of the analysis area. During the period from 1920 through 2007 there were 387 recorded fire starts inside the analysis area. While the vast majority of these starts were lightning-caused, a small number were human-caused. With the majority of the human caused fires being abandon campfires and camping within this area being predominately during fall deer hunting season, these fires were likely hunter oriented. Of the 387 ignitions that occurred during the period from 1920 through 2007 most fires were suppressed at a small size. 296 were controlled at a very small size (Size Class A or < ¼ acre), 75 were controlled under 10 acres (Size Class B), 12 were controlled under 100 acres (Size Class C), 3 were controlled under 1,000 acres (Size Class D), and 2 over 1,000 acres. This number of fire starts would be more than enough ignitions to maintain a frequent fire regime. Prior to fire suppression a fire start in these fire regimes could burn with fairly low intensity for weeks or months during the summer until a weather event with enough moisture would put the fire out.

The historical fire regime is an important reference point to assess changes in vegetative patterns and the associated risks of uncharacteristic fire. A fire regime refers to an integration of disturbance attributes including type, frequency, intensity, duration, and extent. Natural fire regimes have been altered by management activities including fire exclusion, livestock grazing, and timber harvesting. Potential global climate change may further impact fire regimes. Fire regimes range from non-lethal to stand-replacing levels, typically becoming less frequent as severity increases.

The five natural (historical) fire regimes are classified based on average number of years between fires (fire frequency) combined with the severity (amount of replacement) of the fire on the dominant overstory vegetation (Hann, et al, 2003):

> **Fire Regime I** – 0-35 year frequency and low (surface fires most common) to mixed severity (less than 75% of the dominant overstory vegetation replaced);
>
> **Fire Regime II** – 0-35 year frequency and high (stand replacement) severity (greater than 75% of the dominant overstory vegetation replaced);
>
> **Fire Regime III** – 35-100+ year frequency and mixed severity (less than 75% of the dominant overstory vegetation replaced);
>
> **Fire Regime IV** – 35-100+ year frequency and high (stand replacement) severity (greater than 75% of the dominant overstory vegetation replaced);
>
> **Fire Regime V** – 200+ year frequency and high (stand replacement) severity.

The Finley HFRA Thin project area has approximately 91 acres of Fire Regime I and 62 acres of Fire Regime III on National Forest land. The boundary between these two fire regimes may not be stable in both spatial and temporal context as some mixed severity exists within Fire Regime I and the nature of a mixed severity fire regime would contain some low severity fire. The more frequent return of fire within Fire Regime I would occasionally extend into adjacent Fire Regime III especially when it lies directly uphill.

Current Fire/Fuels Conditions

The present condition of an area gives an indication of potential fire effects that may or may not be characteristic of the fire regime. Current "condition class" for a fire regime is defined in terms of departure from the historic fire regime conditions. Determination of amount of departure is based on comparison of a composite measure of fire regime attributes (vegetation characteristics; fuel composition; fire frequency, severity and pattern) to the central tendency of the natural (historical) fire regime. The amount of departure is then classified to determine the fire regime condition class (Hann, et al, 2003).

Condition Class 1 - Fire regimes in this condition class are near or within the natural (historical) ranges. Vegetation composition and structure are intact. The risk of losing key ecosystem components from the occurrence of fire is relatively low. Fire frequencies have departed from historical frequencies (either increased or decreased) by no more than one return interval. Where appropriate, these areas can be maintained through fire use or prescribed fire.

Condition Class 2 - Fire regimes and vegetation attributes in this condition class have been moderately altered from their historical range. The risk of losing key ecosystem components has increased to moderate. Fire frequencies have departed by either increasing or decreasing from historical frequencies by one or more return interval resulting in moderate changes to one or more of the following: fire size, frequency, intensity, severity, or landscape patterns. Where appropriate, these areas may need moderate levels of restoration treatments such as fire use, prescribed fire and hand or mechanical treatments to be restored to their historic fire regime condition class.

Condition Class 3 - Fire regimes and vegetation attributes in this condition class have been significantly altered from their historical range. The risk of losing key ecosystem components is high. Fire frequencies have departed from historical frequencies by multiple return intervals resulting in dramatic changes to one or more of the following: fire size, frequency, intensity, severity, or landscape patterns. Vegetation condition, structure, and diversity have been significantly altered. To restore the historical fire regime these lands may require high levels of restoration treatments such as hand and mechanical before prescribed fire can be utilized.

Present day large wildfire events within all fire regimes burn quickly over the landscape and can consume hundreds and even thousands of acres in a single day. Suppression resources contain a majority of fires (>95%) at a small size (<10acres). Those fires that escape initial containment usually are ignitions that happen when:

fuel moisture and atmospheric conditions allow for extreme fire behavior,
are in areas are not quickly or easily accessible,
are in areas that don't allow suppression resources to safely work in close proximity to the fire (no escape route and/or safety zone),
or there is a lack of resources available for initial attack due to multiple starts

Suppression resources try to work directly adjacent to the edge of fires (direct attack) to contain it with a fireline, which is the removal of ignitable debris by scraping an area

down to mineral soil, thus robbing the fire of fuel. This can be accomplished by hand crews if the general flame length is less than 4 feet. Equipment such as dozers can be used if flame lengths are less than 8 feet. If intensity of the fire doesn't allow direct attack then suppression resources have to find defensible locations away from the fire's immediate edge to place fireline (indirect attack). Using indirect attack has inherent difficulties that can make it less effective at containing a fire. Escape routes and safety zones are critical for firefighter safety. An escape route is an easily negotiated path to a safe area (safety zone) where the fire would not pose a threat to firefighters. In frequent fire regimes where fuels are usually light, fire burns through the light surface fuels quickly leaving behind a blackened area. If other hazards are not present then this area can provide a quickly accessible safety zone for firefighters working directly on the fires edge.

Examples of local area fires within the **Twisp – Carlton County Neighborhood** that have burned mostly in Fire Regime I with portions of Fire Regime III are the 1,825 acre Minnie Fire in 1985 (USFS and DNR lands), the 145 acre Balky Hill Fire in 1999 (DNR-protected lands), the 3,786 acre Libby South Fire of 2001 (USFS and DNR-protected lands), and the 1,097 acre Squaw Creek Fire in 2005 (mostly on DNR protected land with some USFS). These high intensity fires were lethal to most of the trees and even larger fire resistant species (stand replacing) due mostly to surface fuels present and stand structure both vertically and horizontally. Due to the fire intensity of these uncharacteristic wildfires, difficulties were created for suppression resources and their ability to gain control. The situation prior to most of these fires occurring was predominately Condition Class 3.

Fire has the ability to move from the ground into the canopy of even the largest trees if there is continuity of the vegetation or fuel between them. Stands with multiple age classes are a good example. The term ladder fuels is used to describe both live and dead fuels that provide vertical continuity between strata, thereby allowing fire to travel from the ground or surface fuels into the crowns of large trees. They help initiate and can assist the continuation of crown fire which usually causes high mortality.

With fire exclusion, fuels accumulate on the ground beyond what would have existed if fire had occasionally consumed them. The additional fuel produces a higher intensity surface fire which creates longer flame lengths that can reach higher up into the lower canopy and would require less available ladder fuels to carry fire upward. The increased surface fuel accumulation especially at the base of trees can provide the intensity and duration to cause mortality to even large, fire resistant species. Historically down woody debris would have been much less than 15 tons per acre (Schellhaas 1999) and would have been subjected to repeated surface fires that would eventually consume them (Okanogan and Wenatchee Fire Management Plan 2002).

Historically, crown fire susceptibility, under most summer conditions, for Fire Regime I would have been minor across the landscape. Areas where fire may have missed a few cycles may exhibit this potential, but generally would be small in scale.

Vertical arrangement and horizontal continuity of the stands within the Finley HFRA Thin project area differ from the previously described historical stand structures. The stands are denser with a higher proportion of younger sapling to pole-size age trees serving as ladder fuels into the canopies of the fewer large legacy trees. Some of the ponderosa pine is now experiencing beetle-kill.

These conditions occurring in Finley Canyon increase the probability of surface fires developing into crown fires, because understory ladder fuels lower the effective canopy base height (lowest height above ground at which there is significant canopy fuel to propagate fire vertically through the canopy of the stand (Scott and Reinhardt 2001).

Surface fuels have increased substantially as well from historic conditions. Some of the ponderosa pine has recently died from western pine beetle and collapsed. Firewood cutters have cut some dead trees, leaving limbs and tops scattered on the deep litter layer. Logs and large down-dead limb wood created by over maturity that would have historically been consumed by frequent ground fires are now increasing the surface fuel load dramatically.

These conditions are representative of **condition class 3**. The increase in stand density, canopy continuity, and surface fuels are dramatic changes that would produce fire behavior of much higher intensity and severity than that of an inherent condition class 1.

To mitigate the potential of a wildfire exhibiting the characteristics that would damage or destroy the existing timbered stands and legacy trees and to move the current condition of the fire regimes towards the desired future condition or inherent fire regime, a fuels reduction treatment in Finley Canyon area is being proposed.

Fire Regime I is represented on approximately 59% of the National Forest land within the analysis boundary and includes Units 1, 2, and 3. Historically fire was mostly a low severity or non-lethal disturbance agent to the mostly large and open grown fire resistant species such as ponderosa pine, western larch and some larger Douglas-fir that existed. For the most part fire exclusion and early timber sale activity (harvesting the large fire resistant species) has changed the structure to that of dense stands with multiple age classes. Fire exclusion has also led to an increase in shade tolerant species that are susceptible to the effects of fire.

Within the analysis area Fire Regime III is mostly found in moist draws, riparian, and areas of a northerly aspect influence and was historically of mixed severity. Fires would range from non-lethal to stand replacing depending upon stand structure and conditions during a fire. This would include Units 5, 6, and 7.

Altogether, with past activities taken into account, Fire Regime III within the analysis area is currently in condition class 3 (62 ac. or 41%).

Based on BehavePlus (v. 2.0.3) runs mortality estimates of a fire burning under moderate to severe conditions would range from around 11% to 97% of the 60-100 ft. trees under current conditions.

Fuel Models

Surface fuels are described by the 13 fire behavior fuel models (Anderson 1982). They are divided into four groups – grass, shrub, timber, and slash. They describe fuel conditions on the surface only in timber and do not describe live ladder fuels. Those most important to the Finley Canyon area include:

FM-8 - Closed canopy timbered stand with mainly short needles, leaves and occasional twigs on the forest floor. This fuel model is typically generates slow-burning surface fires with low flame lengths with occasional pockets of heavy fuel that can flare up.

FM-9 - Similar to FM-8, but the longer, more volatile needles of ponderosa pine generate fires that run through the surface litter faster and have longer flame height. Concentrations of dead-down woody material will contribute to possible torching out of trees, spotting and crowning.

FM-10 - This fuel model has greater quantities of 3 inch or larger dead-down woody material. Fires burn in the surface fuels with greater intensity than the other timber litter models. Crowning out, spotting and torching of individual trees is more frequent and may lead to potential fire control difficulties.

The photos below taken in the Finley HFRA Thin project area within Fire Regime I show an increase in stand density and an accumulation of fuels on the surface that create a fuel condition that could produce flame lengths at or above 4 feet, given conditions of 10 percent slope, temperature 90 degrees, mid-flame wind speed of 6 MPH, and relative humidity of 20%.

Photo 3-1: Fuel Model 10

Photo 3-2: Fuel Model 9

Under these conditions handcrews no longer have the ability to use direct attack and both handcrews and dozers do not have easily traveled escape routes and would not have an area burn out quickly after the fire passes that may provide a safety zone.

Fire effects prediction models such as BEHAVEPlus utilize these surface fuel models to estimate potential fire behavior, effects and intensities along with other fire behavior outputs. BEHAVEPlus gives estimates primarily based on one fuel model at a time. Based on BEHAVEPlus (v. 2.0.3) runs, mortality of the large legacy trees is modeled to be from 30% given moderate to severe burning conditions.

With fire exclusion, trees have grown dense in the Finley HFRA Thin project area. This has allowed tree limbs to grow closer to the ground and smaller trees to fill open air voids. This has lowered the average height to the live canopy or canopy base height and

increased the density of woody material in the canopy (crown bulk density) across most of the landscape. Canopy base height across most of the Finley HFRA Thin area is estimated to be within 3 to 8 feet of the ground when considering all trees, even the small ones in the understory.

The present condition, within most of the project area, of increased surface fuel loading and low canopy base heights with higher crown bulk densities greatly increases the areas susceptibility to passive and/or active crown fire.

On-the-ground observations of surface fuel models for the area within National Forest boundary show 91 acres or 59% as Fuel Model 9 (FM-9) and 62 acres or 41% as FM-10.

The present fuel condition within the Finley HFRA Thin project area has great potential for high intensity and high severity stand replacing fire affects that for most of the area would be uncharacteristic. This, coupled with high risk to the Moon Mullins residence with limited egress, creates a difficult suppression scenario should a fire occur. Conditions will continue to degrade and fire risk will increase without proposed action treatments.

Rural fire protection district currently covers WUI only to Wenner Lakes and not further to the Moon Mullins residence. Initial responses to fire reports in the analysis area come from the US Forest Service, Methow Valley Ranger District and Washington State Department of Natural Resources (DNR), South Omak District. Response times would be variable depending on resource locations at the time of a fire report. These federal and state fire agencies only are equipped and trained to fight wildland fires and will try to keep structure fires from spreading into the wildland around it and wildland fires from spreading to primary residences.

Insects and Disease

Dwarf mistletoe is prevalent across that part of the analysis area in Units #5, 6, and 7. It has the tendency to produce dense brooms that increase ladder fuel especially in understory Douglas-fir and lower canopies of larger Douglas-fir trees. It has increased the crown bulk density and lowered the canopy base height from conditions characteristic of fire regime I and has increased the expanse of this condition for fire regime III. Pine beetle is also prevalent in Units # 2 and 3, leading to increased fuel loads upon dead tree collapse. These conditions would continue to increase resulting in increased fire risk without proposed action treatments.

Riparian

Fire exclusion has led to changes in fuel characteristics within riparian areas as well. These areas are usually moister allowing for greater vegetation growing potential thus fuel characteristics may have changed further.

Historically riparian areas experienced both low severity fire as well as high intensity stand replacing fire and mixtures in between depending on stand conditions, dead fuel moistures and atmospheric conditions. Downed woody debris was likely small but continuous within the drier forest riparian and was affected by the frequency of fire

(Olson 2000). Large down woody material was likely consumed by frequent fire (Olson 2000).

Access Management

The current road system in the analysis area allows limited access for ground based suppression resources. The narrow, dead-end road into the canyon can easily lead to an entrapment as in the case of the 30-Mile Fire of 2001. Roads that loop or do not terminate are preferred since they provide ingress and egress which would lessen the hazard of possible entrapment during fire suppression. Roads that provide vistas can help fire suppression resources locate fire starts early and help pinpoint (triangulate) exact fire location given an azimuth from a fire tower lookout and may provide locations to post a lookout person for safety reasons during suppression of a fire.

Presently, fuel conditions adjacent to the roadway within the analysis area do not provide a safe place to fight fire. Wildfire intensity adjacent to the road would be high with fire likely up in the forest canopy. This could generate enough convective and radiant heat to make survival in a vehicle unlikely. Wildfires would easily cross these fuel barriers and continue on.

Air Quality

The Clean Air Act (as amended in 1990) is a legal mandate designed to protect public human health and welfare from air pollution. The act defines National Ambient Air Quality Standards (NAAQS) as levels of pollutant above which detrimental effects on human health and welfare could occur. Particulate matter or PM is the major pollutant of concern from wildfires and prescribed fires. PM means any airborne finely divided solid or liquid material with an aerodynamic diameter smaller than 100 micrometers (microns). The small size of PM in wood smoke allows some particles to be carried deep into the lungs. Most particles larger than 10 microns are intercepted in the nose and mouth through inertial impaction. The Environmental Protection Agency has identified PM10 and PM 2.5 particle sizes as the standards for evaluating emissions and its effect on human health. PM 10 (coarse) particles are those particles in smoke less than 10 microns in size. PM 2.5 (fine) particles are those particles in smoke less than 2.5 microns in size. These particles are too small to be filtered out by the human respiratory system. These small particulates can cause respiratory problems, especially to smoke sensitive portions of the population. In addition to health problems, PM can cause reduced visibility. The State Implementation Plan (SIP) provides means by which goals of the Clean Air Act are to be attained. The Clean Air Act also contains a provision that provides for prevention of significant deterioration (PSD) of air quality in areas that currently have very clean air. Three air quality classes were established (Class I, II and III). The classification of an area determines the amount or "increment" of air quality deterioration that is allowed over a baseline level. Class I areas have the smallest increments and therefore allow the least amount of air quality deterioration. The following are the Class I areas in Washington State:

Alpine Lakes Wilderness
Glacier Peak Wilderness
Goat Rocks Wilderness
Mount Adams Wilderness

Mount Rainier National Park
North Cascades National Park
Olympic National Park
Pasayten Wilderness

The Pasayten Wilderness lies approximately 32 air miles northwest of Finley Canyon.

Prior to European settlement in the 1800s air quality in the Interior Columbia Basin was not pristine due to natural and anthropogenic sources of fire. Levels of smoke have declined as fire was excluded from forests, particularly after the advent of organized fire suppression in the 1930's (Interior Columbia Basin Assessment, USDA Forest Service 1997). Over the past few centuries the average area burned per year by wildfire in Washington was 326,172 acres (Agee 1993).

Wildfires have an impact on the air resource by degrading ambient air quality and impairing visibility. The wildfire regime is substantially different than it was historically because of increased fuel loading, the development of fuel ladders and an increase in stand density.

Both wildfire and prescribed fire emit PM and other pollutants which have potential to impact public health and visibility. Wildfire is the air pollution source with the greatest potential of any air pollution source in the country for exposing the public to extremely high short-term fine particulate concentrations. The large wildfires of 2002 created air pollution problems for both firefighters and the public. In some cases the public was impacted over a hundred miles from the fires as a result of long-range transport (Haddow 2003). The Tripod Fire of 2006 also created immense air quality issues for the public in Okanogan County.

Over the last 10 years state air regulators and scientists have measured air impacts that exceed National Ambient Air Quality Standards (NAAQS) in urban areas from wildfire. The 1994 wildfires near Wenatchee, Washington produced 24-hour concentrations of PM 10 that were more than double the federal health standards, and these conditions persisted for days (Interior Columbia Basin Assessment, June 1997). Summer inversions in Eastern Washington increase the impact on ambient air quality associated with wildfires.

Wildfire events would likely persist and with existing fuel conditions they would likely be high intensity fires consuming most of the available fuel. Wildfires release large amounts of particulate matter (PM), CO, SO2, NOx, and Volatile Organic Carbon (VOC), which can cause serious consequence of regional and local air quality (Sandberg et al., 1999). Differences between the larger amounts of wildfire emissions produced verses prescribed fire emissions for the same amount of area burned relate to the amount of fuel consumed. During summer wildfires fuel moistures are usually lower allowing for more consumption of the available surface fuel as well as the higher fire intensities burning aerial live and dead fuels that are seldom burned during spring and fall prescribed fires. Atmospheric conditions during summer are often more stable than spring or fall affecting the ability for smoke to disperse.

Excerpt from Hearings before the United States Senate Committee on Energy and Natural Resources Concerning 2002 Wildfire Season and 2003 Preparedness March 13,

2003 "The smoke from these wildfires reached more unhealthy levels and was of a much longer duration than any that might be produced by prescribed burning. Prescribed burns are of shorter duration, are done under conditions that disperse smoke, and are in compliance with states' smoke management programs."

Management Guidance

The proposed action for the Finley HFRA Thin project responds to the Healthy Forest Restoration Act of 2003 and follows Federal Wildland Fire Policy, the Cohesive Strategy, A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment 10-Year Comprehensive Strategy, the 10-Year Comprehensive Strategy Implementation Plan, and National Fire Plan.

The Goals and Guiding Principles of the 10-Year Comprehensive Strategy as stated in the implementation plan are as follows:

Goals
1. Improve Fire Prevention and Suppression
2. Reduce Hazardous Fuels
3. Restore Fire Adapted Ecosystems
4. Promote Community Assistance

Guiding Principles
1. Priority setting that emphasizes the protection of communities and other high-priority watersheds at-risk.
2. Collaboration among governments and broadly representative stakeholders
3. Accountability through performance measures and monitoring for results.

The proposed action was developed in collaboration with the Okanogan County Community Wildfire Protection Group.

Proposed Fuel Treatments

Proposed treatments include; commercial thinning fuel treatments on approximately 133 acres of national forest land, non-commercial fuel treatments on 133 acres of national forest land, hand and/or excavator piling slash created by commercial and non-commercial fuel treatments on 133 acres and the subsequent burning of the piles. Burning of landing slash piles on approximately 4 acres and underburning on 99 acres over approximately a five year period after the commercial fuel treatments are completed. After commercial fuels treatments are completed the units will be evaluated by the district fuels department to determine if excavator/hand piling and/or underburning is the follow up treatment needed to meet the objectives of the unit. Underburning would be the preferred treatment. However, when the combination of activity created and natural created fuel are too heavy to meet objectives or cost prohibitive to handpile, excavator piling would be used. It is estimated that the maximum acres to be excavator piled within the Finley HFRA Thin project area would be 116 ac. Handpiling in the riparian-associated units #6 and 7, followed by underburning in Unit #6 is the proposed treatment.

The project objectives are to reduce potential fire behavior and provide a safer egress route. This would also have an effect on increasing firefighter and public safety while

creating a more sustainable ecosystem, thus providing a persistence of current ponderosa pine and Douglas-fir legacy trees. This can be accomplished by raising the average canopy base height and reducing crown bulk density along with reducing surface fuel loadings (primarily fine fuels) to the point where average flame lengths are 4 feet or less during most summertime conditions.

In order to accomplish proposed treatments within riparian areas, there is a need to amend the Forest Plan, specifically Eastside Screen direction to allow harvest in riparian areas that are normally restricted from operations in Regional Foresters Amendment #2 (Interim riparian standard #4,c). Operational restrictions consistent with the Amended Forest Plan would be inconsistent with the need to do fuels reduction treatments important for protecting resources, lives, homes, and structures from wildfire in the area.

The proposed amendment will allow fuels to be treated resulting in effective defensible space allowing protection of resources and private developments in the surrounding WUI area.

Environmental Consequences

Direct and Indirect Effects

Fuel Condition and Fire Behavior

Fuel treatments would have a direct effect on canopy base height and crown bulk density. Commercial and non-commercial fuel treatments would raise the average canopy base height by thinning from below and reduce horizontal canopy continuity. Underburning, excavator piling and handpiling would reduce surface fuels resulting in lower flame lengths and fire intensity. Where currently proposed treatment units have a general height of 3-8 feet to the base of the average lower canopy, there would be an increase to around 15 – 20 feet. This would also have an effect of reducing the overall crown bulk density. By increasing average canopy base heights, surface fires would have a greater tendency to stay on the surface and not ignite larger tree canopies. By reducing horizontal canopy continuity there would be a reduction of crown bulk density, thus reducing crown fire sustainability.

Fire spreads by burning through surface fuels and by spotting. Spotting is greatly enhanced when torching and crowning loft fire brands in the convection column. These fire brands can cause spot fires over ½ mile away from the main fire. Fires that spread by spotting are much more difficult to contain than fires spreading through the surface fuels.

The proposed reduction of canopy, ladder and surface fuels would greatly reduce the potential for long range spotting from the treatment units. A passive or active crown fire burning towards a treated area may spot into it or burn on the surface and in the crowns as it reaches it, but fire would drop to the surface upon entering the treated area and intensities would be reduced allowing suppression resources a better opportunity at containment in all but the most extreme conditions.

Based on BEHAVEPlus (v. 3.0.2) runs mortality estimates from a fire for moderate to severe fire weather would average 30% of the legacy trees before treatment and 11%

after the prescribed stand treatments across approximately 133 acres of the planning area are completed.

Treatments of hand and/or excavator piling and underburning would be done to reduce surface fuels. To achieve the level of surface fuel reduction needed, prescribed fire intensities would have the potential to heavily scorch and/or torch individual and small groups of trees. These effects can be lessened by utilizing a lower intensity initial underburn that would consume a good portion of the fine fuels while not creating a stark visual change on the landscape. The proposed treatments also provide for a more fire resilient ecosystem that would benefit the visual aspects of the area by ensuring a greater survivability of legacy trees through the next 15-20 years. Treatments of excavator piling would be used when the activity fuel loadings are such that underburning would cause unacceptable levels of mortality in the overstory.

Approximately 4 miles of hand fireline or dozer line would need to be constructed for the underburning proposed. Handlines would be constructed using hand tools to produce a line 12-18 inches wide of bare ground that would create a barrier to surface fire spread. Dozer lines should be constructed with a smaller machine (size D-3 or smaller) and would produce a line 4-6 feet wide down to bare ground. After underburns are declared out, grass seeding of the dozer firelines with the appropriate seed mix will be used as a mitigation measure to weed infestations (Pg. 2-11).

Units 6 and 7 contain riparian areas within Riparian Habitat Conservation Areas (RHCAs) of 100' of either side of intermittent stream location. Because of their width these RHCAs are usually not as moist as the riparian areas they buffer immediately adjacent to the streams, and are susceptible to intense fire effects like the rest of the Finley HFRA Thin project area. Similar fuel treatments within RHCA are recommended to reduce tree density and raise canopy base heights that allow for surface fuel treatment of prescribed fire with more moderated intensities. RHCAs left untreated within Fire Regimes I and III are prone to intense fire effects during a wildfire.

Where riparian areas cross underburn boundaries, hand lines would be constructed within the RHCA, instead of dozer lines.

Unit #6 is the only unit containing a RHCA area where underburning is planned on approximately 8 acres. The intent is to allow fire to back into the RHCA and then into the channel area of the riparian where usually more moist conditions exist.

When commercial and non-commercial fuel reduction treatments are applied within RHCAs in Units 6, and 7, the treatment will raise canopy base heights and reduce crown bulk density allowing for prescribed fire use while still maintaining desired vegetation characteristics. Without the commercial and non-commercial fuel treatments prior to prescribed fire use the RHCAs would likely experience more intense fire.

Soil heating from burning activities would be well below the 200 degrees Centigrade threshold on all but the excavator piled units and landing areas. Actual excavator piles cover a small overall area across the acreage piled. Each pile is generally around 11 feet x 11 feet and planned numbers of piles per acre range from 10-15. This equates to 1210 sq. ft. to 1815 sq. ft. per acre or 3.3 acres to 4.4 acres over the 111 acres estimated to be excavator piled, if fuel loadings are high enough to cause resource damage when underburned or if cost-prohibitive to hand pile. Piles are usually placed in

areas traveled by the excavator so are impacting some of the same ground as the tracks. Burning landings piles would also have an effect from approximately 13 landing piles that would impact approximately 750 sq feet each or 0.3 to 0.5 of 1 acre total. See the Soils section of this document for effects to soils from burning these landing piles (Pg. 3-36).

Excavator piling will not be feasible within 20 feet of intermittent stream channels in RHCAs. In these areas of units 5, 6, 7 non-commercial fuel treatments used to raise canopy base height and lower crown bulk densities would involve cutting material generally less than 8 inches in diameter followed by handpiling which would target the fine fuels or material 6 inches and less in diameter. This is in addition to the commercial fuels treatments where the larger material is removed verses left on site. Increasing fuel loads further increases the amount of material to be handpiled which is expensive.

Approximately 2 miles of secondary road in the analysis area would have better egress conditions because fire along the road would likely stay on the surface and have flame lengths less than 4 feet. This would improve greatly the ability of an individual in a vehicle to drive out of the area and not sustain high intensity temperatures or falling trees along the way.

Future fire suppression costs would likely be reduced within the next 15-25 years because of anticipated reduction in future fire intensity as a result of proposed stand treatments. These reduced intensities would give more options to fire suppression managers and resources during suppression actions and allow suppression actions to be more effective.

Condition Class

Based on past timber harvest and fire history along with field reconnaissance the following changes are predicted to current condition class:

91 acres of Fire Regime I would change from CC3 to CC1
62 acres of Fire Regime III would change from CC3 to CC1

Overall there would be an increase in CC1 to 100% after all treatments are complete within the Finley HFRA Thin units, especially in key areas around private property and egress routes. This would greatly increase the potential to protect life and property in the analysis area, and improve fire fighter safety.

Fuel Model changes

Changes in the fuel models for the National Forest land within the analysis area after all treatments are complete would be a conversion of 62 acres of FM-10 to FM-8. Units 1, 2, and 3, currently FM-9, would lose its flammability and potential intensity for 5 to 10 years, but would always remain FM-9 with more herbaceous fuels, such as bunchgrass and bitterbrush added to it.

Fuel Model 9 was used to model the surface fuel conditions after treatment based on assumption there would be a mix of Fuel Models 8 and 9 throughout the project area. The lower outputs of FM-8 would temper the higher spread/intensity of FM-9.

Air Quality

Table 3-1: Estimated Particulate Matter (PM) Emissions (tons)

Activity	Acres	TSP	PM 10	PM 2.5
Burn Hand piles	42	1.04	0.73	0.67
Burn Landings	3	1.2	0.85	0.78
Burn Excavator piles	111	8.05	5.69	5.22
Underburn	99	7.46	5.28	4.84

TSP = total suspended particulates
PM10 = suspended particulates less than 10 microns in size
PM2.5 = suspended particulates less than 2.5 microns in size

By implementing fuel management activities in fire-adapted ecosystems, especially by modifying Condition Class 3 into Condition Class 1, the potential release of emissions in the event of wildland fire would be substantially reduced.

While increased levels of prescribed fire can have temporary negative impacts on air quality, in the long term, acute impacts to air quality from wildfires can be reduced (Schaaf 1996). All burning would be within State of Washington air quality standards and Clean Air Act standards. Some temporary smoke impacts would occur in the Carlton and Methow areas during evening inversions while prescribed fires are undertaken.

Burning proposed in this project is not expected to have a direct or indirect impact to any Class 1 airshed because the Pasayten Class 1 airshed lies 32 miles north of the project area, and the prevailing winds are out of the west.

The prescribed burning planned in this project should not interfere with livestock turn out and turn off dates since turn out dates are generally after the prescribed burning season and turn off dates are generally before the beginning of the fall burning season. When there is overlap, cows generally avoid areas where active prescribed burning is occurring. In addition range managers use salting and riding to discourage cows from entering recently burned areas.

Cumulative Effects

This cumulative effects analysis is based on the effects within the Finley Canyon drainage between Pole Pick Mountain and Finley Mountain and adjacent private lands from past prescribed fires, and timber stand treatment actions, and anticipated future fuels maintenance prescribed burn projects. Maintenance burning would be needed 10-15 years after treatments to maintain these areas in Condition Class 1.

The wind direction of concern for the project area would be out of the Southeast and East. Most cumulative effects relating to fire and air would be limited to the northern and southern sides of the analysis area and adjacent to private lands to the west.

Landscape Condition

The effect of past actions on fuels in the Finley Canyon area is described in the existing condition information above. In addition, the Finley Mountain landscape burn of 2001 converted approximately 5,416 acres of Condition Class 3 to CC 2 between Finley Mountain and Benson Creek, as well as the 2,000 acre Finley Canyon Prescribed Burn of 2005 between Pole Pick Mountain and Finley Canyon.

This project has an objective of providing protection to the resources at risk in the Finley Canyon area and returning Fire Regime I and a portion of Fire Regime III to Condition Class 1. This would have an impact on how naturally occurring and human caused fires would burn. After commercial harvest, the need remains to treat the surface and ladder fuels. As more acres of surface and ladder fuel treatments are done over time, there would be a higher probability of not having total stand replacing fire effects on a large scale and higher levels of large tree structure would be retained on the landscape.

Past and ongoing firewood gathering creates additional fuels in localized areas where woodcutters remove the bole of the trees, but leave all the limbs. Existing firewood slash would be reduced along with natural fuels and activity created slash within the areas proposed for treatment. Creation of fuel from future firewood cutting would be expected to continue, although the 4100-380 Road would be closed near the creek crossing with this project, which would limit vehicle access for woodcutters.

Future Maintenance

Although not “reasonably foreseeable” within the scope of NEPA since such treatments have not been “proposed”, it is recognized that maintenance treatments of prescribed burning or mechanical fuel treatments would need to be utilized in the future to keep from regressing to the condition we presently have. These treatments should follow the approximate historical return interval of fire for the given fire regime. Frequency may be greater in proximity of resources needing greater protection such as residences near the forest boundary and egress routes.

Grazing

Past and on-going cattle grazing generally has a beneficial effect on reducing potential fire spread through reduction of grasses and forbs, and this effect is expected to continue into the future.

Grazing can have detrimental effects to the implementation of prescribed fires if it removes the fuel (grass) necessary to carry fire between ignition strips or out from spot ignitions in order to meet burn objectives.

Air Quality

Air quality impacts from past actions no longer occur since smoke disperses quickly after fires are out. Smoke from prescribed fires, during mostly spring and fall seasons, would likely continue across the Methow Valley Ranger District in at least the foreseeable future. Smoke from all sources, except the Colville Confederated Tribes land and Canada is regulated by the State of Washington. Even with regulation prescribed fire smoke can create short term impacts. These usually last only a day or two and quickly

disperse due to burn approval from the State coming at times of favorable atmospheric conditions. The State approves the amount of prescribed burning based on expected smoke dispersal, although nuisance smoke does still occasionally occur. District Prescribed Fire Managers in conjunction with the State of Washington would monitor atmospheric conditions and emissions from all sources of smoke to curtail potential smoke impacts.

The potential for smoke impacts to a Class 1 airshed is low because the Pasayten Wilderness lies 32 miles northwest of the analysis area and prevalent wind patterns usually contain a westerly component. East winds are rarer and are least likely to result in conditions where the State would grant burning approval.

Potential cumulative effects of smoke to the general population would most likely be from a visual or nuisance perspective.

Forest Vegetation

The section below summarizes the existing condition information, along with the direct, indirect and cumulative effects from the Finley HFRA Thin project, as documented in the Finley HFRA Thin Vegetation Treatment Report, by District Silviculturist John Daily located in the analysis file (Daily, 2008). Reference information is contained in the full specialists report.

Existing Condition

Historical Forest Vegetation Conditions

Historically fire played a critical role in the development and maintenance of lower elevation dry and mesic forest stand structures in the project area. The historic fire regime maintained open stands of large diameter ponderosa pine and Douglas-fir trees for centuries on these sites (Hessburg et al. 1994). Low severity fires typically maintained stand density at low levels by preventing the establishment of smaller understory trees. Stands of trees with primarily single canopy layers and low stem density allowed large diameter, fire resistant trees (particularly ponderosa pine) to persist on the lower elevation sites in the analysis area (Hessburg and Agee 2003).

Fire exclusion and timber harvest activities are the primary factors responsible for changes in lower elevation forest stand structures in the project area. Fire exclusion from the early 1900s to the present has eliminated the frequent, low severity fires that maintained the open, park-like stands of mature trees that formerly dominated lower elevation dry and adjacent mesic forest sites in the area. Timber harvest operations that focused on the removal of large trees probably began in the early 1900s and continued into the mid 1980s. A canopy layer of densely stocked immature trees, generally less than 18 inches diameter at breast height (dbh), has become established as a result of fire suppression and removal of mature trees. The densely stocked understory canopy layer is competing with the remaining mature trees, generally 18 inches dbh and larger, on many sites.

The tree species composition, structural diversity, and natural disturbance patterns of lower elevation forests have changed over the past century. Douglas-fir trees now comprise a greater proportion of overall forest cover compared to pre-fire suppression and timber harvest levels. Current tree stocking levels are higher and the average tree size is smaller compared to historic conditions which existed in the early 1900s. Deciduous tree species, including aspen, have declined in the project area due to competition with encroaching conifers. These changes in forest stand structures and disturbance patterns have occurred in upland forest areas as well as the riparian habitat conservation areas (RHCAs) located adjacent to intermittent and perennial streams in the project area.

Tree vigor has declined following an increase in stocking levels and the risk of bark beetle attacks in ponderosa pine has greatly increased. Stocking levels throughout the majority of proposed harvest units exceed density thresholds where ponderosa pines become increasingly susceptible to pine bark beetle attacks (Cochran et al 1994, Cochran and Barrett 1998). The density threshold for drier, less productive stands (proposed units 1 and 2) is stand density index (Reinecke 1933) (SDI) 120 which is equivalent to 80 to 90 square feet basal area per acre. Basal area is defined as the cross sectional area of tree stems per acre in square feet measured at breast height. The density threshold for the more productive stands (proposed units 3, 5, 6, and 7) is SDI 200 or 120 square feet basal area per acre. Aerial surveys conducted in 2001 identified a pine bark beetle outbreak with tree mortality on approximately 100 acres in the vicinity of proposed harvest units 2, 3, 6, and 7. Long term retention of large ponderosa pines 21 inches dbh and larger is unlikely without intervention in the majority of proposed harvest units because overstocking creates ideal conditions for pine beetle activity and mortality of the largest, least vigorous trees (DeMars and Roettgering 1982).

Current Forest Vegetation Conditions

Current tree stocking levels and species composition in the majority of stands considered for treatment will not maintain nor promote the development of sustainable late and old structure stands. Douglas-fir trees currently are much more common in the understory and overstory canopy layers compared to historic stand structures in proposed harvest units 3, 5, 6, and 7. This condition is associated with an increased risk of damage by insect defoliators including the western spruce budworm and Douglas-fir tussock moth (Carlson and Wulf 1989, Brookes et al. 1978). Western spruce budworm defoliation of Douglas-fir was observed throughout proposed treatment units as well as the bottom of Finley Canyon in 2007. Prolonged periods of insect defoliation increase the likelihood of mortality or top kill from bark beetle attacks on weakened trees (Wickman et al 1981, Fellin and Dewey 1982).

Douglas-fir dwarf mistletoe is prevalent in proposed units 5, 6, and 7. Dwarf mistletoe causes the production of distorted growth on infected branches called witches brooms. Witches brooms provide fuel ladders which allow flames from surface fires to spread upward into tree crowns (Hadfield et al. 2000). Dwarf mistletoe reduces the vigor of infected trees and height and stem diameter growth are reduced when one third or more of a host tree canopy is affected (Hawksworth and Wiens 1996). Growth impacts are more severe as infection levels increase, and severely infected trees are less capable of resisting attacks by other diseases and insects. These multistory stands provide a continuous supply of susceptible hosts and favorable conditions for the spread and intensification of dwarf mistletoe infection (Steele et al. 1996). Disease levels are

expected to increase in these units unless measures are taken to reduce existing dwarf mistletoe infections and reduce the number of potential hosts. Dwarf mistletoe impacts, including declining host vigor and ladder fuel accumulation, are expected to increase in the project area without management intervention or natural disturbance such as fire.

Management Direction

The proposed Finley HFRA Thin project covers approximately 133 acres of National Forest land in the Finley Canyon area of the Benson Creek watershed. The proposed project is located in management areas 14 and 26 of the *Land and Resource Management Plan for Okanogan National Forest* (USDA 1989) (Okanogan Forest Plan) as revised by the *Regional Forester's Forest Plan Amendment Number 2* (USDA 1995). The goal statement for Management Area 14 directs the Forest Service to provide a diversity of wildlife habitat, including deer winter range, while growing and producing merchantable wood fiber. The goal statement for Management Area 26 directs the Forest Service to manage deer winter range and fawning habitats to provide conditions which can sustain optimal numbers of deer indefinitely, without degrading habitat characteristics such as forage, cover, and soil.

The Regional Forester's Forest Plan Amendment Number 2 (Eastside Forest Plan Amendment) provides timber sale direction on retaining late and old stand attributes at the local scale and managing forest stand structures within the historical range of variability (HRV) at the landscape level. This management direction exists in the form of ecosystem and wildlife standards which are commonly referred to as the "eastside screens". The Eastside Forest Plan Amendment exempted several categories of timber sales from consideration of HRV through the ecosystem standard, including commercial thinning and understory removal sales located outside of currently mapped old growth. Timber sales that are exempted from the ecosystem standard, however, must apply the wildlife standards as described in the amendment. The wildlife standard as applied to the Finley HFRA Thin project requires that the direction provided in Scenario A, items 1) through 4) must be followed. Stand structure analyses previously conducted in two similar, adjacent watersheds indicate that LOS stand structures are below the HRV in one particular biophysical environment where proposed harvest treatments are being considered in the Finley HFRA Thin project. An extensive stand structure analysis for the watershed that contains the Finley HFRA Thin project area has not been conducted. However, to determine which wildlife standards apply to a project, it is necessary to determine which of the two wildlife scenarios described in Regional Forester Amendment #2 apply. The *Middle Methow Watershed Analysis* (USDA Forest Service 1997) clearly indicates that late and old stand structure is below that found historically (page 84) and therefore the more restrictive scenario A has been applied to the Finley HFRA project.

The proposed project is located within the Benson Creek subwatershed of the Middle Methow watershed. An analysis of natural resource conditions within the Middle Methow watershed was conducted in 1996. *The Middle Methow Watershed Analysis* (USDA Forest Service 1997) recognized that fire control and timber harvest had changed the structure and distribution of timber stands compared to historic conditions that existed at the beginning of the twentieth century. The watershed analysis identified a timber stand management objective to maintain vigorous trees that are resistant to insect and disease outbreaks, and minimize high-intensity fire risk. The following management

recommendations for ponderosa pine and Douglas-fir stands similar to those found in the proposed project area are provided in the watershed analysis:

> Maintain mature, large diameter trees by reducing excess understory stocking with timber harvest, thinning sub-merchantable trees, and prescribed burning.
> Restore stand canopy structures and pine bark beetle dynamics to historic levels by removing excess understory Douglas-fir and decreasing the density of understory ponderosa pine.
> Reduce wildfire risk to mature overstory trees by decreasing the density of understory stems and removing ladder fuels which extend into the overstory canopy level.
> Reduce competition in young stands to provide adequate growing space which will allow trees to eventually reach large size.
> Promote ponderosa pine and other early seral (tree) species by removing excess understory Douglas-fir stocking.
> Reduce dwarf mistletoe infection in the understory (particularly in Douglas-fir) and confine infection primarily to large, mature trees.

The Strategy for Management of Dry Forest Vegetation on the Okanogan-Wenatchee National Forest (USDA Forest Service, 2000) provides a framework for management of dense, dry forest vegetation. The Strategy was originally developed following the 1994 fire season and the current version incorporates comments and suggestions made during a scientific review of the original version. The Dry Forest Strategy identifies the following management objectives to maintain, protect, and enhance the health of dry forests in the proposed project area:

> Reduce stand density (number of trees per acre).
> Alter tree species composition.
> Reduce fuel loads to conditions consistent with pre-settlement fire regimes.
> Maintain tree density consistent with pre-settlement fire regimes.
> Maintain fuel levels consistent with inherent fire regimes.
> Reduce susceptibility to insects and disease occurrence outside of endemic levels.

Desired Forest Vegetation Conditions

The desired future condition of forest vegetation in the proposed Finley HFRA Thin treatment units would include the following characteristics:

> Fire resiliency and resistance to crown fire would increase from current undesirable levels.
> Late and old structure (LOS) stands would be treated to maintain large trees and other sustainable structural elements of LOS stands; young stands would be treated to accelerate the development of LOS stands in the future.
> Susceptibility to forest insects and diseases would be restored to endemic levels associated with historic stand structures and disturbance patterns.
> Tree species composition would be changed to reflect historic conditions and increase the proportion of early seral species including ponderosa pine and aspen.

Proposed Vegetation Management Treatments

Commercial thinning

A harvest activity that would fell and remove commercial size trees to achieve stocking levels needed to increase stand resiliency to natural disturbances including forest insect attacks, tree diseases, and wildfires. Trees seven to 20.9 inches diameter at breast height (dbh) determined to exceed desired stocking levels would be harvested. Excess trees less than seven inches dbh would be removed if favorable market conditions exist at the time of logging. The majority of trees targeted for removal would be relatively smaller trees that are competing with larger, more vigorous trees or competing with more vigorous trees in the same canopy layer. This thinning technique is known as thinning from below or low thinning (Smith 1962, Graham et al. 1999, Peterson et al. 2005). Generally the largest and most vigorous trees in a given area would be retained to attain desired residual tree stocking levels. The vast majority of trees expected to be removed would be less than 18 inches dbh and the average estimated cut tree size would be approximately 12 inches dbh. Trees 18 to 20.9 inches dbh would be harvested only where needed to maintain and restore larger and more vigorous trees growing in close proximity. Variable spacing of residual trees is desirable depending on the distribution of existing dominant trees. Vigorous ponderosa pines and Douglas-firs would be the favored conifers to retain following thinning. In addition to vigorous live trees, snags and live defective trees would also be retained throughout harvest units to provide dead tree and cavity dependant wildlife habitat plus a recruitment source for future snags and coarse woody debris.

Stocking level guides were developed for stands in the Finley analysis area based on a method recommended by Cochran and others (Cochran 1994). The stocking level guides are based on site productivity and growth requirements of ponderosa pine and Douglas-fir which are the primary tree species growing in stands proposed for commercial thinning treatment. These guides provide a range of tree stocking levels that maintain or enhance tree vigor and reduce susceptibility to insects and disease occurrence outside of endemic levels, thereby reducing fuels accumulation from future tree mortality. Recommended stocking levels are similar to historic tree stocking levels that were present on comparable sites at the beginning of the twentieth century based on a study conducted on the Okanogan National Forest in 1999 (Ohlson and Schellhaas 1999).

The target stocking level for the hot-dry sites is stand density index (SDI) 60-90 (Reinecke, 1933). Stand density index is the number of trees per acre that a stand would have with a quadratic mean diameter at breast height of 10 inches. The range of desired conifer stocking levels by size class for units 1 & 2 is displayed in the following Table 3-2:

Table 3-2: Recommended Residual Tree Stocking; Hot/Dry Stands

Average diameter of residual trees contributing to target stocking	Target SDI	Approximate trees per acre	Approximate basal area per acre range	Average Target Spacing
7 to 12 inches	60	50 to 60	30 to 40 square feet	30 feet

Average diameter of residual trees contributing to target stocking	Target SDI	Approximate trees per acre	Approximate basal area per acre range	Average Target Spacing
13 to 18 inches	60 to 70	30 to 40	50 square feet	35 feet
19 inches and larger	80 to 90	30 to 40	60 to 80 square feet	35 feet

The target stocking level for the more productive warm-mesic and cool-dry sites is stand density index (SDI) 80-120. The range of desired conifer stocking levels by size class for units 3, 5, 6, & 7 is displayed in the following Table 3-3:

Table 3-3: Recommended Residual Tree Stocking; Warm/Mesic and Cool/Dry Stands

Average diameter of residual trees contributing to target stocking	Target SDI	Approximate trees per acre	Approximate basal area per acre range	Average Target Spacing*
7 to 12 inches	80 to 90	70 to 90	40 to 50 square feet	25 feet
13 to 18 inches	100	40 to 70	60 to 70 square feet	30 feet
19 inches and larger	110 to 120	30 to 40	80 to 90 square feet	35 feet

* Increase spacing of residual conifers ≤ 18"DBH to 35 feet within aspen clones in units 3, 6, & 7.

Trees with heavy dwarf mistletoe infections would be removed to reduce disease levels. Occasional openings in the forest canopy one quarter acre (approximately 100 feet square) and smaller in size would be created by the removal of diseased trees in units with high proportions of Douglas-fir stocking (units 3, 6, and 7).

Existing aspen clones would be maintained by increasing the spacing between residual conifers growing adjacent to aspen trees in units 3, 6, and 7. Openings created by the removal of dwarf mistletoe infected trees in units 3, 6, and 7 would provide areas favorable for the establishment of aspen and other deciduous vegetation.

Post Harvest Pre-commercial Thin for Ladder Fuel Reduction

Conifers less than seven inches dbh growing within 15 to 20 feet of the canopy dripline of larger vigorous conifer crop trees would be felled following harvest to reduce ladder fuels and understory competition for light, water, and nutrients. Conifers less than seven inches dbh growing within 20 feet of the canopy dripline of aspen trees would be felled to maintain and enhance aspen growth. Patches of vigorous conifers less than seven inches dbh remaining after ladder fuel reduction and crop tree release felling would be thinned to an average spacing of 20 to 25 feet based on site productivity. Vigorous ponderosa pines would be the favored conifer to retain during post harvest thinning and Douglas-firs would be second preference for retention. Fuels created by this post

harvest treatment would be piled and burned concurrently with fuels created by commercial thinning operations.

Environmental Consequences

Direct and Indirect Effects

Fire Resiliency and Resistance to Crown Fire

Proposed vegetation and fuels management treatments would improve fire resiliency and increase crown fire resistance on approximately 158 acres. Commercial thinning from below, ladder fuel reduction, and release felling treatments would help reduce crown fire potential (Agee 1996, Agee et al. 2000, Agee and Skinner 2005, Graham et al. 2004, Peterson et al. 2005). Ladder fuels and tree canopy fuel loading would be reduced, and the largest, most fire resistant trees would be maintained in treated stands. All trees 21 inches dbh and larger would be retained, and the vast majority of trees 18 to 20.9 inches dbh would be retained in proposed treatment units. Post harvest slash disposal treatments including piling and burning would reduce surface fuels to prevent ground fires from severely damaging residual trees and spreading into the canopy of treated stands (Cram et al. 2006, Raymond and Peterson 2005, Ritchie et al. 2007, Stephens and Moghaddas 2005). Tree densities and fuel loading would be changed to levels that are consistent with pre-settlement fire regimes and stand structures. Fire resilient stands which are resistant to crown fire during all but the most extreme burning conditions would be created. Treated stands would benefit from proposed vegetation and fuels reduction treatments for approximately 20 to 30 years before tree stocking levels and fuels increase to undesirable levels.

Stand Structures

Vegetation and fuels management treatments would be implemented in three late and old structure stands with multiple canopy layers (LOSM) totaling approximately 51 acres. Proposed harvest units 3, 6, and 7 East would be treated with commercial harvest and post-harvest thinning and slash disposal treatments to maintain large trees and create late and old structure single canopy layer (LOSS) stands. There would be no net loss of LOS stands within the project area, merely a change from LOSM to LOSS conditions. All LOSM stands that would be treated are located on sites in the warm-dry to warm-mesic biophysical environment where LOSS stand conditions historically were more common than they currently are in the project area. All trees 21 inches dbh and larger and the vast majority of trees 18 to 20.9 inches dbh would be retained in proposed LOSM treatment units. Treating these LOSM stands would help restore open, park-like (single canopy layer) timber stands where they historically occurred in the project area. Proposed treatments would create LOS vegetation and fuels conditions that are more resistant to natural disturbances and more sustainable than the current situation. Recruitment of snags and down trees in treated LOS stands would be restored to levels that are consistent with historic natural disturbance patterns. The proportion of large trees in treated stands would be maintained or increase thereby providing for the sustained recruitment of large snags and coarse woody debris in the future.

Vegetation and fuels treatments also would be applied in four middle structure timber stands totaling approximately 102 acres to promote the development of future late and old structure stands. Proposed harvest units 1, 2, and 7 West would be treated with commercial harvest and post –harvest thinning and slash disposal treatments to maintain existing large trees and

provide favorable growing conditions for young trees to develop into larger trees. All trees 21 inches dbh and larger and the majority of trees 18 to 20.9 inches dbh would be retained. Although these treatments would move stands toward late and old structure, they most likely would require future treatments to develop into late and old structure single canopy layer (LOSS) stands. All younger middle structure stands that would be treated are located on sites in the hot-dry and warm-dry to warm-mesic biophysical environments where LOSS stand conditions historically were more common than they currently are in the project area. Timber stands in all proposed harvest units (including LOSM and middle structure stands) would be more resilient to natural disturbances and sustainable over the long term following treatment. Tree stocking levels and fuel loading would be consistent with pre-settlement fire regimes in all treated stands. Tree species composition would be adjusted to maintain or restore historic proportions of ponderosa pine stocking in treated stands. Susceptibility to forest insects and diseases would be restored to endemic levels associated with historic stand conditions. Tree density would be reduced to decrease stress, maintain or improve individual tree vigor, and prevent bark beetles from killing large ponderosa pines in treated stands (Cochran and Barrett 1998, Fiedler 1996, Skov et al. 2004, Stone et al. 1999). Dwarf mistletoe infections would be reduced from current levels, confined primarily to large trees, and distributed in a manner similar to historic conditions. Stand structures and tree stocking levels in treated stands would reduce susceptibility to western spruce budworm and Douglas-fir tussock moth defoliation (Carlson and Wulf 1989, Steele et al.1996) and Douglas-fir beetle attacks (Jenkins et al. 2008).

Treated LOS and middle structure stands would benefit from proposed vegetation and fuels reduction treatments for approximately 20 to 30 years before tree stocking levels and fuels increase to undesirable levels. Natural disturbance regimes for forest insects, diseases, and fire in treated stands would be restored during this time period.

Riparian Areas and Aspen

Vegetation and fuels management treatments would be implemented in upland forest stands within RHCAs totaling approximately 27 acres. The applied silvicultural practices will help acquire desired vegetation characteristics to help attain RMOs. The treatment will help in the development of larger trees in RHCAs to provide future large woody debris which will help future pool development. Densely stocked timber stands would be treated to change undesirable vegetation and fuels conditions which have contributed to an increased risk of insect, disease, and fire related tree mortality and the decline of aspen and other deciduous vegetation in the RHCAs. Streamside vegetation and stream channel integrity would be protected by retaining all trees growing within five feet of stream banks and tracked or wheeled equipment would not be operated within 20 feet of all stream channels. Wetlands and areas with riparian vegetation would be excluded from all mechanical vegetation or fuels management treatments.

Vegetation management and fuels reduction treatments would be applied to reduce tree stocking levels, adjust tree species composition, and reduce susceptibility to uncharacteristic levels of insect, disease, and fire related tree mortality. Large conifers would be maintained by reducing tree stocking levels to prevent bark beetles from killing large ponderosa pines (Cochran and Barrett 1998, Fiedler 1996, Skov et al. 2004, Stone et al. 1999) and Douglas-firs (Jenkins et al. 2008). Post treatment tree stocking levels would promote the development of future large trees and prevent shade tolerant Douglas-fir from replacing ponderosa pine on sites where pine historically was the predominant tree species. Crown fire potential would be reduced by surface, ladder, and crown fuel reduction treatments.

Aspens growing in and adjacent to the RHCAs would benefit from proposed vegetation management activities. Approximately 17 acres of existing aspen clones would be maintained by removing conifers in harvest units 3, 6, and 7 West. Aspens and other deciduous plant species would benefit from more open canopy conditions and increased availability of sunlight created by the removal of encroaching conifers (growing primarily in the understory canopy layer). Openings in the forest canopy created by the removal of diseased conifers in units 3, 6, and 7 East could create up to five acres of growing sites that are favorable for the establishment of aspen and other deciduous vegetation.

Historical tree species composition, structural diversity, and natural disturbance regimes for forest insects, diseases, and fire would be restored in treated RHCA stands. Fire resilient conditions would be created by reducing fuel loading to levels that are consistent with pre-settlement fire regimes and maintaining or increasing the proportion of fire resistant aspen and large conifers in treated RHCA stands. Tree mortality and recruitment of snags and large woody debris would be restored to levels that are consistent with historic disturbance patterns. Snags and coarse woody debris generally would be larger in the future and mortality of large trees would be sustained over an extended time period in treated areas. Beneficial effects of proposed vegetation and fuels management treatments would last for approximately 20 to 30 years before tree stocking levels and fuels increase to undesirable levels.

In order to accomplish proposed treatments within riparian areas, there is a need to amend the Forest Plan, specifically Eastside Screen direction to allow harvest in riparian areas that are normally restricted from operations in Regional Foresters Amendment #2 (Interim riparian standard #4,c). Operational restrictions consistent with the Amended Forest Plan would be inconsistent with the need to do fuels reduction treatments important for protecting resources, lives, homes, and structures from wildfire in the area.

The proposed amendment will allow fuels to be treated resulting in effective defensible space allowing protection of resources and private developments in the surrounding WUI area.

Cumulative Effects

The spatial boundary for discussion of cumulative effects on forest vegetation conditions is the immediate area that encompasses the proposed Finley HFRA Thin treatment units which total approximately 158 acres. The temporal boundary for cumulative effects on forest vegetation conditions would span from the early 1900s to approximately 30 years into the future when the effects of vegetation management treatments would diminish.

Past Actions

The historical and existing conditions portion of this report provides details about the effects of past actions on the condition of forest vegetation in the project area. Past actions affecting the condition of forest vegetation include fire exclusion and timber harvest that most likely began in the early 1900s. Fire exclusion in the project area which began in the early 1900s and continued until 2005 (Finley Canyon prescribed burn) has eliminated the frequent low severity fires that maintained the open, park-like stands of mature trees that formerly dominated forested sites in the area. Timber harvest operations that focused on the removal of large pine trees probably began in the early 1900s and continued into the mid 1980s. Current tree stocking

levels in dry and warm-mesic forest stands are higher and the average tree size is smaller than the historic conditions that occurred at the beginning of the 20th century. Douglas-fir trees now comprise a greater proportion of forest cover compared to pre-fire exclusion and timber harvest levels. Deciduous tree species including aspen have declined in the project area due to increased levels of competition for sunlight with encroaching conifers.

The Finley Canyon prescribed fire project was implemented in portions of the proposed Finley HFRA Thin treatment units in 2005. Prescribed burning reduced surface and ladder fuels in the project area and had a limited effect on reducing understory tree stocking levels. This stand alone application of prescribed fire did not appreciably change vegetation conditions of forest stands in the project area.

Present Actions or Reasonably Foreseeable Future Actions

There are no present or reasonably foreseeable future actions that would have a measurable effect on forest vegetation conditions in the proposed Finley HFRA Thin treatment units.

Proposed Action

The cumulative effects of the proposed action and all past, present, and reasonably foreseeable future actions would be an improvement of forest vegetation conditions on approximately 158acres. The proposed action would implement vegetation and fuels management treatments to improve fire resiliency, create stand structures that are representative of historic conditions, and restore natural disturbance regimes for forest insects, diseases, and wildfire. Tree stocking and fuel loading would be manipulated to levels that are consistent with pre-settlement fire regimes and decrease the probability of high severity crown fires in treated stands. Tree stocking levels and species composition would be adjusted to maintain and restore large trees and early seral tree species to create stand structures that are representative of historic conditions in the project area. Tree density and fuel loading would be reduced where needed to decrease stress, maintain or improve tree vigor, and reduce susceptibility of forest stands to insect attacks, disease infection, and wildfire damage that exceed endemic levels.

Application of proposed forest vegetation and fuels management treatments would promote change in the desired direction of creating and maintaining stands of larger, fire resistant trees that are resilient to natural disturbances and more sustainable than the current situation.

Soils

The section below summarizes the existing condition information, along with the direct, indirect and cumulative effects from the Finley HFRA Thin project, as analyzed by Zone Soil Scientist Annie Greene and documented in the Finley HFRA Thin Soils Report (Greene 2008), in the analysis file. Reference information is contained in the full specialists report.

Existing Condition

Geology/Geomorphology

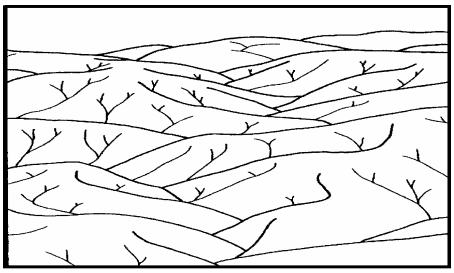
The analysis area is dominated by glacial and fluvial landforms. Glacial fluvial deposits occur in the valley bottom with glacial drift occurring on adjacent slopes. Dissected glaciated slopes dominate the area. Bedrock is composed of Cretaceous or older high-grade metamorphic bedrock (Stoffel, 1990). The primary rock units of this group consist of medium to coarse-grained tonalities, granodiorites, and quartz monsonites. Typically, these rock units are hard and resistant to weathering, forming prominent ridges. Soil weathering products are normally quite coarse and lack fine silt and clay fractions.

The Cordilleran Ice Sheet over rode the analysis area as late as 12 to 14 thousand years ago and has strongly influenced topographic expression (Waitt 1972). This massive ice sheet filled all valleys and over-rode many of the ridges within the analysis area. All major ridge complexes have a rounded appearance caused by ice scour from the continental ice sheet.

Topographic expression in the project area has been described in the in-service publication *Landtype Associations of Central Washington* (USDA Forest Service 2004). Continental glacial processes have shaped all landforms within the project area. This process also helps to explain soil properties and the occurrence of soils across the landscape.

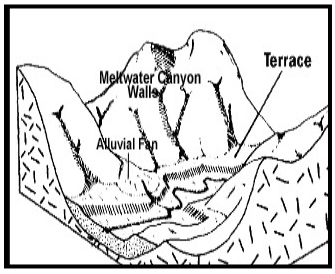
Three dominant landform groups occur within the analysis area, Jb2, Mu2, and Ou2 (USDA Forest Service 2004).

Dissected Glaciated Mountain Slopes



This landform, **Jb2**, occurs on relatively steep, high relief mountain slopes with moderately narrow ridgetops and steep sideslopes. Slopes form relatively V-shaped valleys. Landforms were shaped by fluvial erosion and locally with some continental glaciation. Slope gradients range from 35-65%. Glacial till deposits if present, occur on north-facing slopes. Differential surface erosion influences topographic expression with south-facing slopes being steeper and more highly dissected. Slopes are dissected by a relatively high density of confined, moderate to high gradient streams in a sub-parallel to weak dendritic pattern.

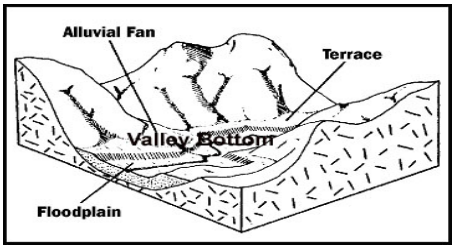
Meltwater Canyons and Coulees



This landform, **Mu2,** occurs on extremely steep, rocky sideslopes bordering relatively flat valley bottoms. Landforms were shaped by glacial/fluvial flooding induced by the melting of glaciers. Slope gradients on sideslopes typically exceed 60% and valley floor slope gradients are generally less than 20%. Valley floors are typically underlain with glacial outwash and morainal deposits. Glacial till deposits are generally absent from sideslopes but may occur along toeslope positions or at mouths of tributary drainages. Canyonwalls are dissected by weakly defined, low order, intermittent streams in a parallel drainage pattern. Mainstem streams, if present, can be higher energy, low gradient and perennial. Channels are commonly meandering and substrate is moderately to well

sorted sand to boulder size. Ponds, marshes, overflow channels, and morainal lakes are not uncommon.

Valley Bottoms/Outwash



This landform, **Ou2**, occurs on nearly level terraces and floodplains in broad valley bottoms. Glacial/fluvial outwash deposition was the primary land forming process. Slopes gradients range from 0 to 20% and are generally less than 10% and are dissected by high energy, low gradient, perennial streams. Stream channels most commonly meander but may be braided in some reaches. Substrate is usually comprised of stratified sand to cobble size material but very large boulders are not uncommon. Ponds, marshes and overflow channels may occur. Valley bottoms are subject to frequent flooding. Subsurface and in-stream flow may be in continuity. Included within this landform are alluvial fans and colluvial deposits located along the valley sides.

Soil Development and Occurrence

The glacial till deposits are typically thick enough to mask the effects of underlying bedrock (USDA 2004). In areas of glacial deposition (moraines), soils consistently occur on gentle benches or undulating rounded ridges and are often characterized by thick surfaces of light colored volcanic ash overlying cobbly glacial till.

Soil Classification

Soils occur in rather predictable patterns, which have been verified by field assessments completed by Forest Service Soil Scientists. A soil survey is complete in the analysis area Okanogan-Methow Highland Area, (USDA-NRCS 2004). Representative soils were selected to represent the soil-site features of each landform group. The representative soil has similar properties and would have similar management responses as the other soils it represents. These representative soils occur within the planned harvest units and are listed in Table 3-4, Soil-site Relationships and Table 3-5, Representative Soils. The representative soil map unit number is highlighted in the table along with the other soils it represents. Soil classification nomenclature conveys specific soil properties that are explained in the “Soil Properties” section below (USDA-NRCS, 2005).

Table 3-4: Soil-site Relationships (treatment units)

Soil Group Number	**Soil Series occurring by landform**
Soil Group 1, *Valley Bottoms/Meltwater Canyons, seasonally wet soils*, 0-15%	
111	Aquandic Xerofluvents, 0-5% slopes
Soil Group 3, *Valley Bottoms/Meltwater Canyons , mixed ash soils,* 0-35% slopes	
177	Granflat, 0-35% slopes
Soil Group 4, *Dissected Glaciated Mountain Slopes, mixed ash soils,* 35-65% slopes	
124, 348, 374	Brevco-Lithic Haploxerepts-Rock outcrop Complex, 35-65% slopes

Table 3-5: Representative Soil Series

Soil Name	Family or Higher Taxonomic Classification
Brevco	Loamy-skeletal, isotic, frigid, Vitrandic Haploxerolls
Granflat	Sandy-skeletal, isotic, frigid, Vitrandic Haploxerolls

Soil Properties

The hard crystalline bedrock and glacial till deposits typically weather into soils with coarse textures (sandy loams) with a fair amount of rock cobbles in soil profiles. The bedrock weathering products and glacial till deposits are typically low in base saturation and clay content.

Due to past differential erosion and historical vegetation patterns, soils within the project area have varying thickness of volcanic ash. The glacial till is composed of sub-rounded to rounded cobbles and boulders. These rock fragments often comprise more than 25% of the soil regoliths (skeletal). Often these cobbly rock fragments occur mixed in the upper volcanic ash surfaces.

Soil textures of the volcanic ash are most often very fine sandy loams depending upon the degree of mixing of weathered granite bedrock or glacial till material. Soil textures in the glacial till deposits include cobbly sandy loams and loamy sands. Where glacial materials exist in lower soil profiles, materials generally range in size from medium to coarse sands with very cobbly or bouldery rock matrixes.

The *Granflat and Brevco* representative soil series, Soil Group 3 and 4 are *Mollisols*, or grassland soils that occur in warm dry climates. These soils contain more than 25% subrounded glacial till cobbles or angular rock fragments.

Soil Environments

Soil Groups with representative soils discussed below are displayed on the Soil Distribution Map in the analysis file. Each representative soil is assigned a soils group number for easier analysis, discussion and for the map display. Surface soil properties provide an insight into the environmental conditions, which strongly influenced soil development.

Soil Group 1*, Xerofluvents* representative soils are seasonally wet due to fluctuating water tables and proximity to perennial water. These soils have a high rock content and poor soil development.

Granflat representative soils occur in Soil Group 3, 15-35% slopes, and *Brevco* representative soils occur in Soil Group 4, 35-65% slopes; have relatively shallow, dark-colored surfaces that are very light-colored when dry. These soils likely supported open canopy forest communities with varying amounts of grass in the understory, which would persist for long periods. The above soils occur in treatment units listed in Table 3-8: Proposed Action Treatments by Soil Mapunit.

Soil Interpretations

Refer to Table 3-7: Relative Soil Interpretations for each representative soil. The NRCS, NASIS (National Soil Information System) was used to determine soil interpretations within the analysis area.

Available Soil Water (holding capacity)

The project area occurs in a relatively warm, dry area. Soil moisture stress locally has a substantial effect on vegetation growth and vigor. Volcanic ash soils within the analysis area have very low bulk density with extremely high pore space. Soils with high pore space also have relatively high water holding capacities. The depth of volcanic ash would strongly influence the amount of available soil water for many plant species, especially those that have relatively shallow root systems. Other site influences, which can limit available soil water, are elevation and aspect. Soils on low elevation or southern to westerly exposures typically lose an exceptional high amount of annual precipitation through active evaporation, runoff, and evapo-transporation.

The other representative Soil Group 3, *Mollisols,* which includes the *Granflat,* 15-35% slope and Soil Group 4, *Brevco*, 35-65% slope, soils tend to have relatively shallow dark mixed volcanic ash layers and occur at lower elevations or southern exposures. This group of soils would have low to moderate levels of available soil water depending upon slope and aspect positions.

Soil Erosion

Refer to Table 3-7, Relative Soil Interpretations for a listing of erosion hazard ratings for each Soil Group. These erosion rates reflect the influences of surface soil texture, surface rock content, ground vegetation recovery and slope steepness.

Most soils in the analysis have course sandy loam textures with mixed ash content. Soils are friable and have weak structure. This characteristic can result in erosive conditions if site features are not limiting hydrologic processes.

Detrimental Soil Compaction/Displacement

Detrimental soil compaction can be a contributing factor to soil erosion and reduction of soil productivity. Severely compacted soils would normally restrict water infiltration rates, possibly resulting in greater chances of overland flow with subsequent increases in soil erosion (Froehlich H. A. no date). Soil compaction also has the potential to affect long-term site productivity. Long-term site productivity losses from soil compaction can range from 6 to 25% of both diameter and height growth and persist for 32 years after initial logging. Recovery of compaction in the surface (6 inches) could occur sooner (Wert, S. and B.R. Thomas. 1981)

Soil Group 3 and 4 soils have 35 to 65 % rock fragments in the surface soil layers and are less susceptible to compaction.

Livestock grazing can be a contributing factor toward detrimental soil compaction as well as ground based mechanical harvest equipment. This normally occurs when livestock grazing is concentrated and not well distributed. Livestock can also delay vegetation recovery by trampling and overgrazing. Easy access by roads and flat terrain make these areas accessible for livestock.

Finley Grazing allotment overlaps commercial harvest units. Additional information is contained in the Range Specialist Report.

Soil Productivity

Productivity of the soils within the project area would vary depending on a variety of both physical and chemical properties. These properties generally include, but are not limited to: slope, aspect, elevation, precipitation, soil type, and soil depth, available water capacity of the soil, soil drainage, surface organic matter (including Course Woody Debris) and bulk density of the soil.

CWD is material derived from tree limbs, boles, and roots in various stages of decay larger than 3 inches in diameter (Harmon et al. 1986). The creation and accumulation of CWD depends on forest type, successional stage, insect and disease activity, weather events, fire-return events, and decay. CWD can protect soils from erosion, displacement, and compaction. In addition, CWD can protect forests from both abiotic and biotic elements. Residues provide shade and protection from wind and snow and can be critical factors in protecting newly established seedlings. Decaying logs on the ground are excellent for nitrogen fixation (Graham et al. 1991).

Effective Ground Cover

The Regional policy describes minimum effective ground cover percentages after soil disturbing activity based on soil erosion hazard classes. Effective ground cover typically recovers quickly and is not a long-lasting condition.

Mass Wasting

Mass wasting is a natural process that occurs to some extent in most watersheds. Certain forest management activities can aggravate mass wasting processes. Landslide risk is affected by slope gradient, soil depth to an impervious layer, soil saturation, reduced root strength, drainage features, geomorphic features, soil features, and vegetation patterns. Landslides can occur both under natural conditions and from disturbance activities. Mass wasting events would be in the form of debris torrents or slides associated with high intensity summer storms or rapid snowmelt. Analysis of the project area, supported by aerial photo interpretation and field observations indicate no evidence of mass wasting.

Soil Microorganisms

Ectomycorrhizae fungi (ECM) are required for nutrient and water uptake by forest tree species in the Pacific Northwest. Both timber harvest and fire have the potential to impact ectomycorrhizae populations. Fire impacts microbial activity directly by heat and indirectly by causing physical and chemical changes. Some studies have indicated that the greatest reductions in ectomycorrhizae were associated with the hottest burns because these associations occur more frequently in organic horizons that can be consumed by fire. Some studies, however, do not report mycorrhizal reductions following harvest and fire, especially in low intensity burns (Amaranthus1991).

Management practices that retain living trees and shrubs and input of organic matter provide the energy source and substrata necessary for ECM linkages (Amaranthus and Perry 1994). Amaranthus found that ECM root tip abundance and diversity on Douglas-fir seedlings was reduced in severely compacted soils (Amaranthus et al 1996).

Soil displacement can have adverse effects on microorganism function by reducing the depth of surface horizons. If surface horizons are shallow, displacement would have more serious or lasting effects. Many of the microorganisms are important for tree seedling establishment and initial growth. Often microorganism activity is highest in the surface organic duff layer and surface mineral soil. The deeper ashy soils are expected to have higher microorganism activity than the thin ashy soils. The mixed ash soils in Soil Group 2 and 4 are considered more susceptible to displacement and loss of microorganism activity. The depth of ash would be used to infer effects to microorganism function.

Existing Detrimental Soil Conditions (DSC)

Harvest activities within the project area date back to 1986. Recovery in these units has been in the form of pine grass some bunchgrasses, as well as snowberry and other low-lying shrubs. The rooting activity from these deep-rooted grasses and other vegetation has very likely reduced the level of compaction from past harvest activities (Waldron et al.1982). Refer to Table 3-6 for Past Sale Activity.

Table 3-6: Past Sale Activity (overlapping harvest units)

Past Sale Name	Year Cut	Overlap with Finley HFRA Thin Unit		
		Unit	LoggingSystem	Acres
Finley Salvage	1986	7	Tractor	20

Sampling of proposed harvest units indicated that vegetation has been re-established in Unit 7. Visible cut stumps remain and an old landing site.

Detrimental Soil Table

This table displays estimated detrimental soil based on field observations and aerial photo interpretation. A majority of the units were visited in the field to confirm the mapped soil series and also evaluate existing soil condition (Howes 2001). Noncommercial only units are not included because the non-mechanical treatments proposed in these units would only have minimal effects on soils.

Soil Interpretations Table

The relative soil interpretations are included in Table 3-7. These interpretations are qualitative, not quantitative. As such, they are meant to help compare soil map units within the analysis area. Interpretation ratings were determined by the NRCS, National Soil Information System (Nasis), (NRCS, 2003) and ratings assigned in the in-service publication *Landtype Associations of Central Washington* (USDA Forest Service 2004). Definitions are located in these documents.

Table 3-7: Relative Soil Interpretations (based on soil/site factors and Okanogan-Methow Highlands Area Soil Survey information)

Soil Group #	Soil Map Unit #	Soil Map Unit Name	Soil Erosion	Soil Compaction	Soil Water Availability	Inherent Soil Potential	
			Vegetation Recovery	Displace-ment Hazard		Forest CWD Tons/acre	Grass
1	**111**	Aquandic Xerofluvents, 0-5% slopes	Low High	Moderate Low	High	Moderate (3-7)	Moderate
3	**177**	Granflat	Low High	Moderate Low	Moderate	Moderate (3-7)	Moderate
4	**124**, 348, 374	Brevco-Lithic Haploxerepts-Rock outcrop Complex, 35-65% slopes	Moderate Moderate	Low Severe	Low	Moderate (3-7)	Moderate

Environmental Consequences

Effects Analysis

Soil interpretations were used to assess effects of the Proposed Action. In the following assessments, detrimental soil disturbance would be used as a surrogate to explain soil productivity, soil microorganisms, and available soil water (holding capacity) effects because these effects are linked so closely to the integrity of the surface volcanic ash soil horizons. The effects analysis was developed from soil survey interpretations, air photo interpretation, and field observations of proposed treatment units.

The effects analysis would focus primarily on detrimental soil disturbance from proposed ground based harvest, effects of wildland fire intensities, and effects of road management actions. The effect of these management actions on detrimental soil compaction/displacement, erosion, and coarse woody debris (CWD) would be described.

Monitoring of past prescribed fire and precommercial thinning activities indicates little to no detrimental soil effects would be expected from the Proposed Action. Prescribed underburn fires are designed to be low intensity with short residence times. These types of burns normally do not generate enough heat to consume organic duff layers. If duff is consumed, it is normally restricted to small discontinuous spots. Precommerical thinning operations are conducted by hand crews working across the landscape, which causes little detrimental soil disturbance. The effects from prescribed underburn fire and precommercial thinning would not be discussed in detail in this assessment.

Table 3-8 lists Proposed Action Treatments by Soil Mapunit, by harvest units with expected harvest operations, which could result in soil disturbance:

Table 3-8: Proposed Action Treatment by Soil Mapunit

Soil Map Unit #	**Soil Map Unit Name**	**Total Treatment Acres of Ground based Commercial Thin** (Treatment Units)
Soil Group 1 *Valley Bottoms, seasonally wet soils*		
111	Andic Eutrocryepts-Cryaquolls, 0-35%	**54** (3, 7)
Soil Group 3 *Glacial Moraines, mixed ash soils*		
177	Granflat 15-35% slopes	**86** (1, 2, 3, 6)
Soil Group 4 *Dissected Glaciated Mountain Slopes, mixed ash soils 35-65%*		
124, 348, 374	Brevco-Lithic Haploxerepts-Rock outcrop 35-65% slopes	**12** (1, 3, 6)

Direct and Indirect Effects

Detrimental Soil Disturbance (Compaction)

If project monitoring indicated that activity generated compaction levels in additional units exceeds Forest Plan standards and guidelines, de-compaction designated skid/forwarder trails and landings would be done to reduce the effects of additional detrimental soil compaction. This treatment would be expected to reduce levels of additional detrimental soil compaction below the threshold standard of 15 percent detrimental soil compaction. De-compaction treatment could be considered restoration because skid/forwarder trails would be left in an improved condition following the proposed action. Appropriate grass seeding should be considered as a companion treatment units with the de-compacting and would assist in the prolonged recovery of these soils.

The above mitigations would ensure effective ground cover percents required by the amended Forest Plan, following summer ground soil disturbing activities.

Within the analysis area, de-compacting skid/forwarder trails would not be an acceptable restoration measure in the rocky soil map units in Soil Group 3. The Proposed Action has 86 acres in Soil Group 3 for ground based operations. These soil map units are not suitable for de-compacting due to the amount of profile and surface rock fragments (Andrus and Froehlich1983).

Designated skid/forwarder trails normally represent approximately 10-15 percent of treatment units. Active restoration in treatment units would reduce detrimental soil compaction following harvest.

Ground based equipment would not be allowed to operate on Soil Group 1 soils when they are saturated with standing water present. Required winter operations on Soil Group 1, units 6, and 7 as listed in Chapter 2 would ensure that soils are protected from compaction. The Proposed Action has 54 acres in Soil Group 1 for ground based operations.

Natural grass release and additional grass from seeding is expected to help move soils to a more desirable condition into the future. The release of grassy under stories would indirectly increase the degree of pore space within compacted surface layers. This is considered passive restoration.

Detrimental Soil Displacement/Erosion

Soils most susceptible to displacement occur in Soil Group 4. These soil groups have moderately steep 35-65% slopes. Soil Group 4 soils contain soil map units that have a dominant rock component. Lithic (less than 20 inches) to moderately deep (20-40 inches) soils are also dominant. The Proposed Action has 12 acres in Soil Group 4. All these units are in ground based harvest operations. These acres are estimated from the Soil Survey (NRCS-USDA, 2004).

Go back trails or trails that follow gentler slopes, less than 35% and contour around the slopes may be used to access these steeper slopes. Line pulling is another option. Both of these can be used in both winter and summer logging conditions to avoid soil displacement on slopes over 35% and included in ground based harvest units.

Single pass trails by a feller buncher during summer logging has had minimal soil impacts when adequate surface rock, vegetation, duff or slash is available. This would be acceptable for Soil Groups 3 and 4. This has been observed on previous sale monitoring and in Soil Monitoring Report, (Greene 2006).

No new erosion is expected with road building activities as no new system road construction is considered. Approximately 1.5 miles of maintenance of existing system road (4100-370) and .5 miles of temporary road construction would occur. All temporary roads and.5 miles of system road (4100-370) would be closed following logging and result in no additional soil disturbance.

Coarse Woody Debris

Organic matter in the soil surface horizon plays a role in the regulation of water availability, movement and storage, soil structure and soil stability.

Coarse Woody Debris standards were developed for the area in an attempt to be consistent with natural forest systems and fire disturbance (USDA Forest Service 1997). The CWD standards were expressed in tons/acre for specific forest settings. It was originally felt that each piece of CWD would equate to a ton. The standards were adjusted slightly after more careful review of piece size and effects of decay in 2002 (Snell and Brown 1980).

The Soil Group 1 and 3, *Xerofluvents* and *Granflat* representative soils, with inferred transitional forest communities would need 3-7 tons per acre of CWD (USDA Forest Service 2000, Fire Regime Descriptions). Soil Groups 4 soils contain shallow soils and

rock outcrop areas and CWD loading would range 3 to 7 tons per acre. These ranges of CWD are consistent with natural fire regimes common to the project area. These recommendations for CWD are based on amounts needed to maintain forest productivity and to protect the site from severe soil erosion. Where potential harvest units are at or below these recommended amounts, removal of additional surface CWD should be avoided. Refer to Table 3-7, Relative Soil Interpretations.

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

Compared to no action, the direct effects of the proposed action logging would reduce levels of trees and coarse wood in harvest units. In terms of both short and long-term soil productivity, the tree harvest represents some fundamental tradeoffs to the nutrient cycle. Tree bole removal would remove a long-term source of organic matter, while reducing the risk of severe fire effects in the future by reducing fuel loading.

Remaining logging slash left on the ground on proposed units post logging would be adequate in units for CWD requirements (see Table 3-7, Relative Soil Interpretation).

Soil Productivity

Existing site conditions have been discussed in the existing condition section. Soil Group 1 soils are the most productive followed by Soil Groups 3 and 4 for tree growth. This is tied to the water availability and site characteristics.

The Group 3 and 4 soils are historically grassland/ open tree stand soils and would be better managed for open tree stands and forage production. These soils would be the most beneficial for livestock grazing. Reduced stocking of trees on these soils would return the sites to more historic fire regimes.

Effective Ground Cover

Increased levels of effective ground cover from logging litter can reduce soil loss in post-fire watersheds. Logging slash created from harvest operations would [in most cases] increase the amount of effective ground cover [in the short term] by adding slash to the forest floor.

Mass Wasting

Soil movement is a concern on steep slopes. Gentle slopes on these ground base treatment units would limit potential for mass wasting soil movement.

Detrimental Soil Condition (DSC)

Landings would range from .3 to .5 acre and about 1 landing every 12 acres would be proposed (approximately 13 landings total). Landings would range from 4 to 6.5 acres in the 158 acres of commercial thinning. Landings are larger to accommodate equipment used to delimb trees if a cut-to-length (CTL) system is not used. Landings would be actively restored and seeded as listed in Chapter 2. Additional detrimental soil from landings after restorative treatments is accounted for in additional detrimental soil.

Landings often become loafing areas for livestock. If livestock persist than vegetation recovery is slowed. Active management of livestock distribution can reduce impacts and implementation is part of the Range Annual Operating Plan.

Monitoring conducted in 2004 on winter logging activity on the Methow and Tonasket Districts indicates less than 5% soil disturbance, (Greene 2006). Winter logging (Flatten 2004) is effective at causing minimal detrimental soil disturbance.

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

Feller buncher equipment used for logging would likely use single 40 foot spacing on Soil Groups 3 and 4. Similar impacts as CTL systems would occur with minimal slash produced. As discussed above, minimal impacts are expected and any unacceptable level of rutting or compaction exceeding 15% detrimental soil would be mitigated as discussed in Chapter 2.

Trees need to be removed after they are cut with the feller buncher and this skidding on multiple pass trails would produce the majority of detrimental soil impacts. Designated trails along with mitigations listed in Chapter 2 would ensure that detrimental soil impacts remain below the 15% standard. Acres of Estimated Additional, Potential Detrimental Soil and Estimated Active Soil Restoration, for the Proposed Action in Table 3-7 display the amount of potential detrimental soil from harvest operations and the active restoration anticipated to meet the soil standard.

Fire effects on soils

Hand piles that include small diameter material, less than 6 inches would occur in all units. Fire duration times for hand piles would be short. The piles would be approximately 16 square feet with an estimate of 15 to 20 piles per acre. Pile numbers can be variable with terrain and amount of material. Hand piles occurring over the entire project is estimated to total 42 acres. Because of the short burn duration, the duff around handpiles would not likely be consumed and no detrimental soil heating is expected. If excessive heating occurs seeding would be required to ensure vegetation recovery.

Excavator piling would occur in units that display excessive post-logging slash. Fire duration for these piles is estimated to be longer than the hand piles due to larger diameter material. Piles sizes are approximately 121 square feet and estimated at 10 to 15 piles per acre. The 111 acres area would potentially see 3 to 4.6 acres of piles.

Both the excavator and landing piles would consume duff underneath the piles and create detrimental soil effects by heating. Landings that are compacted during summer logging will be de-compacted. Seeding would be required to ensure vegetation recovery. Seeding would also be done a season after the piles are burned.

The number of hand piles to landing piles is variable. Piles would not be located within channel riparian areas. Soil recovery occurs after 1 to 2 seasons after piles are burned. Seeding large pile areas would slow soil erosion, control weed establishment, and allow natural vegetation to occur.

Though piling and burning would be the principal methods of fuels treatment in the Finley HFRA Thin Project, underburning may also take place over 99 acres of the treatment area. Roads and natural breaks would be used for control lines as much as possible. It is estimated that 4 miles of machine or hand line may need to be constructed to support underburning.

Erosion and soil impacts from machine or hand line are minimal as these lines are scraped with vegetation removed and minimally constructed. Past experience of hand lines on used on sales shows that vegetation readily comes back after one season. Areas with substantial bare soil would be seeded.

Approximately 42 acres of the 158 acres of fuels treatment units would be in RHCA, from harvest and ladder fuel reduction slash.

In actuality a mixture of the above treatment would be used to effectively and economically treat fuels over the treatment area. All of these methods would be used to treat harvest, ladder fuel reduction and pre-commercial thinning slash.

Direct/Indirect Effects Summary

Table 3-9 below displays**,** Existing Soil Disturbance, Estimated Additional Potential Detrimental Soil, Estimated Active Soil Restoration and Estimated Post Project Detrimental Soil Acres. Estimates are given for summer operations only as winter operations would be considerably less and require considerably less active restoration. The active restoration[1] along with passive restoration[2] (seeding, natural vegetation recovery, tree planting) would meet Okanogan Forest Plan Standards meeting the 15% detrimental soil threshold:

[1] Active restoration measures such as sub-soiling or excavator de-compacting skid/forwarder trails would meet the 15% detrimental soil threshold in the Proposed Action.

[2] Passive restoration as seeding and natural re-vegetation would allow for improved livestock distribution would be effective at moving these disturbed areas toward more desirable conditions.

Table 3-9: Direct/Indirect Effects Summary (By Harvest Unit)

Harvest Unit	Acres	Estimated Existing Detrimental Soil Acres	Estimated Additional Potential Detrimental Soil Acres	Estimated Post Harvest Detrimental Soil Acres	Estimated Active /Passive Restoration Soil acres	Estimated Post Project Detrimental Soil Acres
1	49	3	4	7	0	7
2	17	1	1.5	2.5	0	2.5
3	25	2	1	3	0	3
6	8	1	.5	1.5	0	1.5
7	34	3	2	5	0	5
Landings			6.5	6.5	6.5	0
Totals	**133**	**12**	**10**	**28.5**	**6.5**	**22**

Table 3-10 displays a summary of direct/indirect effects of ground disturbing activities:

Table 3-10: Direct/Indirect Effects Summary (By Action)

Actions	Proposed Action Acres
Ground Based (CT)	133
Landings Ground Based	6.5
Estimated Existing Detrimental Soil Acres on Ground Based	12
Estimated Additional Detrimental Soil Acres on Ground based units	10
Estimated Active Restoration on ground based units (landings only)	6.5
Estimated Passive (seeding) Restoration on Ground Based Units	0
Estimated Post Project Detrimental Soil acres	**22**

The Proposed Action would achieve soil quality objectives and has design criteria and mitigation measures that would keep detrimental soil condition to 14%, which is within the 15% allowable detrimental soil disturbance as described by the Okanogan Forest Plan. Existing areas of detrimental soil disturbance would be reused (example- old landings), and additional detrimental soil disturbance from proposed activity, would be mitigated with active restoration such as de-compaction treatments and passive restoration such as seeding.

Cumulative Effects

This cumulative effects analysis considers the effects on soils from past actions going back 22 years, along with ongoing actions and reasonably foreseeable future actions that re expected for approximately 15 years out. A complete list of past, present and reasonably foreseeable future actions is listed at the beginning of this chapter. Only those activities that have affected soils are considered in this cumulative effects analysis. Because effects on soils are localized, the cumulative effects analysis is limited to the immediate area surrounding the actual units.

Forest Plan standards require that cumulative detrimental effects from project implementation and restoration must not exceed the conditions prior to the planned activity and should move toward a net improvement in soil quality. Design criteria, mitigations and restoration would insure this standard would be met.

Ongoing activities include livestock grazing, weed control, road maintenance, and firewood gathering. Weed control would occur along roads and in invasive weed areas. See Invasive Plant Specialist Report for details. Removing weeds would allow native plants to become established and stabilize soils. This would be a beneficial cumulative effect. Firewood gathering has no cumulative effects to soils as impacts are spread out and only small areas would be impacted.

The Proposed Action does not propose any new permanent roads and no future proposals for road construction are planned, so no cumulative effects are expected.

Hydrology

The section below summarizes the existing condition information, along with the direct, indirect and cumulative effects from the Finley HFRA Thin project, as analyzed by Forest Hydrologist Mel Bennett and documented in a report dated 6/6/05, located in the analysis file (Bennett 2008). Reference information is contained in the full specialists report.

Existing Condition

The Finley project area (Finley Creek) drains into Benson Creek, which drains into the Methow River just north of Carlton, WA. Benson Creek is the 6th field analysis watershed considered in this analysis.

Water uses in the analysis watershed includes recreation, domestic, livestock watering and irrigation. The analysis watershed does not contribute to downstream resident fisheries as there is a noticeable lack of surface water connectivity of Finley Creek during portions of the year with the main stem of Benson Creek.

United States of America water rights includes stock water developments on National Forest System lands and *Reserved* water rights to maintain favorable conditions of

streamflow and provide the continuous production of timber. The priority date for reserved rights is 1898 (date of reservation of the National Forest System lands). This portion of the Methow basin has been closed to further appropriation (Kauffman 1976) except for the period October 1 to May 1 of each year.

All waters on the Okanogan National Forest lands are classified by the Washington State Department of Ecology in WAC 173-201-080 as a Class AA waters. The general classification of WAC 173-201-070 classifies all surface waters on national forest system lands as AA. Water quality standards are listed in WAC 173-201-045. Water quality standards are established for temperature and turbidity (WAC 173-201), and allow increases over background levels. The water quality parameter (which has a Washington State Water quality standard) most likely impacted by increased stream sedimentation is turbidity. The standard allows for a 5 Nepholometric Turbidity Units (NTUs) increase over background conditions or a 10% increase over background if it is over 50 NTUs.

Water quality information for current conditions is not available. Stream channel banks have been impacted by livestock use where surface water exists during the middle and late season grazing period.

303(d) Water Quality Impaired Listing

Streams in the analysis watershed are not listed on the Washington State 2004 303(d), Impaired Water Body list. Streams from the Finley project area eventually drain into the Methow River which has a Category 5 listing for water temperature near Pateros, WA. Stream flow from Benson Creek has no effect on the water temperature of the Methow River 20-25 miles downstream of the confluence with Benson Creek. Surface water flow from Benson Creek is a very small component of the Methow River flow. In addition, during the low flow periods of August, September and October, there may be no surface water flow from Benson Creek into the Methow River.

Past vegetation manipulation may have affected local water temperatures in Benson Creek, but there will be no potential effect on the water temperature of the Methow River where the Methow River water temperature is considered impaired (near Pateros) and on the current 303(d) list.

State Water Quality Standards

Water quality standards are established for temperature and turbidity (WAC 173-201). These standards provide for allowable increases over background levels. Generally the state standards for turbidity allow a 5 NTU increase over background levels or a 10% increase in NTUs if the background level is 50 NTUs or higher. Water temperature may increase 1-2 °F. over background, up to background water temperature levels of 64 °F., the closer background is to 64 °F, the smaller the allowable increase.

Other water quality parameters may change following vegetation manipulation practices. Snyder, Haupt and Belt (1975) reported water *conductivity* increases up to three times of background levels on some streams in the vicinity of burning in clearcuts in northern Idaho. Snyder, etal and also reported Background levels reported by Snyder, etal, were very low, so the increased conductivity was still far below levels of concern. Further downstream, changes disappeared and *conductivity* levels become nearly the same as

above the activity. The return to previous levels downstream of the activity also occurred with other parameters such as pH, turbidity, sulfates, nitrates, sodium, potassium, magnesium and calcium. In the Finley HFRA Thin project area there is a lack of connectivity with flows in the main stem of Benson Creek and any impacts from past projects is normally localized.

Past General Water Quality Impacts

Past timber harvest, road construction and grazing activity have impacted stream channels in Benson Creek by adding sediment from past management activities from impacted stream banks impacted by equipment, channel encroachment from adjacent road fills or diversion of road ditch water into streams. Livestock grazing has also impacted channel banks where animals access the streams. Livestock grazing has also influenced channel hydrologic functions and sediment loads by changing channel shapes in the most heavily impacted areas, or removing vegetative stream cover. Disturbed channel cross-sections are wider and shallower. These stream channels have lower levels of water energy, so sediments accumulate in these reaches, which further reduce water velocities and increases sediment deposits in the channel. Water temperatures also increase in the summer and early fall when the water flow is lower and slower and the water depth is reduced. .

Water quality varies by season. Turbidity and suspended sediment loads are normally highest during the spring flood period. Heavy rains or spring rain-on-snow floods also contribute to higher suspended sediment loads. Water temperature fluctuates by season, and is highest during the late summer and early fall, and lowest during the winter months.

Water Quantity

According to Kauffman and Bucknell (1977) there are no adjudicated water rights in Benson Creek, although some water is used for irrigation. Average Benson Creek flow in July drops to 1.6 cfs and stays below that level until the following March. Flow drops to .5 cfs during September and there are periods when no surface water flows into the Methow River. Seasonal water flows are the highest in the spring and are generated by spring snowmelt. Flows are often intermittent in summer and early fall when precipitation is low.

Water is a limiting factor for road maintenance, during most months in the summer and fall. Hauling water for road maintenance from other locations will likely be necessary. Other options include restrictions on road maintenance to periods when water is available under our reserved rights near Finley Creek, or use water substitutes for roadwork where possible.

Table 3-11 shows the estimated peak flow for 10 and 100-year flows. Peak water flow may be changed by created openings from vegetation removal. Extra snow accumulates in harvest-created openings and may increase runoff, but additional snow accumulation is not likely where no created openings are made.

Table 3-11: Estimated Peak Stream Flows (CFS) in Analysis Watershed

Watershed	Flood Recurrence Interval (years)	
	10	100
Benson Creek	250	800

Mapping of ground water and ground water re-charge areas is not practical over the analysis watershed. An approximation of shallow ground water locations can be made from the US Fish and Wildlife Service floodplains and wetlands map located in the analysis file. These maps generally infer areas surrounding existing water bodies are shallow ground water flow locations. There are about 143 acres of mapped wetlands and floodplains in the Benson Analysis Watershed.

Stream Class

All streams in the analysis watershed are currently classified Class III or IV.

Table 3-12: Stream Class by Watershed in the Finley Analysis Area

Analysis Watershed	Stream Class Miles			
	I	II	III	IV
Benson Creek			12.4	27.3

Plans of Other Agencies

Washington State Department of Ecology regulates the beneficial uses of water in the Methow River Basin. Minimum flows have been established for major segments of the Methow River. Minimum flows impacts water rights for beneficial uses filed with the Department of Ecology after 1976. These junior water rights (filed after 1976) have been regulated many times since 1985 to maintain minimum stream flows.

Road Density

Road density is listed for the analysis watershed and its RHCAs. High road density may increase the rate of surface runoff from the watershed and decrease shallow ground water where the road prism intercepts shallow ground water and routes the water to a road-stream crossing.

Relatively low stream density reduces the risk accelerated sediment will get to surface water. Drainage density is defined as the miles of stream within a watershed per square mile of watershed. The larger the number of stream miles per square mile of watershed, the greater the risk for increasing accelerated sediment loads in the streams from potential management activities. The drainage density in the Finley analysis area is relatively low, when compared to the rest of the Okanogan National Forest.

Table 3-13: Road and Drainage Density

Analysis Watershed	Acres	Road Density (Mi./Mi.²)	RHCA (acres)	Stream Density (Mi./Mi.²)
Benson Creek	25,410	3.3	8.3	1.1

Estimated water yield changes are related to changes in forested watershed cover. There are currently only two acres of created openings mapped inside RHCAs in the Analysis Watershed. The proposed action does not generate any new created openings. No change in peak stream flow is expected from the proposed action. Estimated changes in peak flows up to 10% are usually below detection using standard stream gauging methods. The potential risk for stream channel damage from higher peak stream flow would be very low from this project.

Currently there are about 133 miles of road in the 40.3 square mile sub-watershed. Road density is 3.3 miles per square mile. There are 4.6 square miles of RHCA and about 21 miles of roads within the RHCAs. Road density in the RHCAs is 4.6 miles per square mile.

Table 3-14: Estimated Created Openings by Watershed Background

Analysis Watershed	Watershed Acres	Acres of Created Openings	Forested Acres in Watershed	% of Forested Area in Existing Created Openings	% Change in Water Yield	Created Opening in RHCA
Benson Creek	25,410	399	16,670	2%	+1%	2

Delivered sediment information for background and current conditions is listed below. It was estimated by the Modified Soil Loss Equation.

Table 3-15: Current Delivered Sediment Production (Tons per year)

6th Field Watershed	Background Condition	Existing Roads	Total Sediment	% Change to Background
Benson Creek	4015	1147	5162	29%

Environmental Consequences

Analysis Procedure

This analysis considers the proposed action developed by the project interdisciplinary team (idt). The analysis estimates changes in sediment delivered to streams, estimated changes in peak stream flow by alternative and changes in created openings. Proposed harvest acres were used to estimate sedimentation changes. Background sediment

production and sediment production from existing roads was also estimated. A modified Universal Soil Loss Equation (MSLE) estimated the increased stream sediment loads (US Environmental Protection Agency 1980) from surface erosion. The MSLE is not a particularly accurate soil erosion model for forestlands in the Pacific Northwest, but it does allow a systematic approach to evaluating management practices. Watershed systems are complex, and actual seasonal and annual sediment outputs are highly variable. Outputs vary for a variety of reasons, including weather changes from year to year, time since last major climatic and runoff event, amount and age of management activities, bedrock lithology and weathering, soil and vegetation development and geomorphic processes. This analysis considered "average" conditions.

Direct and Indirect Effects

Stream Sedimentation

Increased stream sedimentation is the most obvious effect on water resources from activities that disturb vegetative cover or freshly expose soil. Management activities increase surface erosion rates, influence the delivery of sediment to surface water, and may lead to changes in the erosion and/or deposition processes in stream channels. Initially the greatest sediment concentrations will be closest to the activity. The sediment estimates determine the relative difference between the current situation and the proposed action. The lower the difference, the less accelerated sedimentation will occur, compared to the current condition.

The existing average sedimentation level is estimated to be 5160 tons per year in Benson Creek. This includes natural sedimentation and sedimentation from existing roads. This is a 29% increase over the estimated geologic sedimentation rate. Existing roads increase geologic sedimentation rates to the *Existing Levels* of sedimentation.

The Proposed Action sedimentation is about 5170 tons per year in Benson Creek. This includes natural sedimentation, existing roads, proposed timber harvest and proposed fuel treatments. The proposed action produces less than 1% increase in sedimentation compared to the *Existing Levels* of sedimentation per year in the Analysis Watershed.

303(d) Impaired Water Body List

The water quality parameter on the 303(d) list that could be affected by the proposed Finley fuels project is water temperature. Water temperature would be influenced by removing overstory in the riparian areas, especially created openings. Creating openings removes vegetation which could shade surface water and intercept solar energy which would increase water temperature. There are no new created openings in the proposed action. No created openings in RHCAs are proposed, so no changes in water temperature would occur on site or in the Methow River near Pateros, where an elevated water temperature has put the river on the 303(d) impaired water body list.

Road Density Impacts

The Analysis Watershed road densities are listed in the Table 3-16. There area bout 0.5 miles of total potential construction of temporary roads to serve landings or other needs. The 0.5 miles of temporary road would be composed of several short segments from

existing roads or landings. The temporary roads would be decommissioned or obliterated when the project is finished. Stream crossings would be avoided. No stream crossing structures would be removed in the Proposed Action.

Table 3-16: Watershed Road Density (Miles of road per square mile of watershed)

Analysis Watershed	Current		Proposed Action	
	Watershed	RHCA	Watershed	RHCA
Benson Creek	3.3	8.3	3.3	8.3

Created Openings/Water Yield Changes

More water is available for evapotranspiration or runoff following timber removal. Water use by vegetation on dry sites in the lower Methow River valley is below the maximum potential rate in the dry sites because soil water is not available to meet the vegetative water demands throughout the year. Annual precipitation is low, and the soils are generally coarse textured with a lower water holding capacity. Any additional soil-water after timber removal would likely be used by the remaining vegetation.

No created openings are in the Proposed Action, and no additional runoff is expected to leave the site in the Proposed Action. There would be no stream channel impacts from the stream flows in the Proposed Action.

Roads influence slope hydrology and may affect the timing of water runoff. Since no new roads are proposed, no changes in runoff timing are expected from roads in the Proposed Action.

Cumulative Effects

Extent and Time-frame

Cumulative effects are considered in the space of the Benson Creek. The time-frame for sedimentation impacts from past vegetation activities are two to three years. Water yield changes are from the 1990's to approximately 15 years out (the length of time created openings remain created openings).

Past Actions

Most known invasive weed sites within the Finley assessment area have been treated with picloram since 1998. Hand pulling occurred in 1995, 1996, 1997, and 1998. Integrated weed management including herbicide application has also occurred along roads and on adjacent sites throughout the assessment area. This has resulted in no impacts to the water quality of the area.

Grazing has occurred and continues to occur throughout the project area and on private lands adjacent. Stream channels and stream banks have been impacted by livestock trampling which changed channel cross sections and made channels wider and shallower. Water temperature may increase slightly from the channel widening from ungulate trampling. Local fecal coliform levels increased as livestock waded through the streams.

Firewood gathering has occurred in the past. Some roads used for firewood gathering are user-created. Firewood gathering has little impact on water quality, except when vehicles get stuck in or drive through streams or wet areas. There is a chance of oil contamination in surface water if a vehicle gets stuck in a stream or there is frequent driving through streams.

Vegetation management practices included logging on the national forest system lands over the past 50 years, is still affecting hydrology of the area, although no planned harvesting has occurred over the past 10 years. Some logging on nearby private land, about 60 acres on the adjacent Mullins property, has occurred recently. Past logging ranged from regeneration harvests and created openings to pre-commercial thinning. Ground disturbance also occurred from these activities, but because of the age of the activities, re-vegetation of the disturbed sites is common. Created openings remain at current levels as discussed in Table 3-14, and include the created openings from the Mullins private property adjacent.

Ground disturbance in many cases has re-vegetated; however, soil compaction has occurred. See soils report and cumulative effects analysis for a discussion of soil compactions, its affects and duration.

Past actions also include the Finley Canyon prescription burn of about 2000 acres. This area is rapidly becoming fully re-vegetated and the erosion rate from the treated area is near normal, once again.

Private land development includes home construction and access roads. Homes are still relatively scattered and the Finley Proposed Action will not add to the cumulative effects from the home construction and road access construction.

Past road maintenance has included road grading, ditch cleanout and spot aggregate surfacing. The limited amounts of these activities have only slightly increased erosion and stream sedimentation in this system.

Present Actions

Present actions also include: livestock grazing, firewood cutting, road maintenance, invasive weed management, including herbicides and manual treatments, hunting, minor dispersed recreation activity, snowmobiling consistent with the Forest Travel Plan

The current livestock grazing plan is planned for the next ten years. Livestock grazing occurs on private and state lands inside the analysis watersheds from a few days to year-round (on private lands). Current grazing systems on private lands are expected to continue indefinitely. Ongoing cumulative effects of grazing on national forest lands with the proposed Finley project are not expected to affect the 303(d) listing of impaired water bodies in the Methow River.

Firewood cutting occurs along roads and dispersed along the maintenance level I and II (closed and low-standard) roads in the project area. Firewood cutting also occurs on the private land inside Benson Creek. Tree removal from firewood cutting has no effect on potential water yield changes, so cumulative effects would remain constant for Proposed Action in the Finley HFRA. There would be no adverse cumulative effects on water

quality or water quantity in the analysis watershed. There would be no effects on the listed 303(d) parameters in the Methow River from the Finley HFRA Proposed Action because of firewood cutting.

About 20-30 acres of woodlands are harvested each year on private lands within the analysis watersheds. These projects are not generally scheduled and occur at various locations on the private lands bordering the federal lands. The projects vary in size from an acre or two to a few acres. No cumulative effects on water quality are expected from these actions, although there may be localized impacts on water quality from some activities. These impacts would be limited to a year or two.

Foreseeable Future Actions

Grazing, invasive weed management, firewood gathering and dispersed recreation are expected to continue into the future. Impacts from each of these activities are expected to be local and not contribute to cumulative effects on water quality or quantity within the analysis watersheds. Ground disturbance would occur in limited areas or limited intensity, so no cumulative effects are expected on water quality or quantity from future actions.

Aquatic Habitat

The section below summarizes the existing condition information, along with the direct, indirect and cumulative effects of the Finley HFRA Thin project, as analyzed by District Fish Biologist Nancy Wells and documented in the Aquatics Report located in the analysis file (Wells 2008). Reference information is contained in the full specialists report.

Existing Condition

The Finley HFRA project area is in the Middle Methow River 5th field Hydrological Unit Code (HUC) watershed. Finley Canyon is in the Benson Creek 6th field HUC. The entire project area is in a valley bottom that is a closed basin. All three streams in the project area go subsurface within the project area. These streams have no overland connection to any fish bearing water body. There are no fish bearing streams, lakes, ponds, or wetlands in the Finley HFRA project area.

The Benson Creek 6th field HUC is outside the range of the northern spotted owl, thus, fisheries management direction and standards and guides for this project area are found in PACFISH (USDA/USDI, 1995.). PACFISH Riparian Management Objectives (RMOs) apply to all streams in the area. Three intermittent stream channels enter the project area, two in Unit 7 and one in Unit 6. Project mitigations listed on Pg. 2-9 to 2-10 will provide measures to allow silvicultural practices that acquire desired vegetation characteristics in the RHCAs needed to attain RMOs.

Environmental Effects

Effects Analysis

Environmental effects analysis is based upon project mitigation measures and design criteria described in Chapter 2 being implemented. These measures should prove to be moderately to highly effective at limiting stream sedimentation and impacts to riparian habitat.

Direct and Indirect Effects

If the Proposed Action alternative were to be implemented, fish would not be affected, as none are present in the project area, and there is no stream channels connectivity to outside the project area.

No existing large woody debris would be removed from RHCAs and no pools would be affected by activities. Treatment in RHCAs would not reduce streamside shading because no openings would be created. Development of large trees as a result of treatment would make more large woody debris available to fall into the channels and the RHCAs, which would retain sediment that might be mobilized as the result of livestock trampling, or a high water event. As a result RMOs would be maintained and because these are not fish bearing streams and these streams are not hydrologically connected to the Methow River, listed fish would not be impacted in any way.

Opening of the canopy would encourage grass to grow which may encourage livestock to graze away from the stream channels. Normal distribution of livestock by ongoing allotment management and administration would reduce impacts in the RHCAs.

Closing Road 4700-380 would preclude vehicles access in some areas near the stream channels and over an existing stream crossing. This would reduce potential sedimentation resulting from vehicle travel over and near this point source.

Passive restoration associated with the Proposed Action (such as erosion control seeding) and natural re-vegetation re-sprout would allow for improved livestock distribution would be effective at moving disturbed sites along the channels toward more desirable conditions.

Cumulative Effects

This analysis considers the effects from past, on-going, and reasonably foreseeable future actions that are proposed at this time. The list of past, present and reasonably foreseeable future actions can be found at the beginning of this chapter and range from the 1980's to 10-15 years out. Because the project area is a closed basin, and no channels exit the project area, effects to stream channels would be localized. This cumulative effects analysis is limited to the fifty feet on either side of the three channels in the project area.

Past actions of timber harvest, livestock grazing, and recreation have changed sites along the channels by exposing soils that can be mobilized by rain and snow melt to the channels. Sediment was not moved outside the project area, so effects were local to the channels.

Ongoing activities include livestock grazing, invasive weed management, road maintenance, and firewood gathering.

Livestock grazing has and continues to impact stream channels and riparian areas. Limited use of this area by livestock and active allotment management and administration has limited the impacts by cattle in the RHCAs. Some stream bank erosion and trampling has occurred. Future activities may increase potential for stream bank trampling and erosion by increasing access to stream channel areas. No harvest buffers (Pg. 2-9) should aid in maintaining stream bank integrity.

Invasive weed management activities would occur along roads and in identified off-road infestation areas. Removing invasive weeds would allow native plants to become established and stabilize soils. This would be a beneficial cumulative effect.

Road maintenance may slightly increase sedimentation of streams, however active maintenance near stream channels would be limited, and designed to improve hydrologic stability and erosion control. The Proposed Action does not include any new permanent roads and no future proposals for road construction are planned, so no cumulative effects are expected. Road 4700-380 would be closed after post-harvest activities are concluded. These actions would be a beneficial cumulative effect.

Firewood gathering is not allowed within one hundred fifty feet of these channels, and with the closing of the 4700-380 road, no opportunity for removal of firewood from along the channels would exist, thus no cumulative effects from firewood gathering are expected.

To summarize, no cumulative effects from past, on-going, or proposed actions are expected because the area is a closed basin, and no fish are present in the project area.

Biological Evaluation

Determinations:

No Effect to Federally listed aquatic species and **No Impact** to Regional Forester's Sensitive listed species.

No Biological Assessment for Federally listed fish species is needed for this project because none are in the project area. Streams in the project area do not connect overland to any fish bearing waterbody. Thus, no consultation with the US Fish and Wildlife Service or NOAA Fisheries is required.

<u>Magnuson-Stevens Fishery Conservation and Management Act</u>

No Effect to Essential Fish Habitat.

There are no anadromous fish in the analysis area. All the stream channels go subterranean inside the project area. Therefore, no Essential Fish Habitat (EFH) is present. Stream temperatures in the Methow River will not change, nor will sediment be delivered. Thus, no consultation with the NOAA Fisheries is necessary for Essential Fish Habitat.

Botany

The section below summarizes the existing condition information, along with the direct, indirect and cumulative effects from the Finley HFRA Thin project, as documented in the Finley Botanical Evaluation completed by Okanogan Valley Botanist Kelly Baribar, dated 06/01/05 in the analysis file (Baribar 2005). Reference information is contained in the full specialists report.

Existing Condition

Introduction

Fuel treatments in the Finley HFRA Thin project will provide for a more fire resilient ecosystem, while also providing a safer environment for residents living in the adjacent WUI. Reducing surface and ladder fuels in addition to increased tree spacing, will decrease the likelihood of severe wildfires. Furthermore, these efforts will increase the chance for better establishment of trees and understory vegetation following wildfires, and will also improve plant diversity and vigor. The fuels treatment project in Finley HFRA Thin project is approximately 133 acres and runs east and west along both sides of Forest Service road 4100-370 and 4100-380. The project is divided into three separate blocks: an East Block, a Middle Block and a West Block. The west block runs up against private property. Pre-disturbance surveys for Threatened, Endangered, or Sensitive (TES) species and intuitively controlled surveys for non-vascular species were conducted within the project area.

Pre-field Data Search

Washington Natural Heritage Program database was searched for species known to occur adjacent to the project area. Stems from *Brotrychium mingansese* were found about 1.25 miles northeast of the eastern project block. This species is now on the State Watch List and no longer on the R-6 TES list. There have been very little fuels treatments in the Finley Canyon bottom. The east block may have been logged in the 60's or 70's.

Field Reconnaissance

The project area was surveyed in late spring/early summer by Okanogan Valley Office botanist, Kelly Davis. None of the Federally listed, State listed, or Federal Candidate species were found in the project area.

The Federally listed species TES species that are suspected to occur on the Okanogan-Wenatchee National Forest include:

Spiranthes diuvialis
Howellia aquatillis (which is also a State listed species), and a Federal Candidate species
Botrychium lineare (Federal Candidate species)

Portions of the southern edge of the east and middle project blocks have suitable habitat for a State Sensitive Species, *Cyperpediumfasiculatum.* This species was not encountered during survey efforts. Suitable habitat for State Sensitive Species, *Astragalus microcystis, Botrychium ascendens, Botrychium crenulatum, Botrychuim penduculosum,* and *Carex hystriana* was found but species were not encountered during survey efforts.

Potential habitat for two species *Gomphus bonarii*and and *Sarcodon fuscoindicus,* was located. These species are on the Regional Forester's Special Species Status Program (SSSP) list. These species were not encountered while surveys were conducted. Fungi taxa are not considered practical for pre-disturbace surveys because they do not fruit annually or predictably. However, a wetter than average spring could have lead to higher than average chances of seeing *Gomphus bonarii,* whose fruiting season is spring and autumn. The fruiting season for *SarcodonJuscoindicus* is in autumn and winter; therefore, it would not have been encountered at the time of surveying.

There was no suitable habitat for any rare, uncommon, or SSSP bryophytes. Habitat within the project area is too dry and does not contain suitable plant associations with which these species usually occur. A perennial spring is located in the eastern project block where surveys were conducted to search for *Scouleria marginata,* however, this species was not found. The spring does not provide suitable habitat due to its slow flow velocity for much of the year. None of the lichen species now on the SSSP list were found in the project area. Habitat within the project area could not likely support any of these lichen species.

Environmental Consequences

Direct and Indirect Effects

No State listed, Federally listed, R-6 listed, Special Species Status Program (SSSP) listed species, or State Watch list species were located in the project area.

Although suitable habitat was found for two SSSP fungi species, *Gomphus bonarii* and *Sarcodon fuscoindicus,* no species were encountered at the time surveys were conducted. Suitable habitat for a State Sensitive Species, *Cyperpedium fasiculatum* was located on the southern edge of the eastern and middle portions of the project; however, this species was not encountered during survey efforts.

The fuels treatment project will reduce fuel loading the Finley Canyon bottom reducing risk of high intensity wildfires and help protect wildland urban interface residents from potentially threatening fire behavior or activity. Fuels treatments will open the forest canopy and reduce ground and ladder fuels which will encourage a healthy forest community.

Cumulative Effects

This analysis considers the effects from past, on-going, and reasonably foreseeable future actions that are proposed at this time. The list of past, present and reasonably foreseeable future actions can be found at the beginning of this chapter and range from the 1980’s to 10-15 years out. The proposed action in conjunction with past, present,

and reasonably foreseeable future actions would not have a cumulative effect on T,E,S plant species.

Biological Evaluation (Determinations)

The Proposed Action for the Smith/Elderberry HFRA Thin project will not lead to any further listings of Federally, State, or Region 6 listed plant species.

Wildlife

Introduction

The section below summarizes the existing condition information, along with the direct, indirect and cumulative effects from the Finley HFRA Thin project, as documented in the Finley Botanical Evaluation completed by District Wildlife Biologist Kent Woodruff, dated 03/14/08 in the analysis file (Woodruff 2008).

For resource management projects such as the Finley Project, standards have been developed to insure compliance with laws and directives for wildlife conservation on public land. This report identifies the standards that apply, the expected changes that will take place as a result of the activities identified in the project description, and how those changes compare with the applicable standards. Cumulative effects analyses address how past, present and future activities in the Middle Methow watershed add to the effects of this project. This report is a stand-alone document that provides existing condition and effects descriptions for this project.

The effects described are based on current scientific literature (cited), review of the reports by, and discussions with, other team members, discussions with a variety of experts within and outside the US Forest Service, and District Biologist Kent Woodruff's personal experience with the vegetation communities, wildlife species, and ecological processes in north central Washington.

Existing Condition

The project area is a 2 mile length of the Finley Canyon bottom from the Forest boundary near Moon Mullen's house to the confluence of two branches of the canyon in section 35. Most of the Finley assessment area is forested, with ponderosa pine and Douglas-fir being the dominant trees. The average elevation is 2800 feet.

All of the forest stands in the assessment area are denser than they were historically. Fire likely played an important role in keeping these stands thinned to a density considerably lower than what occurs there today. Some timber harvest has occurred. In 1986, 507,000 board feet of timber was removed in a salvage harvest sale from some of the units considered for this project. The tree regeneration that has taken place since the last timber harvest is a mixture of sapling and pole sized Douglas-fir and ponderosa pine.

Biophysical environments in the Finley Canyon are hot dry Douglas fir in units 1 and 2, and warm mesic or cool dry Douglas fir in units 2, 3, 6, and 7. Some of the stands

considered here contain numerous large trees, but none meets the Forest Plan definition of Mixed Conifer Old Growth.

Finley Canyon is moderately popular for snowmobiling, deer hunting and dispersed recreation activities.

The Forest Plan describes two management allocations for this area: MA-14 Wildlife Habitat including deer, MA-26 Deer Winter Range and Fawning Habitat.

This project is very similar to other dry-forest timber sale projects that have occurred recently on the Okanogan-Wenatchee National Forest. Below are the specific impacts that are being evaluated:

Loss of habitat related to tree removal, thinning, and burning.
Soil disturbance and vegetation impacts from skidding, yarding, and loading
Noise disturbance along road corridors and at landings including worker traffic, equipment haul, log loading, and log hauling.
Chain saw and yarding equipment noise within harvest units.
Hazardous spills from logging equipment, hauling trucks, and burning activities.
Weed spread from off road logging equipment
Weed spread from fire related soil disturbance
Direct loss of snags to provide for worker safety during harvest

Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species database records (January 2006) and Forest Service WILDOBS and FAUNA database records were reviewed for occurrences of federally listed animal species and goshawks within the Middle Methow Watershed. Methow Valley Ranger District raptor nest data were also reviewed. Discussions with Okanogan-Wenatchee National Forest biologists, WDFW biologists, and USDI, Fish and Wildlife Service (USFWS) biologists provided additional species and habitat information.

The project falls within the 146,500 acre Middle Methow Bear Management Unit (BMU), but is outside any core area. The project is outside any Lynx Analysis Unit.

Goshawk territories have been recorded in the 1990s 1.5 miles southeast and 2 miles northeast of proposed unit 7, and in 1990 a golden eagle nest was documented 1 mile east of unit 7. A Townsend's bat hibernaculum was found 1 mile northwest of proposed unit 1 in late fall 1997. Spotted frogs were noted in ponds 2 miles north and 1 mile west of the project area. No other rare animal records were found for the area.

Methow Valley Ranger District biologists (and other resource specialists) have visited the project area since 2004 to gain information relevant to project design and effects.

Environmental Consequences

Following are the areas where analysis was conducted using the best available science:

a) Management Indicator Species
b) Management Requirement Cells
c) Raptor habitat / nests

d) Landbird Conservation
e) Endangered, Threatened, or Sensitive species

Management Indicator Species

The Forest Plan directs that management activities must provide the habitat required by management indicator species (MIS). These species are associated with limited habitats, such as snags or old growth forests. They serve as indicators based on the presumption that providing the habitat needs of these species ensures that habitat is provided for other species dependent on the same biological community. The objective of managing for MIS is to provide sufficient amounts and distribution of limiting habitats to insure species viability across the forest. The wildlife management indicator species considered for this project and their associated habitats are listed in Table 3-17.

Table 3-17: Management Indicator Species

Indicator Species	Limiting Habitat
Mule Deer	Winter Range
Primary Cavity Excavators	Dead and Defective Trees
Pileated Woodpecker	Mature or Old Growth Forests
Ruffed Grouse	Deciduous and Riparian Ecosystems

<u>Mule Deer</u>

Current Condition

The entire project area is considered deer winter range, with a majority of unit 1 designated key winter range. In actuality, based on field visits in winter 2007/2008, the area considered for timber harvest in the bottom of Finley Canyon is marginal deer winter range because it is cold, with deep snow, little sunlight, dense conifer forest canopy, and very little browse. Numerous deer were seen on the slopes just north of the project area during a visit by the district wildlife biologist in January 2008, but there were no tracks or deer sign in the bottom where harvest is proposed.

Direct/Indirect Effects

The project proposes to harvest 133 acres in the winter on frozen ground conditions, in the bottom of Finley Canyon. For the 42 acres that is designated key deer winter range (MA-26), a prohibition on winter logging from December to March is prescribed by Forest Plan Standard MA26-20J. A one-time Forest Plan amendment is included for this project to allow for the winter logging in this area for the following reasons.

The winter habitat for deer where logging is proposed is marginal for deer.
The operation of harvesting, skidding, and loading in the 42 acres of designated key deer winter range will be a very short term disturbance (approximately two weeks).
Falling and limbing trees in the area will actually provide more winter forage for deer than what is available currently

Winter logging (vs. summer logging) will better protect riparian resources that provide fawning habitat
The logging itself will open the stand more and subsequent shrub regeneration will provide more food for deer.

Deer populations are not expected to change measurably in response to the activities proposed on 133 acres.

Cumulative Effects

Cumulative effects are considered within the Benson Creek subwatershed. The time-frame considered for effects to all wildlife species considered throughout this report is 15 years into the past and the 15 years into the future.

Past timber harvest within the Benson Creek watershed are Pond, Hook, Row, and Leecher Thin projects from 1995 to 2004. These were thinning projects as well and they possibly increased deer forage slightly.

Firewood gathering has been an ongoing activity. It has had no effect on deer

Livestock grazing in the Finley Allotment is a past present and foreseeable future action that has, is and will contribute to reduced food for deer. Finley HFRA will potentially provide more forage, so the cumulative effect is possibly beneficial.

Weed management has included spraying and hand pulling at many locations within the watershed. This improves the availability of native plants for deer.

The recent Finley Canyon Prescribed Burn project (2005) under burned about 2000 acres just north of the project area. Some bitterbrush was removed causing a slight reduction in winter forage availability. Finley HFRA will potentially provide more forage, so the cumulative effect is possibly beneficial.

These activities would not contribute a measurable cumulative effect for deer. No other private or State land projects are known for the Benson Creek watershed.

Primary Cavity Excavators

Primary cavity excavators are management indicator species for dead and defective tree habitat. Standards provided in the interim direction from Regional Forester's Amendment #2 are to provide for 100% of the biological potential for cavity nesting species in mixed conifer forests. These standards are to maintain an average of at least four snags per acre; two that are equal to or greater than 10" dbh and two that are equal to or greater than 18"dbh.

DecAID (Mellon et al. 2003) is an advisory system that provides advice on managing for decayed wood, and serves as a summary of the current knowledge and best available science on dead wood in Pacific Northwest ecosystems.

The synthesized data that DecAID provides enable managers to assess the habitat conditions for primary cavity excavators and make informed resource management decisions. Amendment #2 is the current management direction that the Okanogan

National Forest uses for snags and down wood requirements which states that providing adequately for primary cavity excavators requires “using the best available science on species requirements as applied through current snag models or other documented procedures”. DecAID is the acknowledged best available information for use in Region 6.

Current Condition

Field visits and tree plots document that very few snags are present in Finley Canyon bottom. Birds and Burning Project transects in dry forests nearby showed 1.5 snags/acre > 10” dbh and 0.3 snags/acre > 20” dbh. The same plots recorded 50 trees/acre > 10” dbh and 5 trees/acre > 20” dbh. Plots collected in Finley stands recorded 85-215 trees per acre ≥ 7” dbh and 1-17 trees per acre ≥ 21” dbh (See Vegetation Report).

Direct and Indirect Effects

133 acres will be harvested using a commercial thinning prescription leaving all trees greater than 21” dbh. No snags or defective trees will be removed. No down logs that occur pre-harvest will be removed. Piling and burning is the only slash disposal method proposed. Project mitigation measures require retaining all down logs greater than 12" small end diameter.

The timber harvest will not affect the snag resource present. Future large snags will become available as the large trees die. The slash piling and burning planned will not impact the snag or down log resource.

DecAID was consulted, however, since all trees greater than or equal to 21” dbh are being retained (thus providing replacement snags) and since all down logs greater than or equal to 12” small end diameter are being retained (thus providing the maximum amount possible for feeding habitat) the primary cavity excavator habitat available currently will not change as a result of this project. Current cavity nester populations would not be diminished by any of the activities planned. Future cavity nester populations would increase since access for firewood cutting would be reduced somewhat due to the closure of the unnecessary road.

Cumulative Effects

Past timber harvest within the Benson Creek watershed are Pond, Hook, and Row projects from 1995 to 2000. No information was found that describes the number of snags available before or after harvest in these project areas.

Firewood gathering has been an ongoing activity throughout the subwatershed that has had a pervasive cumulative impact on habitat for cavity nesters. No snags are removed for Finley and large trees are left that will provide abundantly for future snags.

Livestock grazing in the Finley Allotment is a past, present, and foreseeable future action that has no effect on snags.

Weed management has included spraying and hand pulling at many locations within the watershed. No measurable effect on cavity nester populations.

The recent Finley Canyon prescribed burning project under burned about 2000 acres just north of the project area. Some snags were lost. Some were created. Piling and prescribed burning is proposed for Finley. Only minor, if any, additive effect would occur as a result of the Finley HFRA project and this would be mitigated by snag and down log retention requirements.

Pileated Woodpecker

Pileated woodpecker habitat structure is present within the Finley project area, but a limiting factor is the lack of large snags. No mixed conifer old-growth habitat occurs in the project area. It will be a number of years before the area can support nesting and feeding pileated woodpeckers.

This species is an Okanogan National Forest Management Indicator for old growth habitat. The Forest Plan requires allocation of Management Requirement cells where no harvest occurs to prevent the loss of limiting old forest habitat. The grid developed for the Forest Plan was applied to this project area and no MR cells were needed in the Finley HFRA Thin project area since adequate habitat is provided by the pileated woodpecker cells designated for the Electric and Leecher projects north and southeast of this project respectively.

Direct and Indirect Effects

There are no direct effects to any designated old growth forest in the Finley Project. Forest Plan direction is met and pileated woodpeckers are adequately provided for outside this area. Thinning prescriptions may help grow additional large snags, so that future nesting and foraging habitat for pileated woodpeckers is available.

Cumulative Effects

Past timber harvest within the Benson Creek watershed are Pond, Hook, and Row projects from 1995 to 2000. Thinning in dry mixed conifer forest is an activity that reduces habitat for pileated woodpeckers. The habitat available for pileated woodpeckers will be reduced by this project. Habitat for other woodpecker species (white-headed woodpeckers, Lewis' woodpeckers) will be increased by this project.

Firewood gathering has been an ongoing activity that has impacted the habitat for pileated woodpeckers. No additional losses are expected as a result of this project.

Livestock grazing in the Finley Allotment is a past present and foreseeable future action that has had and will have no effect on these woodpeckers.

Weed management has included spraying and hand pulling at many locations within the watershed. No cumulative impact to pileated woodpeckers because of this project.

The recent Finley Canyon prescribed burning project under burned about 2000 acres just north of the project area. Some snags were lost, and some were gained. Piling and prescribed burning is the only slash disposal proposed for Finley, consequently, no cumulative impact would occur to pileated woodpeckers because of this project.

Ruffed Grouse

The Okanogan Forest Plan designates ruffed grouse as an indicator for deciduous and riparian habitat. The requirement from the Forest Plan is to protect riparian habitat. Aspen stands and streamside forests are important for many species of wildlife including amphibians, songbirds, and bats. Aspen stands are frequently associated with hydric soils; riparian habitat along streams is associated with sub-irrigation from the stream course and increased shade that keeps soils from drying. Both benefit from livestock restrictions that limit detrimental impacts.

Regional Forester Amendment #2 provides protection for riparian habitat stating "timber sales will not be planned or located within riparian areas…"

One of the project goals for the Finley thinning project is to improve the deciduous component of the riparian community by carefully removing some conifers. Streambank and riparian vegetation protection will be accomplished by mitigation measures for winter logging and restricting equipment to operating outside a buffer zone within 20 feet of the stream or outside the incised stream channel. PACFISH allows harvest where it benefits riparian management objectives and there are no adverse impacts to listed fish.

Streamside riparian habitat also functions as connectivity corridors between stands of old forest. Maintaining these connectivity corridors is another required standard for Regional Forest Amendment #2.

Direct and Indirect Effects

The project proposes to harvest 133 acres including the removal of some conifers < 21" dbh adjacent to the stream courses. This treatment is specifically designed to enhance deciduous habitat for the suite of species represented by ruffed grouse. Harvest equipment would be restricted to areas beyond 20 feet from the stream or areas outside the incised stream channel, whichever is further. Slash piling would occur outside riparian protection buffer of 20 feet of either side of stream channel, so burning piles would not impact riparian habitat. About 10 acres of deciduous habitat would be improved.

Treatment of the riparian areas will contribute to water quality, and meet the habitat protection intent of Regional Forest Amendment #2 and PACFISH.

Since thinning does not impact the ability for most species to disperse, no connections are lost, and the riparian treatment will potentially make the riparian corridor more suitable for species movement. This satisfies the connectivity goal of Regional Forester Amendment #2.

Cumulative Effects

Past timber harvest within the Benson Creek watershed are Pond, Hook, and Row projects from 1995 to 2000. The Row project included aspen treatments similar to those proposed here and all provided riparian protection consistent with PACFISH.

Firewood gathering has been an ongoing activity. In some places where roads are adjacent to riparian areas, riparian snag loss has occurred. This project does not add to

that loss, and in fact improves it slightly with the reduction of road access in riparian habitat.

Livestock grazing in the Finley Allotment is a past, present, and foreseeable future action that has, is, and will continue to contribute to some riparian habitat reduction. This project does not change that.

Weed management has included spraying and hand pulling at many locations within the watershed. Generally weed treatments occur outside riparian and aspen stands.

The recent Finley Canyon prescribed burning project under-burned about 2000 acres just north of the project area. No riparian or aspen impacts occurred. The burning proposed in this project will not contribute any losses of riparian or aspen habitat.

Conclusion for all MIS

This project would fully meet amended Forest Plan guidelines for the Management Indicator Species present in the Finley project area are fully met or exceeded.

Management Requirement Cells

The Forest Plan requires allocation of Management Requirement cells where no harvest occurs to prevent the loss of limiting old forest habitat. The grid developed for the Forest Plan was applied to this project area and no MR cells were needed in the Finley HFRA Thin project area since adequate habitat is provided by the pileated woodpecker cells designated for the Electric and Leecher projects north and southeast of this project respectively.

Raptor Habitat / Nests

Specific guidelines from the amended Forest Plan require protection of raptor territories. Active raptor territories have previously been found nearby and the project has the potential to impact habitat for hawks and eagles. Surveys will be conducted prior to ground disturbing activities for active raptor territories. Where active territories are found, no harvest will occur around the nest and standard seasonal disturbance restrictions (March 15 to August 15) will be implemented.

<u>Golden Eagles</u>

An historical golden eagle territory occurs near the project area. Recent surveys have not been conducted, so current or recent status of this territory is unknown.

<u>Goshawks</u>

There are two goshawk territories near the Finley project area. Recent surveys have not been conducted, so current or recent status of these territories is unknown. Regional Forester Amendment #2 requires specific protection of historic and active goshawk nest sites and establishment of post-fledging areas for active nests. Direct/Indirect Effects

Known raptor territories will not be affected by any alternative. Prescribed burning and log hauling has the potential for short term disturbance and/or displacement of raptors incubating eggs or brooding young. Surveys and subsequent restrictions will mitigate this concern. Forest Plan standards for raptor nest stand protection measures will be applied to active nests located resulting in effective protection.

Vegetation treatments will alter the availability of prey across the analysis area. Aspen release will enhance habitat for ruffed grouse (a key prey species for goshawks). While this area is not optimum habitat, snowshoe hares are present in Finley. Snowshoe hare populations could be reduced with thinning.

Nest site protection will be included around all active raptor nests located. Winter logging will achieve the timing restrictions necessary for avoiding nesting season. A 400 acre post-fledging area will be designated around any active goshawk nests discovered. A monitoring item is included for documenting the response of actively nesting raptors to prescribed fire treatments.

Cumulative Effects

Past timber harvest within the Benson Creek watershed are Pond, Hook, and Row projects from 1995 to 2000. The Hook project area has been a center of goshawk activity for at least 15 years. Several aspen tree nest sites were known in that area. No goshawks surveys or monitoring visits have been conducted since the harvest. The effect of harvest could have changed prey availability. Thinning possibly reduces suitability of old forest stands for goshawks. Aspen treatments may have slightly improved habitat for ruffed grouse. It is possible that the thinning proposed for Finley will further reduce suitable goshawk nesting habitat. It is also possible that prey availability (hares) and foraging habitat will be cumulatively reduced since goshawks tend to prefer dense forests.

Legal, licensed falconry has had an effect on local goshawk populations. Removal of young from nests diminishes the potential for individual sites to be productive and potentially slightly reduces population viability. WDFW manages the resource so that populations are sustainable. The Benson Creek watershed has been one area that falconers have focused on to harvest goshawks. Theoretically the population of goshawks is stable enough on some scale to allow limited removal by falconers. No data were available to assess goshawk sustainability for falconry on the scale considered here (26,000 acre sub-watershed).

Firewood gathering has been an ongoing activity with no effect on goshawks.

Livestock grazing in the Finley Allotment is a past, present, and foreseeable future action that could contribute to habitat reductions for hares and grouse. No change is anticipated as a result of this project.

Weed management has included spraying and hand pulling at many locations within the watershed with no effect for goshawks.

The recent Finley Canyon prescribed burning project under burned about 2000 acres just north of the project area. This had no effect on goshawks. Piling and prescribed burning would not add cumulatively to any effects for goshawks.

Conclusion for Raptors

The Proposed Action would meet required protection for raptors.

Landbirds

According to the Partners in Flight (PIF) North American Landbird Conservation Plan (Rich et al. 2004), conservation issues affecting the coniferous forest habitat like that in the Finley analysis area are inappropriate livestock grazing, invasion of exotic plants, changes in fire frequency and intensity related to fire suppression, loss of cavity nesting habitat, loss of old forest habitat from logging, and degradation of riparian habitat.

The PIF bird conservation plans for the Northern Rocky Mountains of Eastern Oregon and Washington and East Slope of the Cascades Mountains (Altman 2000a and 2000b) are the most applicable to the Finley project area. The plans list the following focal species for ponderosa pine and dry forest types: white-headed woodpecker, pygmy nuthatch, flammulated owl, chipping sparrow, and Lewis' woodpecker. The focal species for late-successional mesic mixed conifer forest are brown creeper, Williamson's sapsucker, Vaux's swift, Townsend's warbler and varied thrush.

Recommended conservation actions in the plans for both dry and mesic forest include:

- Reduce fuel loads and accelerate the development of late-seral conditions with understory burning and thinning
- Retain all large trees, especially ponderosa pine > 18" dbh
- Initiate snag creation and recruitment where necessary
- Retain all existing snags and broken top trees >10" dbh in harvest units
- Implement road closures to the extent possible to limit loss of snags
- Minimize the spread of invasive weeds by equipment used for project activities
- Discontinue fuelwood cutting where snag objectives are not being met
- Allow stand replacing fires to burn where possible.

Direct and Indirect Effects

Most of the recommended conservation actions for landbirds listed above are implemented in this project. Snag deficiencies will not improve and diminished cavity nesting habitat would continue, however the benefits of the thinning and burning for meeting the other management recommendations outweigh the consequences for landbirds. A reduction in road density is also a benefit to landbirds. Landbird habitat would be substantially improved through thinning, burning, road closures, and enhancement of single story old forest where ponderosa pine retention is favored. Large trees are retained in this project and key dry forest species would be aided by the thinning activities that preserve ponderosa pine. Providing a measure of protection from stand replacement fire would benefit all the species considered here.

Cumulative Effects

Past timber harvest within the Benson Creek watershed are Pond, Hook, and Row projects from 1995 to 2000. Removal of large pines in these projects and in earlier harvest probably has had a substantial cumulative effect on some of the focal species.

Loss of mixed conifer old growth habitat from harvest as early as the 1950s continues to be an impact on some focal species populations. Some cumulative losses for species associated with large, old multilayered stands (focal species include brown creepers and varied and hermit thrushes) are expected as a result of the past and proposed thinning projects in the watershed.

Firewood gathering has been an ongoing activity for decades. Loss of snags is a pervasive and persistent cumulative effect for some landbirds.

Livestock grazing in the Finley Allotment is a past present and foreseeable future action that has had a minimal effect on most landbirds. Some ground nesting and ground foraging species lose habitat because of grazing. Thinning will benefit these species by allowing the development of more ground cover where forest stands are thinned.

Weed management has included spraying and hand pulling at many locations within the watershed. These actions will continue. This could provide a positive cumulative effect for some landbirds by providing more native food and cover.

The recent Finley Canyon prescribed burning project under burned about 2000 acres just north of the project area. This is one of the management recommendations from the PIF Conservation Plans for this area and likely has had a beneficial effect for the key focal landbird species in the Benson Creek watershed. The piling and prescribed burning proposed will not contribute cumulatively to habitat effects for landbirds.

Conclusion for Landbirds

Because no old growth habitat is entered, because most large pine trees are retained, and because most snags would not be affected by this project, the cumulative effect of the timber harvest planned for this project when added to the past timber harvest would be minimal for landbirds. Firewood removal has impacted landbirds, but the closure of a segment of road in the project area will reduce the loss of snags and contribute positively to the effect on landbirds. Burning and weed management are both beneficial activities for birds. The piling and prescribed burning proposed for Finley HFRA Thin will not contribute measurably to other burning effects on birds.

Biological Evaluation

This part of the analysis for the Finley HFRA project is completed for the endangered, threatened, and sensitive (T, E, and S) wildlife species listed below in compliance with FSM 2672.4 and the Endangered Species Act as amended.

Table 3-18: Federally Listed T, E, and S Species

Common Name	Scientific Name	Federal Status
Gray Wolf	*Canis lupus*	Endangered
Grizzly Bear	*Ursus arctos horribilis*	Threatened
Canada Lynx	*Lynx canadensis*	Threatened
Northern Spotted Owl	*Strix occidentalis caurina*	Threatened
Bald Eagle	*Haliaeetus leucocephalus*	Sensitive
California Wolverine	*Gulo gulo luteus*	Sensitive

Common Name	Scientific Name	Federal Status
Pacific fisher	*Martes pennanti*	Sensitive
Peregrine Falcon	*Falco peregrinus anatum*	Sensitive
Common Loon	*Gavia immer*	Sensitive
Eared grebe	*Podiceps nigricollis*	Sensitive
Columbian Sharp-tailed Grouse	*Tympanuchus phasianellus c.*	Sensitive
Great Gray Owl	*Strix nebulosa*	Sensitive
Gray Flycatcher	*Empidonax wrightii*	Sensitive
Townsend's Big-Eared Bat	*Corynorhinus townsendii*	Sensitive
Western Gray Squirrel	*Sciurus griseus*	Sensitive

The actions proposed in this project (thinning 133 acres, pile burning slash, and closing a 1 mile segment of road) are expected to the species considered here as follows:

Gray wolf

Life history information for the gray wolf is contained in the publication *Wolf Biology and Ecology* (USFWS 1994). Wolf recovery programs are occurring in Idaho and Wyoming, and wolf numbers there have expanded greatly. No such effort is being pursued in Washington. A recovery plan for wolves was completed for the Northern Rocky Mountains (USFWS 1987). A similar plan for the North Cascades has not been completed.

Strategies for wolf conservation include limiting accidental or intentional shooting, allowing for seclusion at den and rendezvous sites, maintaining a dependable yearlong source of available prey, and providing sufficient space with minimal exposure to human activities (USFWS 1987).

Bear management units or "BMUs" (roughly equivalent to fifth field watersheds) are used to evaluate effects of the project on wolves (Gaines et al. 2003). Tree thinning is proposed on 133 acres in the Middle Methow BMU. The timeframe for consideration of effects is 5 years from the onset of project activities since after that time there will be little noticeable residual effect of the project on wolves or their prey.

To reduce potential adverse effects to gray wolves, the following conservation measures will be implemented:

- If a wolf den or rendezvous site is located at any time during the life of the project, it will be protected from disturbance between April 1 and August 31.

- Information about the protected status of grizzly bears, wolves, lynx, wolverines, fisher, bald eagles, peregrine falcon, gray flycatcher, great gray owl, Townsend's big-eared bat, fringed myotis, and western gray squirrel will be provided to private and Forest Service personnel working on the project. Information will include penalties for shooting, harassing, etc.

- No new access routes will be established in the Finley Project area

- All temporary roads to be built and used as haul routes will be obliterated at the end of logging operations, as part of the timber sale contract[i].

The best current information available indicates that wolves are likely present in the Methow Valley (WDFW PHS digital database 2007, MVRD wildlife records, Scott Fitkin, personal communication, personal observations). Since 1991, numerous reliable wolf sightings have occurred in the county. After reports of tracks and vocalizations in the Salmon Creek watershed (20 miles northeast of the project area), a follow-up camera survey (in winter) recorded two images of an adult wolf or wolf hybrid. Smith Canyon and Twisp River camera stations (10 and 30 miles west of the project area respectively) recorded wolf-like images in June 2008. A sighting of a wolf-like animal by two biologists occurred 6-16-08, in an area 8 miles west of the project where numerous citizen reports have been made in recent months. Other amateur photographs from camera stations have been reported in recent weeks in the Methow Valley. No wolf packs have yet been documented, and no dens have been located.

No wolves have been reported in the Finley project area.

The project area is dry Ponderosa pine and Douglas fir forest with a mix of hardwood species in the understory. Some large pine occur, but trees are mostly 10 – 20" dbh. North of the project area is the southern slope of Pole Pick Mountain. This area, adjacent to the project area, provides excellent bitterbrush deer winter range. The project area itself is poor winter range due to deeper snow, more shade, cold valley bottom conditions, and little available browse. Surveys in January 2008 showed little deer use in the valley bottom, even though nearby slopes had numerous deer.

Habitat quality for gray wolves is based largely on availability of their preferred prey—ungulates. The large Methow Valley mule deer herd provides abundant prey for gray wolves. In the Middle Methow watershed, deer use is concentrated in lower elevations in the winter, but there are numerous deer in the vicinity of the project in the summer. The size and condition of the deer herd here remains at or near carrying capacity (Scott Fitkin WDFW area biologist – personal communication). Small mammals such as hares and marmots, wild turkeys, and grouse are potential alternate prey for wolves. Prey would not be a limiting factor.

In addition to prey, availability of security habitat is an important consideration for wolves and other wide-ranging carnivores. Security habitat provides seclusion from human disturbance. Security habitat (areas with open road densities $\leq$ 1 mi/sq mi) currently comprises 27% of the Middle Methow BMU. Based on the fact that much of the Middle Methow watershed is not considered security habitat, the current level of human influence is rated "high" for gray wolves according to Gaines et al. (2003).

The Finley project area includes parts of two discrete management areas (MAs) that have open road density standards. Table3-19 displays the current open road densities for each MA that has a standard.

Considerable human activity occurs within the project area. Summertime activity includes firewood cutting, camping, and partying. Fall hunting activity is common. Winter snowmobile travel in the Finley bottom occurs at least weekly.

Table 3-19: Current Pre-project Open Road Density

Discrete Mgt. Area	Square Miles	Road Miles	Road Density Mi./Mi.²	Forest Plan Standard
MA 14-06	31.5	59.6	1.9	2.0
MA 26-11	4.4	3.3	0.8	1.0

Singleton et al. (2002) reported that the only existing habitat linkage for large carnivores between the north Cascade Range and the Kettle Range is a corridor through the Salmon Creek drainage. The Finley project is not part of this corridor.

Direct and Indirect Effects

Effects on Security Habitat

The immediate Finley Area is not considered security habitat due to road density in excess of 1 mile per square mile. The availability of security habitat within the Middle Methow BMU would not change as a result of this project, due to planned conservation measures for preventing new travel routes from becoming established. Conservation measures to be implemented include obliterating all new temporary roads, closing those roads opened, and restricting public access for the duration of the timber sale.

Road densities in the Middle Methow BMU would increase slightly for the duration of the project, due to the creation of ¼ mile of temporary haul roads and the opening of ¼ mile of closed road. Even with short-term increases in road density, however, the project would not reduce security habitat for wolves. During the project, public use would be restricted and none of the roads in the project area would be available for public use. The only authorized human presence would be people that were associated with the timber harvest and burning. Personnel using the roads during the project would be given information regarding the consequences for harassment or harm of wolves. There would be no change after the project from the current road density. Under all alternatives, the effects from construction and use of roads would be inconsequential to wolves.

Table 3-20: During Project Open Road Density

	Square Miles	Road Miles	Road Density Mi./Mi.²	Forest Plan Standard
MA 14-06	31.5	60.1	1.9	2.0
MA 26-11	4.4	3.3	0.8	1.0

After the timber sale and prescribed burning are complete open road density will return to that present before project initiation.

Table 3-21: Post Project Open Road Density

	Square Miles	Road Miles	Road Density Mi./Mi.²	Forest Plan Standard
MA 14-06	31.5	59.6	1.9	2.0
MA 26-11	4.4	3.3	0.8	1.0

Noise effects

During the project, tree falling, skidding, and log hauling would be noise producing activities that would possibly displace wolves that might be present in or near the project. Slash piling and burning would also provide human disturbance that might temporarily displace wolves. The duration of logging activities for a few weeks in one winter, and the duration of piling and burning activities for a few weeks in one spring or summer, would not have a measurable influence on a resident wolf population or transient wolves.

Den site effects

Although no wolf den sites or rendezvous sites have been detected in or near this project area, a den or rendezvous site located at any time during the life of the project would be protected from disturbance between April 1 and August 31 for dens, or between May1 and August 31 for rendezvous sites. There would be no impact to den or rendezvous sites.

Prey Availability

Winter logging operations would include noise above ambient conditions, creating disturbance that may temporarily displace wintering deer (and wolves) from winter habitat adjacent to treatment areas and haul routes. Harvest, however, could add to deer forage availability by providing branches and arboreal lichens on the ground. Thinning has the potential to open up stands so more sunlight would give shrub species a chance to develop more vigorously, which would provide improved food availability for deer in the future. Especially because of the limited nature of this project (133 acres, short harvest period, and short burning period) deer availability would not change measurably. Small mammal, grouse, and turkey availability would also experience little or no change as a result of 133 acres of thinning.

Cumulative Effects

Two 2009 hazardous fuels projects (Russian/French and Cougar Lake) and the Twisp Compound Conveyance are the foreseeable projects on Federal land in the Middle Methow watershed. They will not contribute a measurable cumulative effect for wolves or wolf prey. No other private or State land projects are known for the Middle Methow watershed.

Snowmobile recreation occurs throughout this area each winter and has the potential to displace wolves and deer. This would not impact wolf recovery in this area. We know of no other future nonfederal actions within the Middle Methow BMU that could potentially affect wolves or their prey.

Determination

Thinning and burning activities proposed are consistent with interim direction and guidance for management of gray wolves, FSM 2670, and the Okanogan National Forest Land and Resource Management Plan. Potential adverse effects on gray wolf are small due to planned measures for protection of den and rendezvous sites and for preventing new travel routes from becoming established. Effects on preferred prey

(deer) would be inconsequential. Some noise disturbance may temporarily displace wolves. Therefore, the proposed action ***may affect, but is not likely to adversely affect gray wolves***.

Grizzly bear

Life history information for grizzly bears is provided in Grizzly Bear Compendium (Interagency Grizzly Bear Committee or "IGBC" 1987), on file at the Methow Valley Ranger Station.

The initial recovery plan for grizzly bears was completed in 1982 and updated in 1993 (USFWS 1993). Conservation strategies for grizzly bears are in place for the Yellowstone ecosystem (Interagency Conservation Strategy Team 2003) and the North Cascades Ecosystem in Canada (North Cascades Grizzly Bear Recovery Team 2004). A chapter to amend the recovery plan for grizzly bears in the North Cascades in the U.S. (USFWS 1997) was approved in 1997, but has not been implemented due to lack of funds.

In 1993, a study of the North Cascades ecosystem was completed to evaluate its capability for supporting grizzly bears (Almack et al. 1993). They determined this ecosystem was able to support a self-sustaining population of grizzlies, but that only a "remnant" population remained that was incapable of enduring without active recovery efforts. The U.S Fish and Wildlife Service determined in 1991 that this population was warranted for listing as "endangered." Current estimates are that only a very small number of grizzly bears occupy the North Cascades (Romain-Bondi et al 2004). Grizzly bears use a wide variety of habitats that occur on the district. They tend to avoid areas that are more developed which have frequent human activity like the Finley project area. Food preferences change seasonally and include carrion, deer, moose, small mammals, spawning salmon, insects, grasses, forbs, and berries.

Grizzly conservation and recovery strategies have included reducing the potential for human-bear encounters and related bear mortality, providing secure habitat for females to raise their young, expanding public awareness, limiting bear access to human food and garbage, reduction of road densities, and retention of "core" habitat.

Proposed timber harvest and slash burning activities in the Finley project have the potential to affect grizzly bears by altering habitat structure for prey and by disturbing or displacing individual bears. The proposed action is evaluated on the basis of prey availability, effects of noise disturbance, and changes to core area.

The Finley project area is located with the North Cascades Grizzly Bear Recovery Zone. For this analysis, project effects are evaluated for the Middle Methow bear management units or "BMU" established under the Grizzly Bear Recovery Plan. Effects are considered for a 5-year timeframe.

To reduce potential adverse effects to grizzly bears, the following conservation measures would be implemented as part of the proposed action:

Information about the protected status of grizzly bears, wolves, lynx,

wolverines, fisher, bald eagles, peregrine falcon, gray flycatcher, great gray owl, Townsend's big-eared bat, Fringed myotis, and western gray squirrel will be provide to all private and Forest Service personnel working on the project. The information will include penalties for shooting, harassing, etc.

Information about "bear smart" hiking and camping will be provided to all private and Forest Service personnel working on the project.

In the unlikely event that an occupied grizzly bear den is located, all project activities within 800 meters will be suspended between Oct 1 and May 30.

Current estimated population size of grizzly bears size in the North Cascades Recovery Zone is small (Romain-Bondi et al. 2004). The best information available indicates that grizzly bears are present in the North Cascades. Two class I (verified) sightings are recorded, one in the Upper Toats BMU (1990) and one in the Lower Chewuch BMU (1986) (Fig. 8). There are 9 other class 2 (probable) sightings and 1 other sighting of unknown reliability, scattered among 6 BMUs surrounding Finley. Observations occurred between 1986 and 2003, and in all seasons of the year (WDFW PHS Digital Data, 2007).

The project area is dry Ponderosa pine and Douglas fir forest with a mix of hardwood species in the understory. Some large pine occur, but trees are mostly 10 – 20" dbh. North of the project area is the southern slope of Pole Pick Mountain. This area, adjacent to the project area, provides excellent bitterbrush deer winter range. The project area itself is poor winter range due to deeper snow, more shade, cold valley bottom conditions, and little available browse. Little spring range occurs near the project, although portions of the bottom of Finley Canyon might be suitable for spring bear use. No alpine habitat, avalanche chutes, or high elevation denning habitat occurs.

Core habitat (areas away from roads, motorized trails, and high use hiking trails) provides seclusion from disturbance for grizzly bears. 17% of the Middle Methow BMU currently qualifies as core habitat. This occurs as isolated small fragments throughout the BMU. BMUs with less than 55% core area are considered to have a high level of human influence on grizzly bear habitat (Gaines et al. 2003, pp. 15).

According to Singleton et al. (2002), the only habitat linkage for large carnivores between the north Cascade Range and the Kettle Range is a corridor that includes the Salmon Creek drainage. Finley is not part of this linkage.

Deer are abundant in the Finley area, especially in winter. Small mammals are also common. Fish sources of food do not occur in Finley.

Human activity is common in the Finley area. A private residence with dogs and livestock occurs 1/2 mile east. A small patch of core habitat (1100 acres) occurs north of the project area and another patch (1700 acres) occurs to the south.

Direct and Indirect Effects

Effects on Core Area and Potential Disturbance from Use of Roads

Availability of core area for grizzly bears (and seclusion from human disturbance) within the Middle Methow BMU would not change with this project, due to planned use of existing roads and to the locations of proposed temporary roads. All temporary roads would be located in areas where no removal of core would result, due to presence of other roads. Small (<1/2 mile) temporary increases in road density would occur in the Middle Methow BMU, but would be inconsequential for grizzly bears due to retention of all existing core area, and the fact that road opening and road use would occur during winter months.

Even though core area would not be affected, use of temporary roads and temporary use of "closed roads" would still increase the potential for noise disturbance to grizzly bears outside of core area. Plans to obliterate all temporary roads and to restore effective closures on level I roads ensure that disturbance levels after this project would be no greater than they are now. Plans to restrict public access for the life of this project ensure that activity during the project is potentially less than it is now. New human use patterns would not become established as a result of this project. Motorized use already occurs in the project area; therefore, use of existing roads for hauling would not pose a new disturbance to grizzly bears or their potential prey.

Road densities in the Middle Methow BMU would increase slightly for the duration of the project, due to the creation of ¼ mile of temporary haul roads and the opening of ¼ mile of closed road. Even with short-term increases in road density, however, the project would not affect grizzly bear core habitat. During the project, public use would be restricted and none of the roads in the project area would be available for public use. The only authorized human presence would be people that were associated with the timber harvest and burning. Personnel using the roads during the project would be given information regarding the consequences for harassment or harm of bears. There would be no change after the project from the current road density (Table 3-21, Pg. 3-66). Under all alternatives, the effects from construction and use of roads would be inconsequential to bears.

Den Site Protection

Based on the current knowledge of grizzly bears, den sites are not possible in the low elevation habitat that occurs in Finley Canyon.

Potential for Negative Human-Bear Encounters

Plans to provide information about “bear smart” camping and hiking and the protected status of grizzly bears to all personnel working on the project reduce the likelihood of accidental shooting and negative encounters between bears and people. Such encounters often end with death of a bear.

Because harvest activity is planned for the middle of winter, bear encounters are unlikely during timber harvest. Burning will occur during non-winter seasons and so, for the weeks that burning occurs a potential exists for encounters and displacement.

Prey Availability
Thinning trees from 133 acres or burning under the remaining trees has little chance of changing small mammal or large mammal prey abundance sufficiently to be meaningful for grizzly bears. Vegetation availability could be positively influenced by allowing the development and growth of berry producing shrubs in the understory of thinned forests.

Noise Disturbance Associated with Harvest and Burning

Winter operation of chainsaws and heavy equipment in treatment areas and at landings would result in noise disturbance. This would not have a consequence for grizzly bears since, if they were present, they would be hibernating in denning habitat dozens of miles away from this area. Burning activities would occur in spring or fall and might displace a bear traveling through the project area. Prey (such as deer), might be displaced, but no change in deer populations are expected from the thinning and burning proposed. Noise disturbance would be of a short duration and would not have an impact on individual bears or a bear population inhabiting the North Cascades.

Linkage Areas

The linkage area within North Central Washington would not be affected.

Cumulative Effects

Two 2009 hazardous fuels projects (Russian/French and Cougar Lake) and the Twisp Compound Conveyance are the foreseeable projects on Federal land in the Middle Methow watershed. They will not contribute a measurable cumulative effect for bears. No other private or State land projects are known for the Middle Methow watershed.

Determination

Based on planned measures for educating personnel associated with the project about bears, the lack of effect to core area, the lack of consequences to deer and other prey, and the limited change to herbaceous food availability, few impacts to bears or their habitat are expected. The thinning and burning project is consistent with guidance for

management of bears and bear habitat in the North Cascades Recovery Zone. Additional measures for preventing new travel routes from becoming established as a result of this project reduce the potential for conflicts for bears outside of core area. Some potential displacement of individual bears is possible. Therefore, *proposed thinning and burning activities* ***may affect but would not likely adversely affect grizzly bears.***

Canada lynx

No habitat.

Northern Spotted Owl

Outside the range. No habitat.

Bald eagle

No habitat.

California wolverine and Pacific fisher

No change in prey. No change in seclusion habitat.

Peregrine falcon

No nesting habitat. No changes in prey.

Common loon and eared grebe

No habitat.

Columbian sharp-tailed grouse

No habitat

Great gray owl

No habitat.

Gray flycatcher

Gray flycatchers inhabit low elevation open stands, where they forage on insects. They are migratory and spend winters as far south as central Mexico. Nests are generally found 2 to 9 feet off the ground in trees or shrubs.

The analysis area provides potential habitat in areas of Ponderosa pine with a bitterbrush understory.

Direct / Indirect Effects

The project would open the canopy and improve habitat for gray flycatchers. Temporary disturbance would occur during project implementation.

Cumulative Effects

The cumulative effects boundary would be the drainage. Future prescribed burning and thinning from below, on Forest and private lands, to restore more open forest will improve habitat conditions for gray flycatchers.

Townsend's big-eared bat and fringed bat

No habitat.

Western gray squirrel

Western gray squirrels are listed as a state threatened species. Surveys were conducted from 1995 to 2000 by the Washington State Department of Fish and Wildlife. Nests were found at elevations lower than 1500 feet, within ¼ mile of a stream, lake or wetlands, in areas of comparatively greater amounts of rainfall, in riparian areas with a greater shade component and in areas with an understory of mast-producing shrubs and in climax riparian habitats created by fire suppression (Bartels, 2000).

Western gray squirrels inhabit the lower parts of the Methow Valley, and have been sighted as far north as Winthrop. The lower portions of the Squaw Creek, Black Canyon and McFarland Creek drainages are activity centers for gray squirrels. Squirrels have also been documented in the Libby Creek drainage. Threats to the population include habitat loss, disease, predators and mortality by vehicles. There are no records of gray squirrels in Finley Canyon or the Benson Creek subwatershed. The nearest records are 10 miles south and 8 miles east. How timber harvest affects population parameters of western gray squirrels has not been studied" (Vander Haegen et al. 2005, page 8).

Shrub species and conifer cones are present in the analysis area and provide a food source. Food sources from private lands, such as walnut trees, apple trees, and bird feeding sites, are also important for the squirrels in the lower valley. Fire suppression has resulted in higher canopy closures than would occur normally, and may have resulted in expansion of the range used by gray squirrels, which are primarily arboreal and move within their territory by jumping from tree canopy to tree canopy.

Direct Indirect Effects

Project activities could result in disturbance to squirrels on a short-term basis or direct mortality from traffic, burning or falling trees. However, it is more likely that squirrels would avoid the activity site in favor of adjacent undisturbed areas. Mortality could occur from prescribed burning, particularly if riparian areas are burned during May or June, before young emerge from the nest. It is not expected that the riparian areas would be burned. No lighting of prescribed burns is generally done in riparian areas, although backing fire is allowed. Habitat value would likely be reduced by the actions proposed. However, after harvest and burning, pine seeds would remain available. Berry producing shrubs may increase. The opportunity for gray squirrels to use the forested stands in Finley Canyon would not be eliminated.

Thinning and harvest will space the trees further apart and make arboreal movement in those stands more difficult.

Cumulative Effects

None are expected with other federal actions. However, increased mortalities are likely as traffic increases on state highway 133 at the edge of the analysis area. Private lands in the vicinity of the highway appear to be important sources of winter food for squirrels. This could increase with additional development.

Determination

The project **may impact individuals but would not lead to a loss of viability or trend toward federal listing.**

Wildlife Analysis Conclusions

This project is generally beneficial for wildlife. Thinning dry forest is prescribed by songbird conservation plans. Riparian enhancement will benefit a large number of birds and mammals. Aspen enhancement is prescribed in the Okanogan Forest Plan and the Middle Methow Watershed Analysis. Nesting raptors would be protected. Habitat would be reduced for songbirds that rely on old, multi-layered mixed conifer forests, and nesting and foraging habitat would be reduced for goshawks.

No effects are expected for Canada lynx. The project **"may effect but is not likely to adversely effect"** gray wolves or grizzly bears. The potential effects of thinning and pile burning on populations of Sensitive gray flycatchers, Townsend's big-eared bats, and gray squirrels are unknown. It is likely that gray squirrel habitat is reduced by the thinning proposed, but we know of no use of this area by gray squirrels. Future use by gray squirrels is not precluded by this project.

Range

The section below summarizes the existing condition information, along with the direct, indirect and cumulative effects from the Finley HFRA Thin project, as documented in the Range Environmental Consequences Report, by District Range Staff Dean McFetridge in the analysis file (McFetridge 2008). Reference information is contained in the full specialists report.

Existing Condition

Allotment Description

The Finley HFRA Project is located in the Finley grazing allotment. All of the harvest units are located within the allotment. The allotment is 11,586 acres with 3 pastures. The grazing system is a deferred-rest rotation. Currently the permit allows 217 cow/calf pairs to graze from 6/1-9/30, which equals 1,164 animal unit months (AUMs). The pasture units are Lower Red Shirt in lower Finley Canyon, Pole Pick on the north side of

Finley Canyon, and Finley Mountain on the south side of Finley Canyon. Portions of all three units are within the project area. There are two early summer pastures, Lower Red Shirt and Finley Mountain, and one late season pasture, Pole Pick. Each of the early summer pastures receives a period of early summer grazing, followed by a year of deferment where the unit is grazed in mid or late summer. The Jack Creek pasture of the Frazer allotment is grazed in conjunction with the Finley allotment as needed to allow flexibility in grazing strategies. The pastures are divided by barbwire fence and natural barriers. Finley Canyon is used as a natural barrier. There is drift down to Finley Canyon bottom with some loafing of cattle but typically cattle numbers are manageable. Drift is highest in the fall and the permittee tries to move the cattle out as they congregate.

Riparian Areas

There are 3 riparian habitat areas within the project area. These are short reaches of stream with surface water. Cattle impacts are mostly at the road crossing as the stream supports a dense conifer canopy and there is very limited shrub and herbaceous riparian obligate vegetation. Virtually all the low gradient canyon bottom has subterranean water only. There is also surface water in a stream at the upper end of the canyon bottom outside the project area that helps to distribute the cattle in upper end to reduce impacts to the lower riparian areas. This area currently has low cattle impacts as the soil stabilizing vegetation is dominated by conifers.

Upland Areas

There are some localized areas of high use within the Finley Canyon area but overall grazing standards are being met. Most of the available forage is in the dry meadow areas and dry pond beds. The open coarse textured soils on the toeslopes of the canyon produce some needle grass and bluebunch wheatgrass and pinegrass is dominant in the conifer understory.

Structural Improvements

There is only one Forest Service maintained fence that needs protection on the east end of unit 06 and no water developments within the harvest units. There is one private land boundary fences on the west boundary of harvest unit 01boundaries would need to be protected.

Range Condition

As the canopy closure continues in forested stands, availability of understory forage would decrease slowly. As snags fall and debris accumulates, taking no action would result in limiting livestock use patterns and distribution. Livestock use in the Finley Canyon bottom would be more concentrated in the limited pockets of forage. Livestock numbers would need to be adjusted through Annual Operating Instructions if Forest Plan allowable use standards are being exceeded.

Fuel loading would continue to increase and fire intensity would be expected to be high in the projects area. In the event of a wildfire, cattle access to the riparian area could increase, and post-fire vegetation could change to a more palatable forage type that would attract cattle, resulting in an increase in damage to streambanks from trampling.

Environmental Consequences

Direct and Indirect Effects

The proposed action would have no direct conflict with livestock grazing because the following measures would be implemented through design features or mitigation. Logging would occur in the winter on frozen grround conditions well outside of the grazing season as required for all of the harvest units (Pg. 2-9). Fence right-of-ways and trails would be cleared of slash produced by logging or post-sale activities. All existing structural range improvements in the proposed timber sale area would be contractually protected. Also, it would be a contract requirement that all gates remain closed while cattle are grazing in the area. Coordination between the District Range Manager, Timber Sale Officer and the grazing permittee would occur to help prevent any conflicts.

Impacts to the riparian areas would not increase due to an increase in transitory forage in the harvest units. Much of the canyon bottom within the project areas is not riparian, that is, there is not riparian obligate vegetation and the vegetation type is made up of assemblages of species that are typically found in upland environments. Most of the harvest units have very little riparian area, however there is a potential that an increase in transitory range and better riparian accessibility as a result of implementing the action alternative would increase livestock impacts to the riparian areas.

During summer, livestock tend to be attracted to riparian zones due to water availability; higher concentrations of nutritious, palatable forage; and, if trees or shrubs are part of the system, preferable thermal conditions (Leonard et al 1997). Cattle generally prefer grasses and forbs to woody vegetation, at least when the herbaceous vegetation is green. Some degree of moderate use of palatable herbs (primarily grasses and sedges) can occur within the riparian area without undesirable browsing of riparian shrubs and without streambank damage (Hall and Bryant 1995). In riparian areas, livestock generally do not browse woody plants if they have a sufficient supply of palatable grass (Leonard et al 1997). As long as a sufficient level of palatable grass is available outside of the riparian area, undesirable streambank damage and browsing of riparian shrubs is unlikely.

Opening the stands would increase available forage outside the riparian areas within the canyon bottom. It is anticipated that the increase in available forage would not increase the number of cattle that access the riparian areas as grazing distribution patterns would improve in the bottoms. Even though the more open stands would allow additional access to riparian areas, no additional use of riparian areas is expected because cattle numbers would remain relatively low with improved distribution.

Water developments in the upland areas that lack water are often a key factor in reducing livestock concentrations in riparian areas. Upland water developments have been constructed in the uplands associated with Finley Canyon. The permittee would continue to maintain the upland water developments. Riding by the permittee will be done at least once a week and more often, if necessary, so as not to exceed the attached allowable use standards. As the grazing season progresses and allowable use is reached in a specific area, livestock will be moved to areas of lighter use.

Cumulative Effects

This cumulative effects analysis considers effects of past, present, and reasonably foreseeable future actions within the Finley project area. The geographic boundary for this cumulative effects analysis is the entire area of the affected livestock grazing allotment pastures. The temporal boundary is the period of time including activities that affect current grazing conditions through completion of the activities associated with this project; from the 1980s to 20 years post-project.

Past Actions

The effect of past actions on fuels in the Finley Canyon area is described in the existing condition information above. In addition, the Finley Mountain landscape burn of 2001 converted approximately 5,416 acres of Condition Class 3 to CC 2 between Finley Mountain and Benson Creek, as well as the 2,000 acre Finley Canyon Prescribed Burn of 2005 between Pole Pick Mountain and Finley Canyon.

This project has an objective of providing protection to the resources at risk in the Finley Canyon area and returning Fire Regime I and a portion of Fire Regime III to Condition Class 1. This would have an impact on how naturally occurring and human caused fires would burn. After commercial harvest, the need remains to treat the surface and ladder fuels. As more acres of surface and ladder fuel treatments are done over time, there would be a higher probability of not having total stand replacing fire effects on a large scale and higher levels of large tree structure would be retained on the landscape.

On-going Actions

Ongoing activities include weed control, road maintenance, and firewood gathering.

Weed control would occur along roads and in some off road areas. See Invasive Plant Specialist Report for details. Removing weeds would allow desirable plants to become established reduce the potential of spread from livestock grazing. This, in connection with the Proposed Action, would be a beneficial cumulative effect.

The Proposed Action does not propose any new permanent roads and no future proposals for road construction are planned, so no cumulative effects are expected.

Livestock grazing would continue. Livestock numbers in the project area would remain relatively consistent to those in the recent past. Range management techniques such as riding; adjusting intensity, timing and duration of use, proper salting, and maintaining water developments and fences would continue to be used to meet riparian protection requirements and to obtain a more uniform distribution of use on the allotment.

Invasive Weeds

The section below summarizes the existing condition information, along with the direct, indirect and cumulative effects from the Finley HFRA Thin project, as documented in the Finley Invasive Weeds Reports, by District Invasive Weed Coordinator Dean McFetridge, located in the analysis file (McFetridge 2008). Reference information is contained in the

full specialists report. Additional information is available in the Integrated Weed Management Plan in the analysis file.

Management Background

This analysis conforms to the requirements of the *Pacific Northwest Region Final Environmental Impact Statement for Preventing and Managing Invasive Plants* (USDA 2005) (PNW Invasive Plant FEIS), *Okanogan & Wenatchee National Forests Weed Prevention Strategy and Best Management Practices* (USDA Forest Service 2001), and the *National Strategy and Implementation Plan for Invasive Species Management* (USDA Forest Service 2004).

This analysis also addresses the Direction of the Region 6 *FEIS for Managing Competing and Unwanted Vegetation* (USDA 1988) as supplemented by the Mediated Agreement (Northwest Coalition for Alternatives to Pesticides, et al. v. Clayton Yeutter 1989).

Both FS National and PNW Region Noxious Weed Strategies use the term “noxious weed” to broadly encompass all invasive, aggressive, or harmful non-indigenous plant species. The more recent term use by the Forest Service is “Invasive Plants,” which are defined as nonnative plants likely to cause economic harm, environmental harm or harm to human health (Executive Order 13112, 1999). For this report the terms “noxious weeds” or “weeds” will continue to be used.

Existing Conditions

Invasive plant populations are present in the Finley HFRA Project area, and fall into three primary categories. These categories are used to prioritize invasive species on the Forest list for treating and inventorying:

1. “Established Invaders” are those species whose population levels and distribution are such that seed production cannot be prevented.
2. “New Invaders” are invasive plant species that occur sporadically on the Forest and that may be controlled by preventing seed production and early treatment;
3. “Potential Invaders” are invasive plants that occur on lands adjacent to the project area but have not been documented on lands administrated by the Forest. However, the potential for infestation is imminent as described in the *Okanogan National Forest Integrated Weed Management Environmental Assessments* (Weed EAs), (USDA Forest Service 1997 and USDA Forest Service 2000)

This project area contains a relatively high potential for New Invaders from adjacent private lands due to its proximity to private land.

Table 3-22: Invasive Classification and Strategy

Forest Service Classification	State and County Classification	Strategy for Treatment
New Invader or Potential Invader:	”A”	Prevention, Early treatment and eradication
New Invader:	Class B, “B-designate”	Prevention, Early treatment and Correction
Established Invader:	”B” and “C”	Prevention, Containment, Maintenance, Correction, No Action

Table 3-23 : Established, New and Potential Invaders (found within or adjacent to the Finley HFRA Thin project area)

Established Invaders (most common):	**New Invaders within project area:**	**Potential Invaders** (not yet on Forest land)**:**
Bull thistle	Whitetop	Japanese knotweed
Canada thistle	Sulfur cinquefoil	Yellow Starthistle
Common mullein	Russian knapweed	Hoary Alyssum
Bulbous bluegrass	Diffuse knapweed	
Cheatgrass	Dalmation toadflax	
	Kochia	
	Russian thistle	

Table 3-24: Invasive weed characteristics (also includes the most common established invader weeds)

SPECIES	CHARACTERISTICS
Diffuse knapweed *Centaurea diffusa*	An annual or short-lived perennial with a long tap root; highly competitive in disturbed areas; occupies a wide range of habitats; not tolerant of shade or flooding; thrives in gravel pits, roadsides, and heavily grazed areas; reproduces primarily by seed and is dispersed as plant breaks off a the base and tumbles or attaches to vehicles.
Whitetop *Carderia draba*	A perennial with deep creeping roots; one of the earliest perennial weeds to emerge in the spring; highly competitive once it becomes established; reproduction mainly by creeping roots; can establish under a wide variety of environmental and climatic conditions, mainly spread by vehicles and contaminated hay.
Sulfur Cinquefoil *Potentilla recta*	A competitive long-lived perennial, unpalatable to grazing animals reducing forage for livestock and wildlife, adapted to a wide range of environmental condition, reproduces by seed and uses early emergence to establish
St. Johnswort *Hypericum perforatum*	A perennial reproducing by seed or short rhizomes; easily established on roadsides; very slow in spreading off of roadside; difficult to control; biological control available.
Oxeye daisy	An aggressive perennial; invader of open forest, meadows and roadsides; strong adventitious roots with branched rhizomes; reproduces vegetatively

SPECIES	CHARACTERISTICS
Chrysanthemum leucanthemum	along rhizomes and by seed.
Common Tansy *Tanacetum vulgare*	Spreads mainly by seeds, and less commonly from creeping rhizomes, to form dense clumps of stems. An invader of disturbed sites and is commonly found on roadsides, fence rows, pastures, stream banks and waste areas.
Russian Knapweed *Acroptilon repens*	A creeping perennial, reproduces from seed and vegetative root buds, toxic to horses, very competitive in heavier soils of bottomlands, invades degraded areas dominating the plant community.
Houndstongue *Cynoglossum officinale*	A biennial; seeds are 4 prickly nutlets that attach to people, livestock, vehicles, for easy dispersal; a very strong competitor with desirable forage; generally non-palatable but toxic properties capable of poisoning livestock, shade tolerant and thrives in wetter grasslands.
Dalmation toadflax *Linaria dalmatica* (Potential Invader)	A perennial reproducing by seed and rhizomes, it is aggressive on roadsides and rangeland, difficult to control.
Japanese Knotweed *Polygonum cuspidatum* (Potential Invader)	An escaped ornamental becoming increasingly common along stream corridors and rights-of-way in Washington, a perennial with spreading rhizomes, can reach 8 feet in height and is often shrubby, very aggressive, capable of crowding out all other vegetation, rarely established from seed, primary spread is through mechanical movement of plant parts, several sites in Methow Valley bottom.
Diffuse knapweed *Centaurea diffusa* (Established Invader)	An annual or short-lived perennial; highly competitive; common along road sides and in will-lit disturbed areas.
Canada thistle *Cirsium arvense* (Established Invader)	A creeping perennial; established slowly; difficult to control because of rhizomes and from adventitious root buds; prolific seed producer; seeds dispersed by wind/water in late summer and fall; seeds can survive in soil up to 22 years depending on the depth of burial.
Common mullein *Verbascum thapsus* (Established Invader)	A biennial, grows in a wide variety of habitats but prefers well-lit disturbed soils, long-lived seeds persist in the seed bank, spreads by prolific seed production but rarely becomes invasive as seeds require open ground to germinate.
Bull thistle *Circium vulgare* (Established Invader)	Highly competitive in newly disturbed sites; common in harvest units; easily dispersed by wind; persistent for about 3 years and is usually greatly reduced in 5 years as disturbed area revegetates.
Yellow Starthistle *(Centaurea solstitialis L.*)	A deep taprooted winter annual with long sharp spines; performs best in deep silt loam soils on south slopes but high adaptability to most arid rangelands; abundant seed production - 150,000 per plant per season; seeds are plumed and plumeless, plumed seed is spread by wind.
Hoary alyssum (*Berteroa incana*)	A member of the mustard family; can be an annual, biennial or perennial; toxic to horses; spreads rapidly due to the high number of seeds per plant; most abundant in disturbed sites but is also found in meadows and pastures and along roadsides; well adapted to dry conditions, particularly in area with sandy to gravelly soils.
Orange Hawkweed *Hieracium aurantiacu,*	A perennial with creeping stolons; forms dense patches and rapidly invades new areas; mostly vegetative reproduction; dispersed by wind, animals, and people, seeds not carried far by the wind - presumably dispersed > 1 klm, minute barbs on the seeds stick to fur, clothing and vehicles; suitable habitat well above 5000 ft. in mountain meadows.

SPECIES	CHARACTERISTICS
Kochia (*Kochia scoparia* L.)	A deep rooted annual plant; produces around 14,600 seeds per plant; highly adaptable; very drought tolerant and can spread rapidly in drought conditions; grows very rapidly through summer; problematic on roadsides and disturbed areas.
Russian thistle *(Salsola kali* L.)	A bushy summer annual; the seed is spread when mature plants detach at the base and are blown by the wind; may produce more than 200,000 seeds; extremely drought tolerant; aggressive in open disturbed areas, less competitive with other species as seedlings are suppressed when other plants become established and shade out the sunlight.

Existing Vegetation

The open south facing slopes of the canyons within the project are produce bluebunch wheatgrass. Pinegrass is dominant in the conifer understory and provides good competition in deterring the establishment of new weed invasions and the spread of existing weed populations (Williams and Lillybridge 1983).

Current Infestations

Noxious weed information and analysis for the following sites has been conducted through the 1997 and 2000 Weed EAs and through recent inventories for this project.

Table 3-25: New Invader Sites (to be considered in this analysis)

Site No.	Species	Gross Acres	Treatment method	Units with potential for direct effect
38	Russian knapweed	18.8	herbicide	Indirect 01
108	Whitetop	18.8	herbicide	Indirect 01
223	Whitetop	1.0	herbicide	Indirect 01
342	Diffuse knapweed	19.6	herbicide	03,07,
428	Diffuse knapweed	24	herbicide	01,02,03,06,07
445	Dalmatian toadflax	5.4	herbicide	Indirect 01
480	Sulfur Cinquefoil	2.8	herbicide	07

Invasive plant population levels are relatively low within the project area.

<u>New Invaders</u>

There are 7 known New Invader sites (Table 3-25) that have a reasonable connection to the HFRA project area. There are 3 sites within the harvest units, 3 sites outside the project area that have potential to spread through vehicle traffic from the seed source to harvest units, and one site with the potential to be spread into the project area by animals. The site of greatest concern is a Sulfur cinquefoil site in Unit 07 as it is a New Invader with very limited distribution throughout the District. The sites with the potential to spread into the project area are 2 whitetop sites and 1 Russian knapweed site along 4100-300 in lower Finley Canyon below the north Wenner Pond. These sites have all been treated with herbicide for the past 5 years and weed densities are currently low, however there are untreated populations of these New Invader weeds on private land with potential to spread into the project area. There is a Dalmatian toadflax site on the

open south facing slope above harvest unit 01 inventoried in 2007 that has not yet been treated. This site has the potential to be spread into the project area by animals (most likely deer). Diffuse knapweed populations are relatively high and strongly associated with the road up the bottom of the canyon. In the lower project area there is one off-road disturbed area with a heavy diffuse knapweed infestation. This population is on the west end of unit 07 near the junction of the 4100-370 and 4100-380 and was treated with herbicide in 2006 and 2007. Currently needlegrass and yarrow are reclaiming the site. The highest knapweed densities are strongly associated with the very open areas where surface water ponds during very wet cycles and where cattle congregate. Populations are very low in the conifer understory. There are also populations of Kochia and Russian knapweed spreading up the county road through private land with a few plants that have been found along the road inside the Forest boundary. These species are well established on private land but are considered New Invaders on Forest Land.

There are some New Invader weed sites on Forest land adjacent to the project area. As these sites are in different drainages and are not associated with any road systems with direct access to the Finley Canyon bottom, there is a low potential for introduction and spread into the project area.

Established Invaders for All Project Areas

The occurrence of five lower-priority Established Invaders; cheatgrass, Canada thistle, bull thistle, common mullein, and bulbous bluegrass, are fairly widespread throughout the District. These weeds are so extensive Forest-wide that they are generally not site-specifically inventoried. Common mullein and bull thistle are less invasive and/or persistent than the high priority weeds and generally give way to or do not out-compete most desirable vegetation. It is expected that these lower-priority weeds occur within the analysis area. Bulbous bluegrass is strongly associated with diffuse knapweed. Cheatgrass and Canada thistle are present in relatively small patches in or adjacent to the project area.

Potential Invaders

Weed sites outside the project area on state, county, and private lands have potential to spread though vehicle traffic into the project units. These species are listed in Table 3-25. The Potential Invader populations are small infestations on the Valley floor currently under treatment administered by the County Noxious Weed Board.

Current practices

Prevention and Management Strategy

The current strategy for invasive species management has 4 elements (USDA Forest Service 2004):

1. Prevention – Stop invasive plants before they arrive.
2. Early detection and rapid response – Find new infestations and eliminate them before they become established.
3. Control and management – Contain and reduce existing infestations.
4. Rehabilitation and restoration – Reclaim native habitats and ecosystems.

Each of these four prevention and management Strategy elements is addressed in detail in the Finley Invasive Weeds Reports located in the analysis file.

Prevention and Risk Assessment

The Strategic Actions for prevention outlined in the Okanogan-Wenatchee National Forest Weed Management and Prevention Strategy and Best Management Practices (USDA Forest Service 2002) require that risk and prevention analysis be completed for prescribed fire and thinning projects. A noxious weed risk assessment was completed for the analysis area, and it was found to have a HIGH risk. The main criterion that determined the HIGH level of risk was that there is a known infestation of a New Invader that occurs within or adjacent to the project area. When the risk assessment is HIGH the following is directed: Implement Prevention and Management Strategy and monitor site until weed-free for 2 years. The prevention strategy is implemented through mitigation measures and the evaluation of six Prevention Strategy Evaluation questions that are discussed in the Finley Invasive Weeds Reports in the analysis file. Population monitoring would be accomplished during on-going weed management activities.

Early Detection and Rapid Response (EDRR)

The capacity for EDRR depends on three factors (Region 6 Invasive Plant EIS, USDA Forest Service 2005):

Number and distribution of people able to recognize potential new invaders.
Regulatory noxious weed designations for new invaders of limited distribution.
Capacity to respond quickly and effectively to new discoveries. New weed infestations are detected primarily through coordinated efforts between the District resource departments. New Invader designation is by the State and County Noxious Weed Control Boards. The most appropriate treatment response is then rapidly implemented within the limitations of budget and priority.

Control and Management

There are five strategies to control noxious weeds. Weed strategies and relation to damage threshold are described below. The damage threshold identifies how much of what kind of weed is too much to permit meeting a site's management objective.

Prevention - This preferred strategy would detect conditions that favor the presence of noxious weeds and change them to prevent establishment.
Early Treatment - This strategy would control noxious weed populations before the damage threshold is reached.
Maintenance - This strategy would support the current condition, keeping it below the damage threshold.
Correction - This strategy would take action after the damage threshold is exceeded.
No Action - With this strategy, no activity would be taken to interfere with natural process on the site. This would be used if noxious weed populations remain below the damage threshold.

The prevention strategy is always preferred and employed as the initial strategy. However, due to the nature of noxious weeds, the prevention strategy is often not adequate to ensure complete exclusion of noxious weeds.

Active treatment of existing weed populations of concern may occur before, during and after implementation of timber harvest, prescribed fire and post-sale activities. Treatment methods would be implemented in phases, like that described in the 1997 and 2000 Weed EAs. Phase one would use a combination of correction and early treatment strategies. The objective of this phase would be to substantially reduce the noxious weed population. Phase two would include the follow-up treatment on phase one sites with a combination of early treatment, maintenance, and prevention strategies. The objective would be to continue reducing the size of the populations, and change site conditions to minimize or eliminate additional treatment. Phase three would combine prevention and early treatment strategies. The objective would be to prevent or minimize the re-establishment of noxious weeds. All sites would be monitored by District weed crew to determine the effectiveness of treatments and ensure that weed populations do not establish in the future.

Weed treatments within this project area are based on integrated weed management principles that may include any combination of manual and mechanical, biological, cultural, and chemical techniques as described in the Region 6 Invasive Plant EIS, 2005 and the 1997 and 2000 Weed EAs.

Manual and Mechanical Control

These treatments physically remove and destroy, disrupt the growth of, or interfere with the reproduction of invasive plants. Manual treatment would use hand pulling, digging and seed head removal. For very small weed sites, manual treatment can be very effective. For larger weed sites, manual methods are listed as having fair effectiveness for diffuse knapweed and St. Johnswort but poor for oxeye daisy, Sulfur cinquefoil, and Common tansy as the root systems makes it difficult to effectively handpull. Manual methods work with small populations of diffuse knapweed, but are not cost effective for large populations. Youtie and Soll (1994) found that hand pulling at least three times per year are needed for effective control. Pulling would need to go on for several years to be effective (Youtie, 1997). Currently, hand pulling is the being conducted on the smaller New Invader sites. Manual methods would be proposed for most all weeds listed above in Tables 3-20 or 3-22, and new detections of small populations.

Mechanical Control consists of mowing road right-of-ways and landings prior to operations and before weeds have gone to seed. This method is not very practical in a forest environment, although it might be used along roads.

Biological

The use of biological control organisms is intended to be a permanent change to the environment. Biological control agents are used when weed eradication is not possible. The agent is released to coexist with the weed while bringing the weed population down to acceptable levels. The knapweed weevil, *Larinus minutus*, has been released on diffuse knapweed in Okanogan County and has been very successful in becoming well established throughout the county. Recent monitoring of the distribution of *Larinus minutus* on the Methow Valley Ranger District has found that it is well established with some successful suppression of diffuse knapweed in some areas but not within the project area. Collecting this insect from known populations elsewhere on the District and releasing on to the larger populations within the project area is preferred method where

herbicides are not approved. Biological control is not available for the other weeds listed above.

Cultural

Cultural methods are generally targeted toward enhancing desirable vegetation to minimize invasion. This includes grass seeding to out-compete the noxious weeds, the addition of fertilizer/soil amendments, competitive planting, or any other cultural practice known to be useful for treating invasive plants. Nitrogen fertilizer has been effective on suppressing Oxeye daisy. Based on a study in an eastern Washington mountain meadow, application of nitrogen fertilizer was almost as effective as herbicides at reducing canopy cover of oxeye daisy (WSDA 2005).

Chemical

Chemical control is generally spot spray applications. All weed sites within the project area were analyzed in the Weed EAs of 1997 and 2000. Only two herbicides are available, Picloram and Glyphosate. Application is with hand-held nozzles attached to backpack sprayers or a tank mounted on an ATV. Within 100 feet of fish bearing streams, only aquatic formulations of Glyphosate are used and applied with hand sprayers or wicking to minimize or eliminate the risk of toxic effects to aquatic organisms and no-target plants. All mitigation measures required for herbicide application in the EAs are followed.

Rehabilitation and Restoration

Site restoration or revegetation is part of any long term strategy to reduce invasive plants. Determining the need for active restoration/revegetation versus passive restoration (allowing plats on site to fill in treated area) is the first choice when addressing this need. Passive restoration may be appropriate where treated sites leave only small gaps of bare ground and native vegetation on site can provide adequate seed source to fill in such gaps (Region 6 Invasive Plant EIS, USDA Forest Service 2005).

For noxious weeds, this is accomplished primarily with competitive grass seeding. Native plant materials are the first choice for restoration, rehabilitation, and revegetation efforts; however, nonnative, non-invasive plant species may be used when:

1. Needed to protect basic resource values (e.g., soil stability and water quality, to prevent establishment of invasive plants)
2. As an interim, non-persistent measure designed to aid in the reestablishment of native plants (unless natural soil, water, and biotic conditions have been permanently altered)
3. Native plant species are not available.
4. In permanently altered plant communities (Region 6 Invasive Plant EIS, USDA Forest Service 2005).

Environmental Consequences

Direct and Indirect Effects

The risk of noxious weed introduction and spread is estimated by assuming that the prevention strategy is implemented in this project through the project mitigation measures. Based on past observations, spread of noxious weeds is generally proportional to the amount of area disturbed. For the purposes of this analysis, "disturbance" includes: 1.) exposed mineral soil, 2.) reduction of competing vegetation, and 3.) increase of light levels through the opening of the canopy. For this project, vegetation treatment of forest stands, hand pile and excavator pile and burn, and temporary road construction would cause at least some level of disturbance. There is also the potential for new weed introductions and spread of weed seeds from project vehicles and equipment.

For the purpose of this weed analysis, the effects of commercial thinning, excavator piling, and pile burning on weeds are discussed. Commercial thinning would fell and remove trees 7 to 21 inches to achieve stocking levels needed to attain stand management objectives and to reduce risk of crow fire. There would be a removal of 1/2 to 1/3 of the existing merchantable trees and a post harvest canopy closure of 25% to 40% is expected.

Weeds exploit disturbed sites. These are areas that have reduced vegetation competition, exposed mineral soils, and high light levels. If weeds are present before disturbance, or weed seeds arrive after disturbance, weeds will commonly increase on disturbed areas. Most activities that disturb soil and increase light levels create favorable conditions for weed invasions. (USDA Forest Service 2004).

The existing natural control for noxious weeds is the presence of native herbaceous plants species that compete with weeds. The conifer understory within the project area is a mix of bluebunch wheatgrass, needlegrass, and pinegrass. The most effective is pinegrass, though it can also be strong competition for tree seedlings that also can reduce weed establishment in the Douglas fir/pinegrass plant association (Williams and Lillybridge 1983). Where pinegrass is the dominant grass species, it would provide adequate competition to deter the establishment of weeds outside the disturbed areas.

Commercial thinning would create a more open forest canopy. More light would provide more favorable conditions for noxious weeds; however, desirable plants that have been suppressed by a dense canopy would also benefit from a more open canopy. A study on understory response after thinning in a dense pine stand in the Upper Methow found that pinegrass was 47% more abundant in thinned forests compared to uncut or unburned forests three years post-treatment (McConnell and Smith 1965). It is expected that there would not be an expansion of the existing established noxious weeds except in areas of soil disturbance. In areas where light levels and soil disturbance both are increased would have the highest potential for expansion of existing weeds and the potential for establishment of new weed introductions from seed spread. Populations of Russian knapweed, whitetop, kochia, and Russian thistle are within one to three miles distance of the project area on the Finley Canyon road and have a potential for new introduction into the more open areas of disturbance caused by the project treatment activities. Sulfur cinquefoil, with one small established site in Unit 07, is also competitive in non-disturbed,

open forest environments. These species are a priority for early detection and rapid response to control new infestations.

Ground-based harvest systems would create soil disturbance that could, without preventative measures to avoid or limit their establishment, allow the invasion of noxious weeds. Tractor logging could create ground disturbance on approximately 133 acres. The lower-priority established noxious weeds would likely increase in density and cover on skid trails, landings, and the burned areas of slash piles. Similarly, The New Invader, diffuse knapweed would likely increase in these areas. Mitigation measures requiring winter logging over frozen ground conditions would help to further reduce soil disturbance and better maintain the cover and density of desirable competitive vegetation. Mitigations requiring skid trail spacing of not less than 100 feet or 40 foot spacing if a harvester-processor and full-support forwarder is used would also limit the amount of disturbed ground available for noxious weed establishment.

Areas of heavily disturbed soils including landings, main skid trails, decommissioned temporary roads, and constructed road cut and fill slopes would be promptly seeded. This would reduce soil erosion potential and area for weeds to become established. Seeding would establish competitive species to help prevent the spread of existing populations, and introduction and establishment of new noxious weed species. Certified weed-free seed would be used to help prevent new populations and species of weeds from entering the analysis area, reducing future control cost.

The Proposed Action would also increase the risk of introduction of new noxious weeds into the project area by vehicles and equipment. A mitigation is be added to require high pressure cleaning of equipment off-site before it comes to the Forest project area. This would be effective in reducing the risk of weed seed introduction to the site.

Precommercial thinning activities would result in little to no detrimental soil effects. Precommerical thinning operations are conducted by hand crews working across the landscape, which causes little detrimental soil disturbance**.** No increase in weed abundance is expected from precommercial thinning..

Post harvest Excavator Pile and Burn and burning of tops at landings is expected to create the concentrations of soil disturbance. Pile burning concentrates the heat of the fire in a single location, causing greater disturbance to the soil and plants in the area of the pile. Landing pile locations would be seeded post-burning. Smaller excavator and hand pile areas are more quickly revegetated by existing desirable vegetation than large landing piles; however, large piles are typically placed in pre-existing disturbed soil areas of past landings.

Summary of Proposed Action Effects

The Proposed Action would result in increased soil disturbance and an increased risk of introduction of new noxious weeds into the project area by vehicles and equipment. However, the Prevention Strategy, discussed above under Current Conditions, would reduce the risk of introduction and spread of noxious weeds. Mitigation measure included in the Proposed Action to limit detrimental soil conditions and reduce weed sources being transported onto the forest will effectively limit any new weed introduction. In addition, the Proposed Action would reduce fuel levels thereby reducing the risk of uncharacteristic high severity fire and the disturbance associated with fire control.

Cumulative Effects

This cumulative effects analysis considers effects of past, present, and reasonably foreseeable future actions within the Finley HFRA Thin project area. The geographic boundary for this cumulative effects analysis is the entire area of the Proposed Action. The temporal boundary is the period of time including activities that affect current weed conditions through completion of the activities associated with this project which create soil disturbance and potential weed source transport; from the 1990s to 15 years post-project.

Past Actions

Intensive logging activity started in the 1950s. Secondary roads were completed in the in conjunction with more timber sales through the 1980s. An increase in recreation and cattle use followed. This opened the area to the potential for weed introduction through dispersal of weed seed on motor vehicles and livestock. Ground-disturbing logging activities, fuels treatments and recreational activities created areas of disturbed soil suitable for weed introduction and establishment.

Present and On-going Actions

Integrated weed management would continue in the New Invader weed infestations on roads used during vegetation management activities and off roads in areas where treatment activities may spread weeds. Integrated weed management (IWM) would be accomplished through implementing the mitigation measures in this assessment and a combination of all the control methods available with emphasis on early detection of new infestations, rapid treatment response, and prompt revegetation. The combination of herbicide, manual, and cultural treatment together would provide effective control of small populations. Treatments would be conducted by the District Weed program with herbicide treatments authorized under the1997 and 2000 Weed EA Decision Notices.

The New Invader sites within all treatment Units would be treated with herbicide as authorized by the1997 and 2000 Weed EAs or otherwise manually treated. Consequently, weed densities and/or seed production would be greatly reduced before project implementation. The plants are scattered in small patches, mostly on the roadsides or on the roadbed. The treatment would prevent all seed production but the risk of spread of existing seeds within the soil seed bank would remain. All New Invader noxious weeds would be treated prior to and after project activities to help prevent weed spread and establishment in the units.

Several weed sites outside the project area have potential to spread through vehicle traffic to newly-disturbed soil within treatment units (see existing conditions).

All the known noxious weed sites in the project area are being prioritized for integrated weed management for project year 2008 under the 1997 and 2000 Weed EAs. Virtually all of the New Invader weed sites were treated in 2007.

Cumulative effects within the project area from cattle grazing would be an increase in the potential for cattle to function as weed vectors. Livestock may transport weed seeds across the landscape with dispersal into the disturbed areas. Given the relatively low

number of cattle grazing within the project area, and the lack of weed species that are readily dispersed by animals, it is expected that the likelihood of cattle facilitating the dispersal of noxious weeds would be low.

Reasonably Foreseeable Future Actions

The cumulative effects of all past, present, and reasonably foreseeable future actions would continue to provide vectors for weed spread. Some level of disturbance would continue to provide sites suitable for weed establishment. Control of existing weeds would continue to occur under the existing IWM decisions which would result in reductions in weed populations.

The cumulative effects of the proposed action and all past, present, and reasonably foreseeable future actions would be short-term increases in amounts of Established Invaders and slight increases in the amount of New Invaders. In the long term, with implementation of mitigation measures and on-going weed management, weed populations would be reduced.

Scenery

The section below summarizes the existing condition information, along with the direct, indirect and cumulative effects from the Finley HFRA Thin project, as documented in the Finley Visual Effects Report, by District Supervisory Forester Arlo Vander Woude, located in the analysis file (Vander Woude 2008). Reference information is contained in the report.

Existing Condition

Local residents and recreation users value the scenery within the Finley HFRA Thin project area. Recreation activities include dispersed camping, hiking, hunting, Mountain biking, snowmobile riding, and other dispersed uses occur in the project area.

The project are is allocated to a Visual Quality Objective (VQO) of maximum modification in the Okanogan National Forest Land and Resource Management Plan (pages IV-83, IV-107 – the Finley Canyon area is not a sensitivity level 1 area). Maximum modification allows management activities to dominate the characteristic landscape, but must follow established form, line, color and texture. Maximum modification is the minimum VQO, and higher VQO's (Modification, Partial Retention or Retention) in areas that are sensitive for recreation and scenic objectives may be desirable.

Existing Landscape Character

The project area is only seen as a dissected valley landform with one primary forest road that accesses the canyon bottom. There are no outstanding landmarks within the project area. There are few viewing opportunities within the project area.

The project area is seen as foreground (views up to ½ mile distance) and middle ground (views up to 4 miles distance) from the Finley Canyon bottom viewpoints.

The landscape setting is a highly to coarsely textured foreground and middle ground view from Forest Road 4100-370. The existing condition is natural appearing timber stands along the travel route with several open meadows areas in the valley bottom. The meadows add form to the tree lined valley corridor with a distinct change in vegetative species and fall color. Fall color is also seen throughout the viewshed with the brilliant yellow aspen contrasting against the evergreen landscape setting.

The vegetation texture is coarse to densely patterned, with the ground visible in some places and the line of large ponderosa tree boles seen throughout the canyon bottom. Larger ponderosa pine tree boles aren't as evident as they likely would have been under pre-European conditions because of ingrowth of smaller trees around the larger pines. Evidence of trees dead and dying trees is seen in the foreground and middle ground view. Human caused alterations to the vegetative character are occasionally evident in the landscape character.

Existing Scenic Integrity

Scenic integrity is the amount of human caused deviation in form, line, color, and texture of a landscape. Scenic integrity serves as a frame of reference for measuring scenic integrity levels based on the valued attributes of the existing landscape character. The degrees of integrity vary from VERY HIGH to VERY LOW. Table 3-26 displays the 5 scenic integrity levels and conditions associated with each level.

Table 3-26: Scenic Integrity Level

Scenic Integrity Level	Condition
VERY HIGH (Preservation VQO)	Unaltered
HIGH (Retention VQO)	Appears Unaltered
MODERATE (Partial Retention VQO)	Slightly Altered
LOW (Modification VQO)	Moderately Altered
VERY LOW (Maximum Modification)	Heavily Altered

The Finley HFRA Thin Project area has a range of scenic integrity levels (conditions) from MODERATE to LOW, slightly altered to moderately altered, based on vegetative characteristics. The scenic integrity levels meet the Forest Plan Standards and Guidelines for a natural appearing foreground viewed from the travel routes.

Social benefits of maintaining a naturally appearing forested environment that is ecologically sound and beautiful include conservation of scenic heritage, identity of self-image of communities and individuals, quality of life, and quality of recreation settings.

Environmental Consequences

Assessing Effects

In terms of assessing scenic quality, vegetation patterns are the elements that change the most. Color and texture would be mosaics dominating the landscape patterns

through vegetation patterns changing throughout the seasons. Aspen groves and western larch add yellow fall color. Prior to European settlement, fire had an effect on the composition of the vegetation patterns and added to the variety of form and color. The forms that would have been most common in the historic landscape would be proportionally in scale to the naturally established landscape and would likely be seen as irregular openings resulting from fires. The vegetation patterns are predominately dry site species with a mix of age classes. Douglas-fir has encroached upon many of the desirable large tree species of ponderosa pine and western larch. The species of vegetation and spatial distribution of plant communities that have been affected by or resulted from fire suppression activities are evident to visitors; however, they are not widely understood to be the result of human intervention in the fire regimes. These effects (different vegetation communities and understory vegetation) are relatively subtle from a visual standpoint and not strongly linked with the more common perception regarding fire, such as black and silver snags, brown needles and black charred trunks. For purpose of analysis, subsequent references to the "effects of fire" refer to the obvious visual evidence that occurs as a direct result of fire rather than the subtle effects of different species of vegetation and spatial distribution of plant communities that are often in advanced succession.

Vegetation management activities of thinning trees, temporarily opening old roads and introducing fire through prescribed burning or underburning can affect the scenic resource by altering the naturally established form, line, color, and texture in a given viewshed. The character of the landscape and the existing scenic integrity level (condition) can be affected. Scenic impacts of the change depend on the interactions of the following:

1. Access to stands by existing roads and skid trails.
2. Logging systems and silvicultural methods.
3. Fuels treatment and methods.
4. Slash disposal methods.
5. Shape, size, and arrangement of thinning units.
6. Topographical relationship to viewer's position and duration of view.
7. Existing landscape character and scenic integrity.
8. The ability of the viewshed to absorb change.

Visual absorption capability (VAC) indicates the relative ability of any landscape to accept human alteration without loss of landscape character or scenic condition. (USDA Forest Service 1995: Landscape Aesthetics, C-1). The ability of a particular viewshed to absorb change is based on several factors including, but not limited to, soil color, texture of vegetation, slope, and percentage of existing alteration to the viewshed. Other factors used in VAC analysis include viewer's perception of expectations, viewer's position in the landscape, and duration of view, distance, and proposed activity in terms of scale, size, shape, and distribution. Using VAC it is possible to rate the project on how easy or difficult it is to blend the activity into the surrounding landscape. VAC is rated in terms of high, medium, or low; high being the easiest to accomplish, low being the most difficult. In general, the Finley HFRA Thin project area has a medium to high VAC rating due to the existing roads, the mosaic texture of the vegetative patterns, and diverse landform of the project area.

Scenic effects within the Finley HFRA Thin Project area are quantified and interpreted based on how the proposed alternative changes the existing landscape character and

scenic integrity level. Landscape character refers to the naturally established landscape patterns that make each landscape identifiable or unique. Scenic integrity is the state of naturalness, or conversely, the state of disturbance created by human activities or alteration. The frame of reference for measuring scenic integrity levels is the valued attributes of the existing landscape character being viewed. The degree of scenic altered condition depends on the amount of changes seen from the foreground. For example, altered condition in the landscape will be the greatest when most of the trees are removed in a given unit or area. The character of the landscape would be least affected when most of the existing trees are left intact.

Direct and Indirect Effects

Treatment Units

Vegetation removal, fuels reduction management activities and associated transportation changes will have an effect on the landscape character and scenic integrity (condition). There are two primary aspects that affect scenic quality; 1) fuel reduction treatments proposed and implementation of the commercial vegetation treatment and 2) prescribed fire and underburning and implementation of mechanical treatments that address surface fuels.

Overall, the reduction of fuels and thinning to enhance large tree growth in the landscape, dry and mesic forest types, would benefit long term scenic quality by providing a more stable, sustainable forest which is typical of Northeast Cascade vegetative character types.

Enhancement of landscape character would be done by thinning and reducing dense stands of young trees, providing variety in spatial distribution of plant communities and moving towards more variety in age classes. Large diameter trees would be retained and would stand out as more dominant after removing small trees around them.

The forest setting on a landscape scale would be moved toward sustainable landscape character by burning small trees and slash created by the thinning activities. Some riparian areas would be enhanced with thinning and the use of prescribed fire. Maintaining meadows and riparian vegetation is desirable for fall color and diversity in landscape character of vegetative species.

Landscape character would be restored, improving the scenic setting along existing travel routes. Utilizing existing landings, roads, fire lines and natural fuel breaks would reduce further visual impacts associated with implementation. Activities would blend into the existing landscape setting.

Visual impacts would be contained in areas already impacted as much as possible rather than introducing new impacts. To the extent practical, landings would be located in areas used previously as landing locations along secondary travel routes.

Thinning would result in texture changes from the existing dense to mosaic textured landscape.

On the landscape scale, using prescribed fire in a timely manner is expected to reduce the future risk of a high-intensity wildfire that would affect scenic quality.

Slash may be seen around the drainages before underburning, machine piling, and handpiling and burning. Proposed under burning may not entirely reduce the slash, especially after the first underburn, but slash would likely be mostly eliminated after the subsequent maintenance underburns. Blackened bark, scorched trees, and snags would be created by fire.

Use of temporary roads would result in removal of vegetation and soil disturbance. These areas would be decompacted, where appropriate, grass seeded and closed after implementation. Most of the temporary roads to be used by the project already exist as user created roads, but some may be constructed for safety. These new temporary roads would have longer-term visual effects until they are closed and vegetation grows providing screening of linear corridors.

Prescribed fire has the potential to create larger forms (openings) in the landscape than intended, possibly burn out of the area intended, and/or to burn trees that are desired to be retained. This potential has been mitigated for this area by scheduling maintenance underburns out approximately 10-15 years, so that each underburn can be accomplished with conditions that provide low intensity burns that have low risk of burning more trees or acres than planned.

Based on the above analysis, all treatment will meet at least the required VQO of modification.

Remainder of Project Area

Overall, the rest of the project area would meet a range of visual quality objectives from Partial Retention to Modification. Activities would be designed to blend with the natural terrain, areas where thinning is proposed would have the least impact on the ground. Areas where ground based logging would occur would show evidence of skid trails, landings, and new temporary road construction.

Overall, on a landscape scale, managing and reducing the dense vegetation patterns through thinning and prescribed burning would enhance scenic quality in the long term by revitalizing the vegetation patterns to be maintained, the residual trees will survive and not succumb to drought, insect or diseases if they are not stressed and over competing for water, sunlight, and other growing conditions. The reduction of fuels and thinning to enhance large tree growth in the landscape, dry series type, and would benefit long term scenic quality by providing a more stable, sustainable forest which is typical of Northeast Cascade vegetative character types. This will maintain and retain the high scenic quality setting in the viewsheds.

Cumulative Effects

This cumulative effects analysis considers effects within the Finley Canyon area from the 1920s to 20+ years in the future. Vegetation treatments prior to the 1960' are not visually evident anymore, although the roads constructed to access older timber sales provide strong line forms that remain visually evident.

The roads accessing Finley Canyon area were constructed starting in the 1950s and 1960s as access for small timber sales. These roads are all strong linear features in the area, although most cannot be seen from viewpoints because of the densely surrounding timber stands. The Finley HFRA Thin project would open up many of these stands and roads may become more visible as a result, although some, like Forest Roads 4100-500, and 4100-300 are hidden by topographic breaks or features. In time, the visible roads would become more subordinate to the existing landscape character as new grasses, forbes and understory grows in to screen and soften the view. Firewood cutters are also creating roads, primarily along Forest Road 4100-375, which are visually evident. Finley HFRA Thin would use some of these roads for treatments, and would follow up with closing these roads so that future firewood cutters would not continue to cut high value trees or leave unsightly or heavy fuels.

The Finley Timber Sale (1990-1993) harvested units along 4100-300, and the Pole Pick Timber Sale along 4100-500 left treatment units that are noticeable as background from the primary access 4100-370 and 4100-380 for the Finley HFRA Thin. The Finley HFRA Thin project may open views into some of these past units in the background.

In the long term, a sustainable forest would be promoted, the larger diameter trees (>20”) would be retained and become more healthy as competition from other vegetation species would be reduced, the large ponderosa pine trees would have more nutrients, water, space for growing and would be visually enhanced for viewing.

Other past, ongoing and reasonably foreseeable future actions listed at the beginning of Chapter 3 of the EA do not cumulative interact with visual impacts from the Finley HFRA Thin project.

Recreation and Public Safety

The section below summarizes the existing condition information, along with the direct, indirect and cumulative effects from the Finley HFRA Thin project from the Finley HFRA Thin project, as documented in the Finley Recreation and Public Safety Report, by District Supervisory Forester Arlo Vander Woude, located in the analysis file (Vander Woude 2008). Reference information is contained in the report.

Existing Condition

Current recreation activities in the area are limited to recreational use of the area by hikers, horseback riders, mountain bikers, hunters, firewood cutters, snowmobilers, Off-Road Vehicles (ORV) enthusiats, riders, and sightseers. There are several dispersed camp sites that are used each year, particularly during the general deer rifle season. There are no developed recreational facilities in the area.

Access into the project area is via County Road # 1590 (Finley Canyon Road). Several residences are located along this road, however daily traffic is minimal and generally only local traffic. Traffic on this road increases substantially during general hunting season in mid-October. Potential hazards include mixed logging and public traffic, dust, winter travel, and speed.

Livestock grazing and invasive weed management activities are currently ongoing in the area and have been for many years. Fencing and other measures are used to keep livestock away from recreation sites to the extent practicable. Otherwise, these activities have had very little impact on recreation resources or visitor use.

Environmental Consequences

Direct and Indirect Effects

There would be some short-term disruption of recreation uses during project activities. Visiting hikers and horseback riders, hunters, and sightseers would be displaced to other areas located nearby. Most roads currently open for project activities would remain open post project, although a few user constructed or temporary roads and 0.5 miles of 4100-380 would be closed in following harvest activity.

After the vegetation management activities, there would be short-term increased woody debris adjacent to the trails. However, the roads themselves would be kept clear of debris. After the prescribed fire activities are completed, the majority of the debris would be gone. The forest adjacent to the roads would be more open, likely increasing views of the surrounding areas. Some char from prescribed fire activities would be evident on the residual trees, but some char is common in the forest and has not been a concern voiced by recreation visitors.

Non-system roads that are planned for use in the Finley HFRA Thin project would be decommissioned following treatment activities. Firewood cutters currently use some of these roads illegally and their closure would limit access for firewood cutters. Use of these roads by firewood cutters is illegal, and their closure would help law enforcement limit illegal firewood cutting.

Public safety issues resulting from increased mixed traffic should be limited in duration and will be monitored and controlled by sale administrators and Forest Service and local law enforcement.

Cumulative Effects

This cumulative effects analysis considers recreation uses within the project area from the 1950s to 10 years into the future, the time span when effects from this project have either ceased or become similar to background. The list of past, present and reasonably foreseeable future actions at the beginning of this chapter that have affected or may be affecting recreation in the area are the Finley and Pole Pick Timber Sales, grazing, invasive weed treatments, firewood gathering and user-created roads, snowmobiling, camping, and ORV use.

Past and on-going recreation uses and their effects are described in the existing condition information above.

Livestock grazing, invasive weed management and firewood cutting are existing activities that would continue, but they have very little or no impact upon recreation users or private residents. Firewood cutters have built and continue to use user-built roads, and would likely continue to both use and build new roads, although some existing user-

created roads would be decommissioned with the Finley HFRA Thin project. Law enforcement employees would continue to monitor and cite violators. Development activities on private land adjacent to the National Forest would continue. These development activities would increase the urgency for taking action on the high fuel load in the area, since more people would potentially be at risk. Fuels reduction activities under the Finley HFRA Thin project would work to reduce fuels across the landscape. Although fuels management activities may impact these recreational special uses short-term with noise, smoke and traffic, the long-term effect of the treatments would be to reduce the risk that these uses may be severely impacted by wildfire.

Although snowmobiling opportunities may be more limited during project activities, at least one road system would remain available (unplowed) for snowmobiling, if winter hauling operations occur. If winter logging occurs, snowmobilers might hear the sounds of logging operations, however most noise would likely be masked by the sound of snowmobiles themselves.

When past, ongoing and foreseeable future actions are considered along with the effects of the Finley HFRA Thin, recreation uses in the area would be impacted in the short-term, but maintained and unaffected in the long- term.

Inventoried Roadless/Undeveloped

Existing Condition

There are no Inventoried Roadless areas in or near the Finley HFRA Thin project area. No areas exhibiting unroaded and undeveloped character are present in or near the project area.

Environmental Consequences

Direct and Indirect Effects

The Proposed Action will have no effect on Inventoried Roadless or areas exhibiting unroaded or undeveloped character.

Cumulative Effects

No cumulative effects to Inventoried Roadless or areas exhibiting unroaded or undeveloped character would result from any past present, or forseeable future action in the project area.

Transportation

The section below summarizes the existing condition information, along with the direct, indirect and cumulative effects from the Finley HFRA project, as documented in the Finley HFRA Thin Transportation Report, by Zone Transportation Planner Dave Colbert located in the analysis file (Colbert 2008). Reference information is contained in the full specialists report.

Existing Condition

There are approximately 3.5 miles of road within the project area. This total includes 3.0 miles of open road and 0.5 miles of closed road. There are 3.0 miles currently on the transportation system (classified), and the remaining 0.5 miles of road are unclassified – not on the transportation system. As part of this project environmental analysis a roads analysis was done for all roads within the project area. This analysis provided evaluation of current conditions and assessment of the needs, assets and liabilities of each road in the area, and identification of road closure opportunities as well as which unclassified roads, if any, should become part of the transportation system and recommended road management objectives. Proposed road management (Pg.2-5) captured these recommendations.

Through the 1980's several roads were built to access timber sales and kept open for post sale activities such as fuels treatment or fire protection. Once a road is established it becomes used for other activities such as firewood gathering or access to other parts of the Forest. Forest Road 4100-370 provides access to the project area. This road is a local road used mainly for dispersed recreation and is suitable for commercial use. There are also several user created roads within the project area. With the exception of the need for some short temporary spurs, the current road access is adequate for this project.

The Finley HFRA Thin project area includes parts of two discrete management areas (MAs) that have open road density standards. Table 3-27 displays the current open road densities for each MA that has a standard.

Table 3-27: Current Open Road Density

Discrete Mgt. Area	Square Miles	Road Miles	Road Density Mi./Mi.^{2}	Forest Plan Standard
MA 14-06	31.5	59.6	1.9	2.0
MA 26-11	4.4	3.3	0.8	1.0

Environmental Consequences

Direct and Indirect Effects

The Finley HFRA Thin project makes road management decisions for those roads that would be used by the project. Several closed roads would be opened to accomplish project activities, and then re-closed. All existing closed roads would be re-closed post project. All non-system roads that would be used by the project would also be closed, regardless of their current closure status. Under NFMA all roads built under contract as temporary roads (not intended to be part of the transportation system) are required to be decommissioned post project to allow for re-vegetation. Three non-system roads would be converted to system roads with the Finley HFRA Thin project, but would remain closed, post project. Open road densities by management area are displayed in Table 3-28.

Table 3-28: During Project Open Road Density

Management Area	Square Miles	Road Miles	Road Density Mi./Mi.²	Forest Plan Standard
MA 14-06	31.5	60.1	1.9	2.0
MA 26-11	4.4	3.3	0.8	1.0

Currently one road in MA 26-11 would need to be opened in order to accomplish fuels management objectives. This road originates in MA 26-11 and carries into MA 14-06. To keep road density within the required standard of 1.0 miles per square mile in MA 26-11 and 2.0 miles per square mile in MA 14-06, this road would be blocked at the upper end of the unit, which would result in no net increase in miles per square mile (as measured to the nearest tenth of a mile), and would maintain a road density below the Forest Plan standard of 1.0 and 2.0 miles per square mile respectively. Post project open road miles would drop as shown in Table 3-29, although open road density in the Management Areas would remain the same (rounded to the nearest tenth mile) miles per square mile post project.

Table 3-29: Post Project Open Road Density

Management Area	Square Miles	Road Miles	Road Density Mi./Mi.²	Forest Plan Standard
MA 14-06	31.5	58.6	1.9	2.0
MA 26-11	4.4	3.3	0.8	1.0

Cumulative Effects

This cumulative effects analysis considers the effects to the transportation system within the project area from the 1950s to approximately 10 years into the future, the time when all road work from the Finley HFRA Thin project would be completed.

Access for timber harvest began in the 1950s. Users created roads (primarily for firewood access) have added to the road network, although these roads are not part of the transportation system. Additionally, some roads that were closed by previous projects have been breached in the project area. Some user created roads used for dispersed recreation or firewood access remain open in the area and contribute to current road density. The charts above account for all past road actions in the project area.

No ongoing or reasonably foreseeable future actions would include new road construction. However, as part of the roads analysis for this project, additional roads not planned for use in the Finley HFRA Thin project were identified for future closure. These potential road closures would have the effect of reducing road density further. Non-system road closures under the Finley HFRA Thin project, in conjunction with potential future road closures would result in further reductions in road density and road maintenance costs.

Heritage

The section below summarizes the existing condition information, along with the direct, indirect and cumulative effects from the Finley HFRA Thin project. Survey information is summarized in the Finley Bottom Heritage Survey/Literature Search Report prepared by Meg Trebon, District Cultural Resources Technician which is located in the project analysis file (Trebon 2007). Reference information is contained in the full specialists report.

Existing Condition

The following records were reviewed for the purpose of identifying previous survey and site records for past undertakings within the project planning area:

Okanogan National Forest Methow Valley Ranger District Site Atlas Bennett, Lee A., 1979
Cultural Resource Overview of the Twisp-Winthrop-Conconully Planning Unit, Fulkerson, Cathy, 1987
Predictive Modeling of Aboriginal sites in the Methow River Region, North-Central Washington, Ford, David L., 1993
Ethnographic survey of the Okanogan National Forest, Okanogan National Forest
Okanogan Valley Office (OVO) Heritage Resource files.
Methow Valley Ranger District project and Heritage Resource files.
Research in the listed publications revealed no sites affected by the project.
Okanogan National Forest map 1960
Chelan National Forest map 1922, 1937, 1949
Fire Control Management Plans 1950 – 1969

The Area of Potential Effect (APE) for heritage resources includes the Finley Canyon bottom between the private land boundary to approximately 1.5 miles to the east. Portions of the project area have been previously inventoried for prescribed fire activities. The Finley Canyon Fuels Project survey covered the northeast corner of the western block, and the northern portion of the middle block north of the 300 road. Site #06080400130, Dunn's Outpost, is located within the Finley Canyon Fuels Project, and west block of this survey. Dunn's Outpost was protected from the prescribed fire. A site update form was completed for Dunn's Outpost and is included in the Finley Bottom Heritage Survey/Literature Search Report. Previous surveys for past management activity preceded adoption of the Wenatchee NF survey protocol and were cursorily examined for site locations.

The entire area covered with this survey was considered high probability by the Forest Archaeologist, Powys Gadd. The entire area was gridded at 30m spacing. Limited subsurface examination was accomplished by examining dirt exposed in root wads of fallen trees, exposed dirt on mechanically disturbed areas from road cuts, and soil brought to the surface by burrowing animals. No further sites were found.

Complete survey is defined as systematic survey of the areas within the practical limitations of safety, terrain, and vegetative cover. Transects need not be straight line, but should be spaced approximately 30 meters apart, following natural contours, accessible landforms, or arbitrary compass bearings.

Environmental Consequences

Direct and Indirect Effects

A cultural resource survey of 133 acres yielded no new sites which are eligible for the National Register of Historic Places. No effects are expected.

Cumulative Effects

Because no direct or indirect effects are expected from project activities, no cumulative effects are expected.

Economics

This document examines a proposal for altering forest fuels at a landscape scale in order to affect a change in future fire behavior. Such a change would improve the chances of protecting valuable resources during future fire events and would likely reduce the costs of future management. This section will discuss the financial aspects of this proposed investment.

Environmental Consequences

Direct and Indirect Effects

<u>Benefits</u>

While the costs of implementing the proposed action can be expressed in monetary terms, the benefits are not as easily quantified and involve both market and non-market values. These benefits include the following:

Reduction of Future Suppression Costs

Several smaller fires have occurred within and adjacent to the Finley Canyon analysis area in recent years. Fire suppression costs for these types of large-scale fires are now commonly within the range of $500 to $2,000 per acre. Based on the predicted effectiveness of treatments (see fuels section) it is very likely that addressing the buildup of fuels at this time would greatly reduce fire suppression costs in the future. This savings would most likely far exceed the costs of implementing the strategies described in the proposed action.

Protection of Non-market Resource Values

Large-scale stand replacement fires, especially in areas where they are not characteristic of the inherent fire regime, can cause substantial damage to forest

resources. Resources such as soils, wildlife habitat, and water, along with scenic values can be substantially affected at a very large scale and for an extended period of time. This type of loss can be difficult to measure in monetary terms but is nonetheless important in terms of ecosystem health. Returning the area to a condition where fire can play a more natural role in the ecosystem would help ensure that these resource values are protected and managed in a sustainable manner. For a more thorough discussion of non-market resource benefits see the soils, water, wildlife and scenery sections of this document.

Protection of Existing Market Value Resources

Other resources that are at risk from catastrophic fire, such as range, timber, recreation, and private property are more commonly assigned a monetary value. However, because of the uncertainty regarding risk, and the timing and scale of future fires, it is difficult to assign a dollar figure to the actual losses that would be avoided or reduced because of treatments. The fuels analysis in this document suggests that risk of a large-scale catastrophic fire is much greater if no action is taken. Such a fire could result in substantial monetary losses, both from damage to forest resources and to private property. The Okanogan County Assessor's records indicate there is about $2.5 million in private development in the surrounding area. Again, losses from a catastrophic fire could far exceed the total costs of treatments proposed in the action alternative.

Monetary Return from the Sale of Products

The proposed action includes about 133 acres of fuels reduction where commercially valuable timber would be removed as a byproduct of that treatment. The value of these marketable products can substantially reduce the overall costs of the project.

Where ground-based equipment has been used to reduce fuels on the Methow Valley Ranger District there has been a predictable, and usually substantial monetary return. Although the amount may vary from site to site and with changes in market conditions, ground based treatments planned for the Finley HFRA Thin project may result in net revenue of $350 per acre. This means that this type of activity would not only pay for itself but also help to partially offset the costs of other treatments and reduce the need for appropriated funding on the project.

<u>Costs</u>

The Table 3-30 displays the probable costs associated with the proposed action;

Table 3-30: Cost Analysis

Treatments	Acres	Cost/Return per Acre	Cost/Return
Commercial Fuels Treatments			
Ground Based	133	$350	$46,550
Surface Fuels Treatments			
Excavator Pile	91	(-$250)	($22,750)
Handpile	42	(-$250)	($10,500)
Underburn	99	(-$120)	($11,880)
Total or Average			$1,420

Budget Constraints and Prioritization

In order to be as effective as possible within budget constraints an implementation plan will be developed that prioritizes treatments according to their relative return on investment. General guidelines have been developed that would be used to guide this prioritization process. The following three types of treatments have been identified as having the highest priority for implementation:

Areas closest to the wildland-urban interface
Strategically located treatment units, which because of their location would have a relatively greater effect on fire behavior at a landscape scale
Treatments that can implemented with little or no cost, or which generate funds which can be used to pay for other treatments

The issue of strategic placement and timing of treatments to effect fire behavior at the landscape scale is the most critical of these in terms of budget constraints. As part of the implementation process further analysis would be performed to identify the most effective sequence of implementation given budget expectations.

Cost-Benefit Ratio and Present Net Value

Because the proposed action involves non-market benefits and there is uncertainty regarding future fire behavior meaningful numerical Benefit-Cost ratio or Present Net Value analysis is not possible. However, a qualitative comparison is still possible by comparing the benefits described above (and reviewing the resource effects section) with the costs of treatment shown in Table 3-30. In an area with such high market and non-market values it appears that the cost of implementing the proposed action constitutes a good investment.

Cumulative Effects

There are no cumulative effects related to the financial aspects of the project.

Other Required Disclosures

Social Groups, Civil Rights and Environmental Justice

Civil Rights would not be affected by the Finley HFRA Thin project. The project includes purchaser work and, and Forest Service employee accomplished work. Under executive Order 11246 companies with Federal, contracts or subcontracts are prohibited from job discrimination the basis of race, color, religion, sex, or national origin. The U. S. Department of Agriculture prohibits discrimination in its employment practices based on race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation, and marital and family status.

Executive Order 12898 (59 Fed, Reg. 7629, 1994) directs Federal agencies to identify and address, as appropriate, any disproportionately high and adverse human health or environmental effects on minority populations and low-income populations. Minority and poor communities adjacent to the planning area include both Hispanic and Native American communities. Many Hispanics in the area hold lower paying jobs in the service and agricultural industries. The Finley HFRA Thin analysis area is located relatively near the Colville Indian Reservation. The Confederated Tribes of the Colville Indian Reservation consider the area as traditional use area. The analysis area is also near traditional use areas of the Yakama Indian Nation. Many Native Americans have a rural lifestyle that is reliant on a clean and healthy environment, and the Forest is important in providing religious or spiritual settings, and hunting, gathering and fishing opportunities.

The Tribal governments for the Confederated Tribes of the Colville Indian Reservation and Yakama Nation were contacted prior to commencement of scoping; no concerns about the project were raised by the tribal government.

The effects of the proposed action on civil rights and low income or minority communities would be minimal. Employment would be created through both timber sale and service contracts, and contractors/subcontractors are prohibited from discrimination based on race, color, religion, sex, or national origin. Some contracts for this project may be offered under Small Business Administration authorities, which could result in positive employment benefits to minority populations.

Proposed haul routes are not planned through communities that have high Hispanic or Native American populations. The most probable haul routes for the northern portion of the project area would be Road 4100-370 to County Rd.# 1590 to County Rd.# 1585 to State Highway 20 near Twisp, then northeast to Okanogan. From Okanogan the haul would go north to Omak on State Highway 20/97 and then on to one of several processing facilities in North central or Northeast Washington. Hauls on Highway 97 between Okanogan and Omak would be across the Colville Indian Reservation. However, because this State Highway receives heavy commercial traffic, the effects on traffic and noise would not be noticeable.

To this point in time, Tribal mills in Omak have not bid on any Federal contracts; if they were to bid and be awarded the timber sale contract, the final ½ mile of log haul would

be through a mostly residential Native American community if accessed off Highway 97. However, the effects of this traffic would not be noticeable because this route is a State highway, already used by commercial traffic. Should the Tribal mills successfully bid on any contracts, employment would benefit a disproportionately high number of Native Americans.

The noise and disturbance from Finley HFRA Thin activities would temporarily displace recreational activity, but would not disproportionately affect Hispanics or Native Americans. Restoring stands in the project area through removal of excess trees and fuels would provide better growing conditions for traditional plants. The effects on hunting, gathering and fishing opportunities can be derived from the effects on wildlife, plants and fish found earlier in this chapter.

This project does not have the potential to disproportionally adversely affect minority or low-income populations and would not affect civil liberties.

The proposed action would have any disparate effects on any consumers, minority groups, women, civil rights, or social/ethnic groups. All contracts would meet Equal Employment Opportunity requirements. The United States Department of Agriculture (USDA) prohibits discrimination in its programs based on race, color, national origin, sex, religion, age, disability, political beliefs, and marital or familial status.

Floodplains and Wetlands

No impacts to designated floodplains or wetlands are projected. Treatments would occur in some RHCAs and effects are described in the aquatic and fuels sections. Floodplains and wetlands would be protected through mitigation measures, which conform to Executive Orders 11988 and 11990.

Prime Rangeland, Farm Land, and Forest Land

The proposed action complies with the Federal Regulations for prime land. Most of the lands within the analysis area do not qualify as “prime” forest land although there may be isolated pockets of forest land that do meet the definition because growth rates may exceed 85 cubic feet/acre/year at culmination of mean annual increment. Effects to forestland are described earlier in this chapter. The Finley HFRA Thin area does not contain any prime rangeland or prime farmland. Therefore, none of the alternatives would have any effect on prime rangeland and farmland.

Wild and Scenic Rivers

No wild or scenic rivers are located within the project area. The Forest Plan did not recommend any of the streams in the project area for inclusion in the Wild and Scenic River System. An eligibility analysis was completed in 2000 for the Forest; none of the creeks in the project area were found to be potentially eligible.

Energy Requirements and Conservation Potential of Actions

With relation to national and global petroleum reserves, the energy consumption associated with the proposed action would be insignificant. Fossil fuels used during the operation and transportation phases of the Finley HFRA Thin project would result in an irreversible resource commitment of fossil fuel resources. As only 133 acres of the project are proposed for logging, energy consumption associated with this project would be insignificant at the local, regional or national scale.

American Indian Treaty Rights

The Finley HFRA Thin project would not affect any treaty rights.

Irreversible and irretrievable Effects

There are no known substantial, irreversible, or irretrievable commitments of resources connected with the proposed action. Fossil fuel needed for operations and transportation associated with this project would be irreversibly lost, but this is insignificant in the context of regional, national or global use.

Chapter 4
Consultation with Others

Details regarding the public involvement, collaboration and consultation process are previously discussed in Chapter 1 of this document.

The following agencies and governments were consulted during preparation of this project:

Confederated Tribes of the Colville Indian Reservation
Yakama Indian Nation
USDI, Fish and Wildlife Service
Washington State Department of Natural Resources
Washington State Historic Preservation Office
Okanogan County

Individuals and Organizations contacted that provided scoping comment on the Finley HFRA Thin Project include:

Sierra Club, Cascade Chapter
Conservation Northwest
Moon Mullins, Twisp, WA
Bill White, Twisp, WA
Tom White, Twisp, WA

The following Forest Service personnel were involved in preparation of this document:

John Daily, District Silviculturist
Dean McFetridge, Range Conservationist/ Invasive Weed Specialist
Mel Bennett, Forest Hydrologist
Kent Woodruff, Wildlife Biologist
Annie Greene, Zone Soil Scientist
Meg Trebon, District Cultural Resource Technician
Michael Dunn, Fuels Technician
Kelly Davis, Okanogan National Forest Botanist
Arlo Vander Woude, Vegetation Management Staff. IDT Leader
Gary Reed, GIS Specialist
Dave Colbert, Zone Transportation Planner
Nancy Wells, Fisheries Biologist

Appendix A
References

Agee, J.K. 1994. *Fire and weather disturbances in terrestrial ecosystems of the Eastern Cascades*. Gen. Tech. Rep. PNW-GTR-320. USDA Forest Service, PNW Station. Portland, OR. 52 pages.

Agee, J.K., and R.L. Edmonds. 1992. *Forest protection guidelines for the northern spotted owl. In Recovery Plan for the Northern Spotted Ow*l: Appendix F. USDI Fish and Wildlife Service. Washington, D.C.

Agee, J.K. 1993. Fire ecology of Pacific Northwest Forests. Island Press, Washington D.C. 493p.

Agee, J.K.; Bahro, B.; Finney, M.A.; Omi, P.O.; Sapsis, D.B.; Skinner, C.N.; van Wagtendonk, J.W.; and Weatherspoon, C.P. 1999. *The use of Shaded fuelbreaks in landscape fire management.* Forest Ecology and Management 127 (2000). p. 55-66.

Agee, J.K.; Skinner, C.N. 2005. *Basic principles of forest fuel reduction treatments.* Forest Ecology and Management 211 (2005). p.83-96.

Altman, B. 2000a. *Conservation strategy for landbirds in the northern Rocky Mountains of eastern Oregon and Washington*. Version 1.0. Oregon-Washington Partners in Flight. 128pp.

Altman, B. 2000b. *Conservation strategy for landbirds east slope of the Cascade Mountains in Oregon and Washington.* Version 1.0. Oregon-Washington Partners in Flight. 81pp.

Amaranthus, M.P. 1991. *Factors affecting ectomycorrhizae and forest regeneration following disturbance in the Pacific Northwest*. In: Proceedings, Management and Productivity of Western-Montane Forest Soils; Boise, ID; April 10-12, 1990. General Technical Report, INT-GTR-280. pp. 205-208.

Amaranthus, M.P. and D. Perry. 1994. *The functioning of ectomycorrhizal fungi in the field: linkages in space and time*. Plant and Soil, 159:133-140. Available online at http://www.springerlink.com/content/50370n860vr2021n/fulltext.pdf (January 12, 2007).

Amaranthus, M.P., D.S. Page-Dumroese, A. Harvey, E. Cazares, and L. Bednar. 1996. *Soil compaction and organic matter affect conifer seedling nonmycorrhizal and ectomycorrhizal root tip abundance and diversity.* Research Paper, PNW-RP-494. Portland, OR: Pacific Northwest Research Station, USDA Forest Service. 12 pp. Available online at http://maps.wildrockies.org/ecosystem_defense/Science_Documents/Amaranthus_et_al_1996.html (January 11, 2007).

Anderson H.E. 1982. *Aids to Determining Fuel Models For Estimating Fire Behavior*. USDA Forest Service. GTR-INT-122 22p. Intermt. For. and Range Exp. Stn., Ogden, Utah 84401.

Bennett, Lee A., 1979, *Cultural Resource Overview of the Twisp-Winthrop-Conconully Planning Unit*

Beschta, R.L., C.A. Frissell, R. Gresswell, R. Hauer, J.R. Karr, G.W. Minshall, D.A. Perry, and J.J. Rhodes. Unpublished report (1995). Wildfire and salvage-logging: Recommendations for ecologically sound post-fire management and other post-fire treatments on federal lands in the west.

Bull, E. L. and J. R. Duncan. 1993**.** *Great Gray Owl (Strix nebulosa). In The Birds of North America, No. 41* (A. Poole and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

Cochran, P.H.; Geist, J.M.; Clemens, D.L.; [and others]. 1994. *Suggested stocking levels for forest stands in northeastern Oregon and southeastern Washington.* Res. Note PNW-RN-513. Portland, OR: USDA Forest Service Pacific Northwest Research Station. 21p.

Cohen, Jack D. 2000. *Preventing Disaster: Home Ignitability in the Wildland-Urban Interface.* Journal of Forestry 98(3): 15-21.

Connelly, J. W., M. W. Gratson, and K. P. Reese. 1998. *Sharp-tailed Grouse (Tympanuchus phasianellus). In The Birds of North America, No. 354* (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

DiTomaso, J.M. 1999**.** *Invasive weeds in rangelands: species, impacts, and management. Weed Science:* Vol. 48, No. 2, pp. 255–265

Edmonds, R.L. 1991. *Organic matter decomposition in western United States forests*. In: Harvey, A.E. and L.F. Neuenschwander, comps. Proceedings – Management and Productivity of Western-Montane Forest Soils. Boise, ID; April 10-12, 1990. General Technical Report, INT-GTR-280. Ogden, UT: Intermountain Research Station, USDA Forest Service. p. 118-128. Available online at http://forest.moscowfsl.wsu.edu/smp/solo/InfoPath/productivity/documents.php (February 14, 2007)

Evers, D. C. 2004**.** *Status assessment and conservation plan for the Common Loon (Gavia immer) in North America*. U.S. Fish and Wildlife Service, Hadley, MA. http://alaska.fws.gov/mbsp/mbm/loons/pdf/Common_Loon_Status_Assessment.pdf

Flatten, B. 2004. *Determining appropriate winter logging conditions for the protection of the soil resource*. Internal Forest Service Report. Okanogan and Wenatchee National Forests. 14 pp.

Ford, David L., 1993, *Ethnographic survey of the Okanogan National Forest, 1993*

Froehlich, H.A. (no date). *Soil Compaction: Why the Controversy*? College of Forestry, Oregon State University. Publication Unknown. p. 20-22.

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

Froehlich, H.A. and D.H. McNabb. 1984. *Minimizing soil compaction in Pacific Northwest forests*. In: E.L. Stone, editor. Forest soils and treatment impacts. Proceedings of the 6th North American Forest Soils Conference, Knoxville, TN. p. 159-192.

Fulkerson, Cathy, 1987, *Predictive Modeling of Aboriginal sites in the Methow River Region, North-Central Washington*

Gaines, W.L. 2005. *Update and recommendations on new sensitive species: great gray owl.* Report to the Forest Leadership Team. August 29, 2005**.** Unpublished report on file at Okanogan and Wenatchee National Forest headquarters. 4 pp.

Gaines, William L.; Singleton, Peter H.; Ross, Roger C. 2003. *Assessing the cumulative effects of linear recreation routes on wildlife habitats on the Okanogan and Wenatchee National Forests.* Gen. Tech. Rep. PNW-GTR-586. Portland, OR. U.S. Department of Agriculture, Forest Service. Pacific Northwest Research Station. 79 pp. http://www.fs.fed.us/pnw/pubs/gtr586.pdf

Goodman, L.D. 2003. *Guidance for implementing eastside screens;* file designation
2430, Memorandum to Forest Supervisors of the Colville, Deschutes, Malheur, Ochoco, Umatilla, Wallowa-Whitman, Wenatchee-Okanogan, and Winema-Fremont National Forests. 3pp. On file with: Okanogan and Wenatchee National Forests, 215 Melody Lane, Wenatchee, WA. 98801. June 11, 2003.

Graham, R.T., D. Minore, A.E. Harvey, M.G. Jurgensen, and D.S. Page-Dumroese. 1991. *Soil management as an integral part of silvicultural systems*. In: Harvey, A.E. and L.F. Neuenschwander, comps. Proceedings – Management and Productivity of Western-Montane Forest Soils. Boise, ID; April 10-12, 1990. General Technical Report, INT-GTR-280. Ogden, UT: Intermountain Research Station, USDA Forest Service. pp. 59-64. Available online at http://forest.moscowfsl.wsu.edu/smp/solo/InfoPath/productivity/documents.php (February 14, 2007).

Graham, R.T.; Harvey, A.E.; Jain, T.B.; Tonn, J.R. 1999. *The effects of thinning and similar stand treatments on fire behavior in Western forests.* Gen. Tech. Rep. PNW-GTR-463. Portland, OR: USDA Forest Service, Pacific Northwest Research Station. 27p.

Graham, R.T.; McCaffrey, S.; Jain, T.B. (tech. eds.) 2004. *Science basis for changing forest structure to modify wildfire behavior and severity.* Gen. Tech. Rep. RMRS-GTR-120. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station. 43p.

Greene, A. 2006y. *Soil Monitoring Report*. Internal Forest Service Report. Okanogan and Wenatchee National Forests.

Hann, Wendel, Havlina, Doug, Shlisky, Ayn, et al. 2003. Interagency and The Nature Conservancy fire regime condition class website .USDA Forest Service, US Department of the Interior, The Nature Conservancy, and Systems for Environmental Management [frcc.gov].

Haddow, Dennis: Wilderness and Air Program Manager, USDA Forest Service, Rocky Mountain Regional Office, Denver, Colorado. Draft answers for the Senate energy and natural resources committee hearing scheduled for March 13, 2003

Harmon, M.E., J.F. Franklin, F.J. Swanson, P. Sollins, V. Gregory, J.D. Lattin, N.H. Anderson, S.P. Cline, N.G. Aumen, J.R. Sedell, G.W. Lienkaemper, K. Cromack, Jr., and K.W. Cummins. 1986. *Ecology of coarse woody debris in temperate ecosystems*. Advances in Ecological Research, 15:133-302.

Hayward, G. D., and J. Verner, (eds.). 1994. *Flammulated, boreal, and great gray owls in the United States: A technical conservation assessment*. Gen. Tech. Report RM-253. U.S.D.A. Forest Service, Rocky Mountain Forest and Range Experiment Station. Fort Collins, CO. 214 pp.

Howes, S.W. 2001. *Proposed Soil Resource Condition Assessment*. Wallowa-Whitman National Forest. Baker City, Or. 9 pp.

Hungerford, R. D., Harrington, M. G, Frandsen, W. H. Ryan, K. C., Niehoff, G. J. 1991 *Influence of Fire on Factors that Affect Site Productivity.* GTR-INT-280. USDA, Forest Service. Intermountain Research Station. Ogden, UT.

Ivey, G. L., and C. P. Herziger, coordinators. 2005. *Intermountain West Waterbird Conservation Plan—A plan associated with the Waterbird Conservation for the Americas initiative. Eared Grebe species account. Version 1.0.* pages 5-27 to 5-28 U.S. Fish and Wildlife Service Pacific Region, Portland, Oregon. http://www.fws.gov/birds/waterbirds/intermountainwest/IWWCPappendices.pdf

Johansen, David, Ronald Copstead and Jeffry Moll. 1997. Relief Culverts. USDA Forest Service, San Dimas Technology and Development Center. San Dimas, CA. Page 3.

Kauffman, Kris G.. 1976. *Water Resource Management Program, Methow River Basin,* Washington State Department of Ecology, Olympia, WA, 22 pages.

Mellen, Kim, Bruce G. Marcot, Janet L. Ohmann, Karen Waddell, Susan A. Livingston, Elizabeth A. Willhite, Bruce B. Hostetler, Catherine Ogden, and Tina Dreisbach. 2003. *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

North Cascades Ecosystem Technical Team. 1999. *Access management in the North Cascades grizzly bear ecosystem: background, assessment process, and interim management direction.* Wenatchee, WA: U.S. Department of Agriculture, Forest Service, Wenatchee National Forest. 25 p.

Olson, D.L. 2000. *Fire in riparian zones: a comparison of historical fire occurrence in riparian and upslope forests in the Blue Mountains and southern Cascade of Oregon.* thesis paper: University of Washington.

Ohlson, P.; Schellhaas, R. *Historical and current stand structure in Douglas-fir and ponderosa pine forests.* Unpublished Report. Wenatchee, WA. USDA Forest Service Forestry Sciences Lab. 30p.

Packard, F.A., S.S. Sumioka and K.J. Whiteman. 1983. *Ground Water-Surface Water Relationships in the Bonaparte Creek Basin, Okanogan County, Washington, 1979-80* USDI Geological Survey, Open File Report 82-172, Tacoma, WA, 46 pages.

Packer, P.E. 1967. *Criteria for Designing and Locating Logging Roads to Control Sediment*. Forest Science, 13(1):2-18.

Pagel, J. E. 1995. *American peregrine falcon: status of the species in the Columbia River Basin.* USDA Forest Service and USDI Burea of Land Management. 29 pp. http://www.icbemp.gov/science/pagel.pdf

Peterson, D.L.; Johnson, M.H.; Agee, J.K.; Mckenzie, D.; and Reinhardt, E.D. 2005. *Forest structure and fire hazard in dry forests of the Western United States.* Gen. Tech. Rep. PNW-GTR-628. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 30p.

Pfankuch, Dale. 1972. "Stream Reach Inventory and Channel Stability Evaluation", USDA Forest Service, Northern Region, Missoula, MT, 26 pages.

Quintana-Coyer, D. L, R. P. Gehrhardt, M. D. Broyles, J. A. Dillon, C. A. Friesen, S. A. Godwin, and S. D. Kamrath. 2004. *Survey protocol for the great gray owl within the range of the Northwest Forest Plan.* USDA Forest Service and UDSI Bureau of Land Management. 52 pp.
http://www.blm.gov/nhp/efoia/or/fy2004/im/im-or-2004-050Att1.pdf

Reinecke, L.H. 1933. *Perfecting a stand density index for even aged forests.* Journal of Agricultural Research. 46: 627-638.

Rothermel, R.C. 1972. *A mathematical model for fire spread predictions in wildland fuels*. USDA Forest Service. Res. Pap. INT-115 40p. Intermt. For. and Range Exp. Stn., Ogden, Utah.

Ruediger, B., J. Claar, S. Mighton, B. Naney, T. Rinaldi, F. Wahl, N. Warren, D.Wenger, A. Williamson, L. Lewis, B. Holt, G. Patton, J. Trick, A. Vandehey, andS. Gniadek. 2000. *Canada Lynx Conservation Assessment and Strategy*. U.S. Department of Agriculture, Forest Service; U.S. Department of the Interior, Fish and Wildlife Service, Bureau of

Land Management, and National Park Service. 142 p. http://training.fws.gov/library/Pubs5/Lynx_consassess_2000.pdf

Ruggiero, L. F., K. B. Aubry, S. W. Buskirk, L. J. Lyon, and L. J. Zielinski. 1994. *The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine in the Western United States.* General Technical Report RM-254. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. http://www.fs.fed.us/rm/pubs_rm/rm_gtr254.html

Ruggiero, L. F., K. B. Aubry, S. W. Buskirk, G. M. Koehler, C. J. Krebs, K. S. McKelvey, and J. R. Squires. 2000. *Ecology and conservation of lynx in the United States.* General Technical Report RMRS-GTR-30WWW. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. http://www.fs.fed.us/rm/pubs/rmrs_gtr030.pdf

Ryan, Loreen A.; Carey, Andrew B. 1995. *Biology and management of the western gray squirrel and Oregon white oak woodlands: with emphasis on the Puget Trough.* Gen. Tech. Rep. PNW-GTR-348. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 36 p. http://www.fs.fed.us/pnw/pubs/pnw_gtr348.pdf

Sandberg, David V.; Ottmar, Roger D.; Peterson, Janice L.; Core, John. 2002. Wildland Fire in Ecosystems: Effects of Fire on Air. Gen Tech. Rep. RMRS-GTR-42-vol. 5. Ogden, UT: U.S. Dept. of Agriculture, Forest Service, Rocky Mountain Research Station. 79p.

Sandberg, D.V., C.C. Hardy, R.D. Ottmar, J.A.K. Snell, A. Acheson, J.L. Peterson, P. Seamon, P. Lahm, D. Wade, 1999: *National strategy plan: Modeling and data systems for wildland fire and air quality.* U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, 60p.

Schaaf, M.D. 1996**.** *Development of the Fire Emissions Tradeoff Model (FETM) and application to the Grande Ronde River Basin, Oregon.* USDA Forest Service, Pacific Northwest Region. Contract No. 53-82FT-03-2 CH2M Hill.

Schellhaas, R., D. Spurbeck, P. Ohlson, D. Keenum and a. Conway. 2002. Report to the Okanogan & Wenatchee National Forests on the Results of the Frosty Creek Planning Area Fire History Research.

Schroeder, M. A. and M. Tirhi. 2003. *Washington Department of Fish & Wildlife's Priority Habitat and Species management recommendations volume IV: birds. Sharp-tailed grouse Tympanuchus phasianellus.* Washington Department of Fish and Wildlife, Olympia, WA. 14 pp. http://wdfw.wa.gov/hab/phs/vol4/stgr.pdf

Scott, J. H. and E. D. Reinhardt. 2001. *Assessing crown fire potential by linking models of surface and crown fire behavior*, Research Paper RMRS-RP-29. Ft. Collins, CO: USDA Forest Service, Rocky Mountain Research Station. 59 p.

Singleton, Peter H.; Gaines, William L.; Lehmkuhl, John F. 2002. *Landscape permeability for large carnivores in Washington: a geographic information system weighted-distance and least-cost corridor assessment.* Res. Pap. PNW-RP-549.

Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 89 p. http://216.48.37.142/pubs/viewpub.jsp?index=5093

Smith, D.M. 1962. *The practice of silviculture.* New York: John Wiley. 578p.

Snell, J.A.K and J.K. Brown. 1980. *Handbook for predicting residue weights of Pacific Northwest conifers*. General Technical Report, PNW-GTR-103. Portland, OR: Pacific Northwest Research Station, USDA Forest Service. 44 pp.

Snyder, Gordon, Harold Haupt and George Belt. 1975. *Clearcutting and Burning Slash Alter Quality of Stream Water in Northern Idaho,* USDA Forest Service Research Paper INT-168, Intermountain Forest and Range Experiment Station, Ogden Utah, 34 pages.

Stratton Richard D., *Assessing the effectiveness of landscape fuel treatments on fire growth and behavior*, Journal of Forestry, October/November 2004

Stephens, S.L.; Moghaddas, J.J. 2005. *Silvicultural and reserve impacts on potential fire behavior and forest conservation:* Twenty-five years of experience from the Sierra Nevada mixed conifer forests. Biological Conservation 125 (2005) 369-379.

Sterling, J. C. 1999. *Gray Flycatcher (Empidonax wrightii). In The Birds of North America, No. 458* (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Stoffel. K.L., compiler, 1990, Geologic map of the Oroville 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth resources Open File report 90-11, 58 p, 1 plate.

Tenny, David. Statement of David Tenny, Deputy Under Secretary, Natural Resources and the Environment, United States Department of Agriculture. Before the United States Senate Committee on Energy and Natural Resources, Concerning 2002 Wildfire Season, 2003 Preparedness. March 13, 2003

USDA Forest Service 1998, Bonaparte Watershed Assessment, Tonasket Ranger District, 1998

USDA Forest Service 1997, Eastside Draft Environmental Impact Statement. Interior Columbia Basin Ecosystem Management Project.

USDA Forest Service. 2000. *Fire Regime Descriptions, Preliminary Report*. Okanogan and Wenatchee National Forests, Wenatchee, WA.

USDA Forest Service. 1995. *Interim Management Dorestion for the Continuation of Interim Management Direction Establishing Riparian Ecosystem and Wildlife Standards for Timber Sales, Region 6.* Portland Oregon. 7 pp.

USDA Forest Service. 2004. *Landtype associations of North Central Washington*, Final Report. Okanogan and Wenatchee National Forests, Wenatchee, WA.

USDA Forest Service. 1989. *Land and Resource Management Plan. Okanogan National Forest. Portland, Oregon.*

USDA Forest Service. 1997. *Middle Methow Watershed Assessment*. Okanogan National Forest, Methow Valley Ranger District.

USDA Forest Service, Okanogan and Wenatchee National Forest Fire Management Plan 2002

USDA Forest Service, 1990, Publication R6-REC-TP-016-90, *Visual Quality Objectives in Douglas-Fir Forests*

USDA Forest Service 1998, West Fork Sanpoil Watershed Assessment, Tonasket Ranger District, March 1998.

USDA NRCS. 2005. *National Soil Survey Handbook, Title 430-VI*. Available online at http://soils.usda.gov/technical/handbook/ (March 27, 2007). (change USDA-NSH).

USDA/USDI, 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. US Department of Agriculture, US Forest Service and US Department of Interior. (This document is known as PACFISH)

U.S. Fish and Wildlife Service. 1986. *Recovery plan for the pacific bald eagle*. Portland, Oregon.

U.S. Fish and Wildlife Service. 1987. *Northern Rocky Mountain Wolf Recovery Plan.* U.S. Fish and Wildlife Service, Denver, Colorado, 119pp. available at http://www.ladywolf.com/pdfs/nrmwrp-full.pdf

U.S. Fish and Wildlife Service. 1993. *Grizzly bear recovery plan*. Missoula, Montana. 181 pp.

U.S. Fish and Wildlife Service. 1994. *Wolf Biology and Ecology.* Appendix 2: Technical Summary. *in* Final EIS: The Reintroduction of Gray Wolves to Yellowstone National Park and Central Idaho. May 1994, section 6:27-31. US Fish and Wildlife Service, Helena MT. available at http://www.ladywolf.com/pdfs/part6.pdf

U.S. Fish and Wildlife Service. 1997. *Grizzly bear recovery plan supplement: North Cascades Ecosystem recovery chapter*. Missoula, Montana. 35 pp.

USDA NRCS. 2004. *Soil Survey Okanogan-Methow Highlands Area, Okanogan County, Washington*. Natural Resources Conservation Service, Spokane, WA.

Washington State Department of Ecology. 1997. Ambient Levels, Bonaparte Creek above Tonasket. Olympia, WA. 1 page. Internet location: http://www.ecy.wa.gov/apps/watersheds/streambio/station.asp?sta=16

Washington State Department of Natural Resources. 1996. Washington Forest Practices Board Manual: Standard Methodology of Conducting Watershed

Analysis: Hydrologic Change module. Washington State Department of Natural Resources, Olympia, Washington. 54 pages.

Washington Priority Habitats and Species Database Records (WAPHS). 2006. *Information regarding species occurrences within the watershed surrounding with this project.* Database maintained at WDFW Headquarters, Olympia, WA. http://wdfw.wa.gov/hab/phspage.htm

Waitt, R.B. 1972. *Geomorphology and Glacial Geology of the Methow Drainage Basin, Eastern North Cascade Range, Washington*. Ph.D. Dissertation. University of Washington

Waldron, L.J. and S. Dakessian. 1982. *Effects of grass, legumes, and tree roots on soil shearing resistance.* Soil Science Society of America Journal. 46:894-899

Wert, S. and B.R. Thomas. 1981. *Effects of skid roads on diameter, height, and volume growth in Douglas-fir*. Soil Science Society of America Journal, 45(3):629-632.

Woodruff, K. and H. Ferguson. 2005. *Washington Department of Fish & Wildlife's Priority Habitat and Species management recommendations volume V: Mammals Townsend's big-eared bat (Coryhorhinus townsendii)* **.** Washington Department of Fish and Wildlife, Olympia, WA. 13pp. http://wdfw.wa.gov/hab/phs/vol5/townsendsbat.pdf

Appendix B
Management Direction and Laws and Guidance Relating to the Desired and Existing Condition

Direction

This project implements (is tiered to) the Okanogan National Forest Land and Resource Management Plan final Environmental Impact Statement (USDA Forest Service 1989). The final EIS has an attached Forest Plan (LRMP) that provides management direction for this area. In addition, management direction for the area is provided in three major Forest Plan amendments:

> Regional Forester Amendment #2 - Revised Continuation of Interim Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales (USDA Forest Service 1995);
> PACFISH – Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (USDA Forest Service 1995)

Forest Plan Forest-wide management direction specific to developing the Purpose and Need for this project is as follows:

> Treatment methods shall be selected based on appropriate analysis where natural fuel accumulations create a fuel profile that poses an unacceptable impediment to current or future protection and management (LRMP, page 4-52);
> No scheduled or non-scheduled timber harvest or firewood collection shall be permitted in mixed conifer old growth stands (LRMP, page IV-33).
> Treatment of natural fuels shall be prohibited in identified old growth stands (LRMP, page 4-53).

The Forest Plan allocated the project area to Management Areas 14 and 26. Specific management direction important to developing the Purpose and Need for this project is as follows:

> Management Area 14 (LRMP, page 4-85)
> - Limit acres burned by habitat damaging wildfires;
> - Treat fuels to reduce the risk to acceptable levels. Prescribe a level of fuel treatment to protect timber stands, wildlife values, and other resources from unacceptable losses caused by wildfire;
> - Place fire tolerant stands on a prescribed burning schedule where cost effective to meet management goals;
> - Suppress insects and diseases when adversely affecting vegetation essential for maintaining wildlife habitat and/or unacceptable damage to resources would occur if no controls are applied;
> - Stands where uneven-aged management is applied shall be generally free of serious pathogens such as root rots and dwarf mistletoe.
> -
>
> Management Area 26 (LRMP, page 4-109)
> - Limit acres burned by habitat-damaging wildfires;

- Fuels treatment, including the use of prescribed fire, shall provide, where practicable, for the retention and/or enhancement of key wildlife habitat.
- Suppress insects and diseases when adversely affecting vegetation essential for maintaining wildlife habitat and/or unacceptable damage to resources would occur if no controls are applied;
- Stands where uneven-aged management is applied shall be generally free of serious pathogens such as root rots and dwarf mistletoe

Regional Forester Amendment #2 directs management activities to retain or encourage the development of late and old structure (LOS) where it is currently deficient, consistent with the historic range of variability (HRV) of the biophysical environments. Regional Forester Amendment #2 requires no net loss of LOS where it is currently deficient. Timber sale activities can occur in LOS where LOS is within or above HRV if treatments maintain or enhance LOS. In addition, multiple canopy LOS can be manipulated toward single canopy LOS where there is a deficiency of single canopy LOS.

PACFISH sets Riparian Management Objectives (RMOs) to be applied within Riparian Habitat Conservation Areas (RHCAs). Timber harvest is allowed where silvicultural practices are applied to develop desired vegetation characteristics needed to attain RMOs, as long as such practices do not retard attainment of RMOs, and avoid adverse effects to anadromous or inland native fish. Fuel treatments are required to be designed so that they do not prevent attainment of RMOs and minimize impacts to riparian ground cover and vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression could perpetuate or be damaging to long-term ecosystem function in anadromous or inland native fish habitat. Prescribed burn projects and prescriptions should be designed to contribute to attainment of RMOs.

This project incorporates appropriate management direction from the 1988 Managing Competing and Unwanted Vegetation final Environmental Impact Statement (FEIS) and its associated mediated agreement. The Federal District Court of Oregon recently raised seven concerns regarding the 1988 FEIS, six of which related to the use of herbicides. This project does not propose any use of herbicides. The first concern raised by the Court was the lack of understanding and assessment of the causes and the increasing spread of noxious weeds. Information covering this subject is analyzed and disclosed in the existing condition information for the Noxious Weed section in Chapter 3 of this Environmental Assessment.

This project is being prepared under the authorities of the Healthy Forests Restoration Act (HFRA, 2003) because it is an authorized fuels reduction project within the Wildland-Urban Interface. The homes and structures around Finley Canyon qualify as at risk communities, and surrounding lands are within the wildland urban interface. HFRA gives new authorities for fuels reduction projects that are within the wildland urban interface. One of the primary purposes of the HFRA is to reduce wildfire risk to communities, municipal water supplies, and other at-risk Federal land through a collaborative process of planning, prioritizing and implementing hazardous fuels reduction projects. HFRA also recognizes the purpose of protecting, restoring and enhancing forest ecosystem components.

<u>Guidance</u>

Additional guidance for this project can be found in the Okanogan and Wenatchee National Forests Dry Site Strategy (2000). The dry site strategy was designed to focus vegetation treatments in areas which historically experienced frequent ground fire, such as the Finley HFRA Thin area, most of which is classified in the Dry Site Strategy as dense, dry forest. According to the Dry Site Strategy:

> *Research has shown that stand structure and composition across the dry forests of the Wenatchee and Okanogan National Forests are vastly different today from pre-settlement conditions (Everett et al. 1997, 1995, 1996). Currently, dry forests on the Wenatchee and Okanogan National Forests support significantly greater numbers of trees than in the past…Additionally, species composition has shifted from predominantly ponderosa pine to Douglas-fir or grand fir as the dominant species. The shift to dense forests with higher percentages of small trees, and a species composition higher in Douglas-fir and grand fir, has significantly increased the risk of lethal stand replacement fires where, prior to settlement by Euro-Americans, low intensity non-lethal fires occurred*

The lands in the Finley HFRA Thin area are classified as Fire Regimes I (80%) and II. Fire Regime I has a fire return interval of 0-35 years and low to mixed severity. Surface fires are the most common in these areas. Fire Regime III has a variable fire return interval (35-100 years) with mixed severity (less than 75% of the dominant overstory vegetation replaced). The boundary between these two fire regimes is not sharply defined. The more frequent return of fire within Fire Regime I would occasionally extend into adjacent Fire Regime III especially where it lies directly uphill from Fire Regime I, or is intermingled because of topography. Most of the Finley HFRA Thin area is within Condition Class III, where Fire Regimes have been substantially altered from historic range. Fire frequencies have departed from historical frequencies, vegetation has been substantially altered, and the stands are at high risk of losing key ecosystem components. Several key recreation areas are located at the end of dead end roads surrounded by Condition Class III stands on all sides.

The Dry Site Strategy identifies eight management objectives for protecting, maintaining or enhancing forest health on dry forests:

> *Reduce stand density (number of trees per acre)*
> *Alter species composition*
> *Reduce fuel loads to conditions consistent with pre-settlement fire regimes*
> *Maintain tree density consistent with pre-settlement fire regimes*
> *Reforest created openings*
> *Maintain desired fuel levels consistent with inherent fire regimes*
> *Maintain native grass and shrub communities*
> *Reduce susceptibility to insects/disease occurrence outside of endemic levels*

In 2004, the Okanogan and Wenatchee National Forests completed an assessment of the health of the forests. In a peer reviewed report entitled “Forest Health Assessment for the Okanogan and Wenatchee National Forests” (Townsley et al., 2004), the Forest discloses the current situation on the forest, ecological processes that influence fire and insects and diseases and how wildlife ecology is affected by these disturbances. The report’s “North Zone” findings include the Finley HFRA Thin area. Forest vegetation was found to be much more dense in the dry and mesic forest types compared to pre-

settlement conditions, with a strong tendency toward multiple canopy structure, with small, medium and large trees occurring on the same acre. Conclusions of importance to the Finley HFRA Thin area were:

- The current structure of vegetation and the condition of fuels create a high risk of severe wildfire in the wildland urban interface.
- The acreage of dense, multiple-canopy forest vegetation in dry and mesic forest types is increasing at a rate that exceeds current and projected treatment levels.
- Mesic forests have many similar characteristics of dry forest and will respond to fire, thinning, and other disturbances in a similar way.
- Dense forest conditions and abundant accumulated fuel found on much of the Okanogan and Wenatchee National Forests cannot be sustained under current or predicted climatic conditions.
- The Dry Site Strategy should be updated to incorporate mesic forest types.

The area around Finley Canyon is within the Benson Creek watershed and was analyzed in the Middle Methow Watershed Assessment in 1997. The Watershed Assessment compared existing conditions to desired conditions identified in the amended Forest Plan and recommended:

- Silvicultural treatments to reduce hazardous fuels and reduce stand densities to increase residual stand health and vigor.
- Prescribed fire to reduce the risk of stand replacement fires, develop desired stand characteristics and improve the health and vigor of stands;
- Retain existing late/old single canopy structure by a combination of fuel reduction and underburning
- Prescribed fire to reduce fire intensity and severity in the rural/forest interface and;
- Development of a Community Fire Plan for the area.

The Lynx Conservation Assessment Strategy (LCAS -2000) has been identified as the “Best Science” from which to analyze the effects on Canada Lynx. Its conservation measures will be used to evaluate the effects of the alternatives on Canada lynx.