ENVIRONMENTAL ASSESSMENT

FOR THE

Bitter Herrig Timber Sale

PREPARED BY

Tyrell Colombo
Management Forester

Kalispell Unit, Northwestern Land Office

Montana Department of Natural Resources and Conservation

August 2013

CHECKLIST ENVIRONMENTAL ASSESSMENT

Project Name:	Bitter Herrig Timber Sale
Proposed Implementation Date:	November 2013
Proponent:	Department of Natural Resource and Conservation, Northwest Land Office, Kalispell Unit
Location:	Section 22, Township 28N, Range 25W Section 34, Township 28N, Range 25W Section 36, Township 28N, Range 25W
County:	Flathead County

I. TYPE AND PURPOSE OF ACTION

The Montana Department of Natural Resources and Conservation (DNRC) Kalispell Unit, is proposing a timber harvest on trust lands located near Little Bitterroot Lake in Section 22, Section 34 and Section 36 T28N, R25W (See Attachment 1, Area Maps, and Project Plan). The sections are located approximately 20 miles west of Kalispell. The DNRC estimates that approximately 6MMBF from 1,060 acres would be harvested within these sections. Silvicultural prescriptions would include commercial thin, seed tree and old growth restoration. Approximately 7 miles of road would be built to access the sale area. The proposed action would produce estimated revenue of $535,000 for the Public Buildings (PB) Trust and $150,000 for the Common Schools (CS) Trust and an additional $230,000 in Forest Improvement fees.

Proposed Project Objectives Include:

- Increasing the vigor and health of the stand by limiting the effects of insects and disease as well as reducing the stocking level.
- Increasing forest productivity beneficial to future actions.
- Generating revenue for the Common School and State Normal School Trust Funds.

Lands involved in this proposed project area are held by the State of Montana in trust for the support for specific beneficiary institutions such as the Common Schools Trust Grant, and other state institutions (Enabling Act of February 22, 1889: 1972 Montana Constitution, Article 1 Section 11). The Board of Land Commissioners and the DNRC are required, by law, to administer these trust lands to produce the largest measure of reasonable and legitimate return over the long run for these beneficiary institutions (Section 77-1-202, MCA). DNRC would manage lands involved in this project in accordance with the State Forest Land Management Plan (SFLMP: DNRC 1996), the Administrative Rules for Forest Management (Rules: ARM 36.11.401 through 471) and the Montana DNRC Forested State Trust Lands Habitat Conservation Plan (HCP) as well as other applicable state and federal laws.

II. PROJECT DEVELOPMENT

1. PUBLIC INVOLVEMENT, AGENCIES, GROUPS OR INDIVIDUALS CONTACTED:

The legal advertisement and scoping letters were for multiple sales that are proposed in the area including this timber sale. A legal advertisement (public notice) was placed in the *Daily Inter Lake* on 9/4/11, 9/11/11, 9/18/11, and 9/25/11. There were also 35 letters sent out to all adjacent land

owners and interested parties. Seven comments were received concerning the proposed projects:

- Two comments were in support of the projects.
- One comment had concerns about big game winter range and new road construction.
- Two comments were concerned with Herrig Creek located in Section 36.
    - One comment was received in regards to new road construction in Section 36.
    - One comment was received concerning Chinese ovens located in Section 36.
- Hydrological, soils, wildlife, and vegetative concerns were identified by DNRC specialists and field foresters for the effects of the Action and No Action Alternatives.

Issues and concerns have been resolved or mitigated through project design or would be included as specific contractual requirements of the project. Recommendations to minimize the direct, indirect, and cumulative impacts have been incorporated in the project design.

2. OTHER GOVERNMENTAL AGENCIES WITH JURISDICTION, LIST OF PERMITS NEEDED:

U.S. Fish and Wildlife Service - In December 2011, the U.S. Fish and Wildlife Service (USFWS) issued DNRC an Incidental Take Permit under Section 10 of the Endangered Species Act. The Permit applies to select forest management activities affecting the habitat of grizzly bear, Canada lynx, and three fish species — bull trout, westslope cutthroat trout, and Columbia redband trout — on project area lands covered under the HCP. DNRC and the USFWS will coordinate monitoring of certain aspects of the conservation commitments to ensure program compliance with the HCP.

Montana DEQ-The DNRC is classified as a major open burner by the Montana Department of Environmental Quality (DEQ), and is issued a permit from the DEQ to conduct burning activities on State lands managed by the DNRC. As a major open burning permit holder, DNRC agrees to comply with all of the limitations and conditions of the permit.

Montana/Idaho Airshed Group-The DNRC is a member of the Montana/Idaho Airshed Group which was formed to coordinate burning activities among members in order to minimize or prevent smoke impacts while using fire to accomplish land management objectives and/or fuel hazard reduction. As a member of the Airshed Group, DNRC agrees to burn only on days approved for good smoke dispersion as determined by the Smoke Management Unit in Missoula, MT.

Other permits needed for the proposed action:

- Special Use Permit from U.S. Fish and Wildlife Service (For use of U.S.F.W.S. roads)
- 124 Permit from Montana Fish Wildlife and Parks

3. ALTERNATIVE DEVELOPMENT:

No Action Alternative: Under this alternative, there would be no management activities taking place.

Action Alternative: Under the Action Alternative, the DNRC would harvest approximately 6MMBF on 1,060 acres in the Pleasant Valley area. The timber would be harvested using conventional ground based and line skidding. The shade tolerant species and those infected or susceptible to insect and disease mortality would be removed to increase forest health and decrease the stocking level. There would be approximately 7 miles of road built to access the section.

Issues surrounding this proposed action have either been resolved or mitigated through project design or would be included as specific restrictive requirements of this project.

Recommendations to minimize direct, indirect and cumulative effects have been incorporated in the project design (Attachment I, Area Maps; Attachment II, Resource Analyses; Attachment III, Prescriptions; Attachment IV, Mitigations; Attachment V, Preparers and Consultants).

III. IMPACTS ON THE PHYSICAL ENVIRONMENT

- *RESOURCES potentially impacted are listed on the form, followed by common issues that would be considered.*
- *Explain POTENTIAL IMPACTS AND MITIGATIONS following each resource heading.*
- *Enter "NONE" If no impacts are identified or the resource is not present.*

4. GEOLOGY AND SOIL QUALITY, STABILITY AND MOISTURE:

Harvest activities would comply with Best Management Practices (BMP's).
Mitigations include:

- limiting equipment operations to minimize soil compaction and rutting,
- planning appropriate skid trails,
- limiting skidding to slopes less than 40% and less than 20% of the harvest unit acreage,
- limiting disturbance and scarification,
- retaining adequate amounts of large woody debris and fine litter following harvest.

Thus, direct, indirect, and cumulative effects to the soil resource would be minimal.

Please refer to Attachment II, Soils Analysis for a more detailed analysis, and Attachment IV, Mitigations for a more detailed description of mitigations.

5. WATER QUALITY, QUANTITY AND DISTRIBUTION:

Harvest activities would:

- use existing roads and segments of existing skid trails where feasible,
- require DNRC approved drainage features on skid trails,
- comply with BMPs and all laws pertaining to Streamside Management Zones (SMZs).

Thus, direct, indirect, and cumulative effects to water resources would be minimal.

Please refer to Attachment II, Water Resources Analysis for a more detailed analysis, and Attachment IV, Mitigations for a description of mitigations.

6. AIR QUALITY:

The project is located in Montana State Airshed 2 which encompasses all of Flathead and Lake Counties, most of Sanders County, and portions of Missoula and Powell Counties. This Airshed contains the Kalispell Impact Zone, an area that is smoke sensitive and has existing air quality problems. The proposed project area occurs outside of this impact zone. Under the Action Alternative, potential post-harvest burning of logging slash would produce some particulate matter. The DNRC would make all attempts to utilize logging slash to minimize the amount of burning needed. Burning within the project area would be short in duration and would be conducted when conditions favored good to excellent ventilation and smoke dispersion as determined by the Montana Department of Environmental Quality and the Montana/Idaho Airshed Group. DNRC would burn only on approved days.

Harvesting and log hauling could create dust which may affect the air quality within the project area and along the haul route. Harvesting operations would be short in duration thereby minimizing dust dispersal within the local residential areas.

Direct, indirect, and cumulative effects to air quality due to slash pile burning, harvesting, and hauling associated with the proposed action are expected to be minimal.

7. VEGETATION COVER, QUANTITY AND QUALITY:

Under the Action Alternative, timber harvest would occur on approximately 1,060 acres and would promote the development of the desired future condition of ponderosa pine and western larch/Douglas-fir. The overall forest health would improve due to the removal of unhealthy suppressed trees that are susceptible to insects and diseases.

The occurrence of noxious weeds may increase due to logging disturbance.

Please refer to Attachment II, Vegetation Resources Analysis for a more detailed analysis, and Attachment IV, Mitigations for a description of mitigations

8. TERRESTRIAL, AVIAN AND AQUATIC LIFE AND HABITATS:

A DNRC wildlife biologist and hydrologist reviewed the project area, transportation system and harvest plan. There were seven wildlife resources that were identified and analyzed. There were fish present in Herrig Creek which is located within the project area so fish habitat will be analyzed in the watershed analysis.

Please refer to Attachment II: Resource Analysis, Wildlife Analysis and Water Resources Analysis for a more detailed analysis and Attachment IV, Mitigation for a description of specific mitigations.

9. UNIQUE, ENDANGERED, FRAGILE OR LIMITED ENVIRONMENTAL RESOURCES:

A DNRC wildlife biologist reviewed the project area, transportation system and harvest plan. Six threatened, endangered and sensitive species were identified.

Please refer to Attachment II: Resource Analysis, Wildlife Analysis for a more detailed analysis and Attachment IV, Mitigation for a description of specific mitigations.

10. HISTORICAL AND ARCHAEOLOGICAL SITES:

A scoping notice was sent to the DNRC archeologist, there were historical sites identified in Section 36. The Lions Camp is located in the SW1/4 SW1/4 Section 36 and has a historical building. The camp is outside of the project area for the proposed activities. There are site leads of three possible Chinese ovens in the NW1/4 of section 36 that are out of the project area. The route of the Great Northern Railroad runs though Section 36. There is a draw crossing with a rock drainage tunnel that was built for the railroad. This section of the old railroad bed is part of the existing road system to access the section. The road will be used during proposed activities but will not be altered from its current state. If there are any other sites or artifacts found, the area will be flagged off and no equipment will be allowed to operate in the immediate area.

11. AESTHETICS:

The project area can be seen from Pleasant Valley Road and Little Bitterroot Lake. Harvest activities are expected to change the visual quality of the project area. Harvest units would appear to be lighter in color due to the reduction in tree cover. Since many of the sections surrounding the project area have been harvested in the past, the proposed action is not expected to create any new or unique lines, shapes, or colors that do not already occur within the

area. In fact, the impacts would be consistent with the surrounding landscape. Over time, both the existing roads and the open areas within the harvest area would become less visible due to natural regeneration. Direct, indirect, and cumulative aesthetic impacts associated with the proposed action are thus expected to be minimal and relatively short in duration.

12. DEMANDS ON ENVIRONMENTAL RESOURCES OF LAND, WATER, AIR OR ENERGY:

No direct, indirect, or cumulative impacts would be expected under either alternative.

13. OTHER ENVIRONMENTAL DOCUMENTS PERTINENT TO THE AREA:

Haskill Pass Timber Sale EA (1976)
Little Bitterroot Lake Timber Sale EA (1981)

IV. IMPACTS ON THE HUMAN POPULATION

- *RESOURCES potentially impacted are listed on the form, followed by common issues that would be considered.*
- *Explain POTENTIAL IMPACTS AND MITIGATIONS following each resource heading.*
- *Enter "NONE" If no impacts are identified or the resource is not present.*

14. HUMAN HEALTH AND SAFETY:

Human health would not be impacted by the proposed timber sale or associated activity. There are no unusual safety considerations associated with the proposed timber sale.

15. INDUSTRIAL, COMMERCIAL AND AGRICULTURE ACTIVITIES AND PRODUCTION:

Timber harvest would provide continuing industrial production in the Flathead Valley.

16. QUANTITY AND DISTRIBUTION OF EMPLOYMENT:

People are currently employed in the wood products industry in the region. According to Montana Bureau of Business and Economic Research, approximately 10 jobs are supported for one year for every 1 MMBF that is harvested. For this project, that equates to approximately 15 jobs per year over four years.

17. LOCAL AND STATE TAX BASE AND TAX REVENUES:

People are currently paying taxes from the wood products industry in the region. Due to the relatively small size of the timber sale, there would be no measurable cumulative impact from this proposed action on tax revenues.

18. DEMAND FOR GOVERNMENT SERVICES:

Log trucks hauling to the purchasing mill would result in temporary increased in traffic on Pleasant Valley Rd. and US Highway 2. This increase would be considered a normal contributor to the activities of the local community and industrial base.

19. LOCALLY ADOPTED ENVIRONMENTAL PLANS AND GOALS:

There are no locally adopted environmental plans for this area.

20. ACCESS TO AND QUALITY OF RECREATIONAL AND WILDERNESS ACTIVITIES:

All three sections receive use from hunters and hikers. Implementation of the proposed project will not displace any current uses of the area. Use is expected to remain the same or increase following this project.

21. DENSITY AND DISTRIBUTION OF POPULATION AND HOUSING:

There would be no measurable impacts related to population and housing due to the relatively small size of this project, and the fact that people are already employed in this occupation in the region.

22. SOCIAL STRUCTURES AND MORES:

No impacts related to social structures and mores would be expected under either alternative.

23. CULTURAL UNIQUENESS AND DIVERSITY:

No impacts related to cultural uniqueness and diversity would be expected under either alternative.

24. OTHER APPROPRIATE SOCIAL AND ECONOMIC CIRCUMSTANCES:

Costs, revenues and estimates of return are estimates intended for relative comparison of alternatives. They are not intended to be used as absolute estimates of return. The estimated stumpage is based on comparable sales analysis. This method compares recent sales to find market value for stumpage. These sales have similar species, quality, average diameter, product mix, terrain, date of sale, distance from mills, road building and logging systems, terms of sale, or anything that could affect a buyer's willingness to pay for timber. The effect of the proposed project will produce an estimated return of $535,000 for the Public Buildings (PB) Trust and $150,000 for the Common Schools (CS) Trust and an additional $230,000 in Forest Improvement fees.

The no-action alternative would not produce revenue for the Common Schools (CS) or Public Buildings Trust.

EA Checklist Prepared By:	**Name:**	Tyrell Colombo	**Date:**	August 12, 2013
	Title:	Management Forester		

V. FINDING

25. ALTERNATIVE SELECTED:

The Montana Department of Natural Resources and Conservation has completed the environmental assessment (EA) for the proposed Bitter Herrig Timber Project on State School Trust Lands described on page 3 of this document. After a thorough review of the EA, public comments, the project file, Department policies, standards, and guidelines, I have made the following decisions concerning this project:

The alternatives proposed for consideration in this EA were the No-Action and Action Alternatives. The Action Alternative would allow for the harvest of approximately 6 million board feet of timber from 1,060 acres, and include 7 miles of new road construction. Information contained in the EA indicates that issues associated with vegetation (including weeds and slash disposal), water resources and soils (including road and forestry BMP's), and wildlife (including snag and woody debris recruitment, T & E species requirements, open road densities, and disturbance to nesting loons, hawks and eagles) are identified and have been resolved or mitigated by the design of the project, or those mitigations would be specific contractual requirements of the project.

The Action Alternative has been selected for the following reasons:

- The Action Alternative meets the Project Purpose and Need listed under section I. of the EA:
  1) Increasing the vigor and health of the stand by limiting the effects of insects and disease as well as reducing the stocking level.
  2) Increasing forest productivity beneficial to future actions.
  3) Sell forest products from trust lands within the project area to generate revenue for various trusts to produce the largest measure of reasonable and legitimate return over the long run for specific beneficiary institutions (*Section 77-1-202, Montana Codes Annotated (MCA)).*

- The proposed use is consistent with State and local policies, laws, and regulations.

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26. SIGNIFICANCE OF POTENTIAL IMPACTS:

Upon review of the project and the analysis herein, I find that none of the project impacts are regarded as severe, enduring, geographically widespread, or frequent. Further, I find that the quantity and quality of the natural resources, including any that may be considered unique or fragile, will not be adversely affected to a significant degree. I find no precedent for the future actions that would cause significant impacts, and I find no conflict with local, State, or federal laws, requirements, or formal plans. In summary, I find that adverse impacts would be avoided, controlled, or mitigated by the design and implementation of the project to an extent that they are not significant.

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27. NEED FOR FURTHER ENVIRONMENTAL ANALYSIS:

	EIS		More Detailed EA	X	No Further Analysis

EA Checklist Approved By:	**Name: David M. Poukish** **Title: Kalispell Unit Manager**
Signature:/s/ David M. Poukish	**Date**: 09/24/13

Attachment I

Project Area Maps

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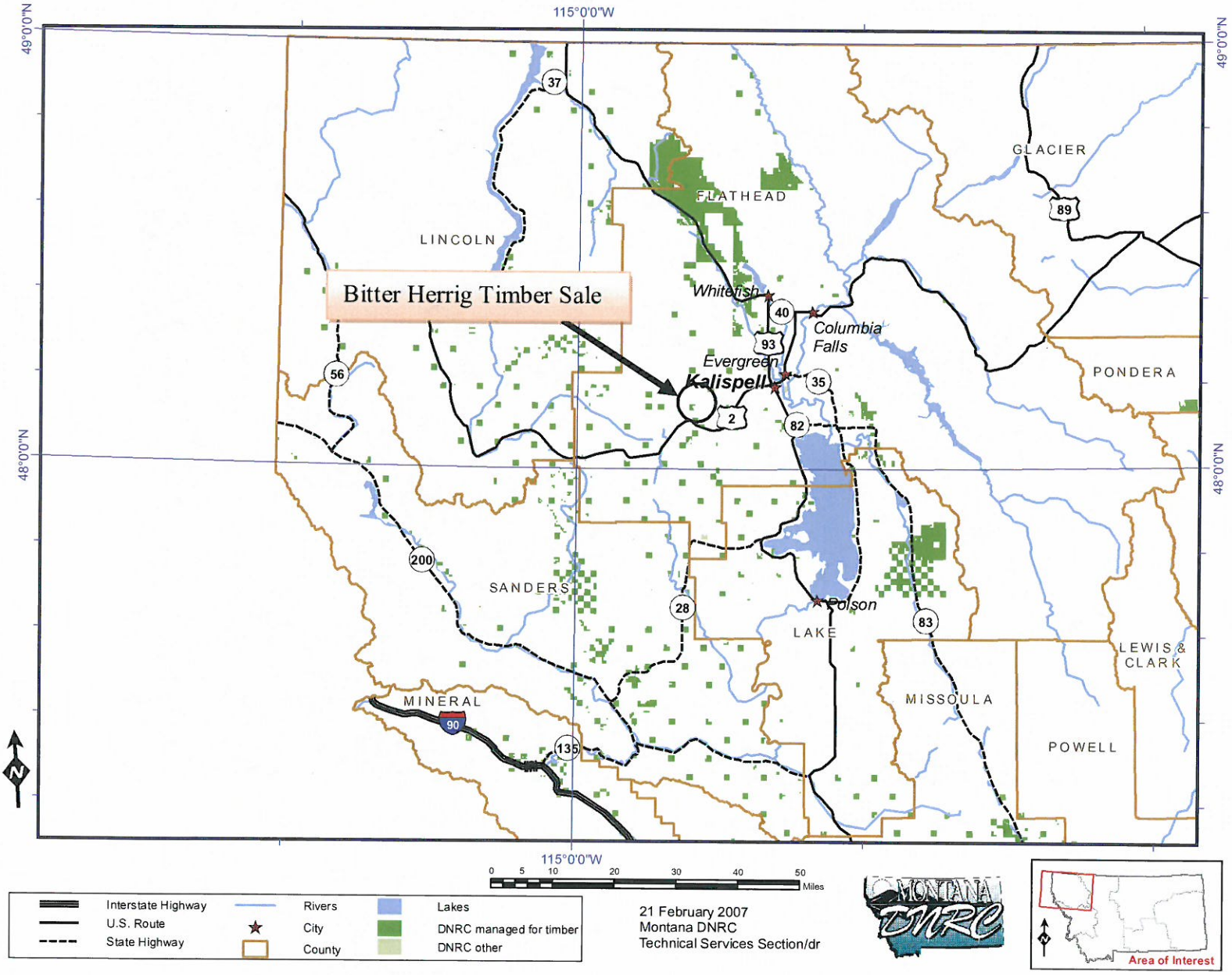
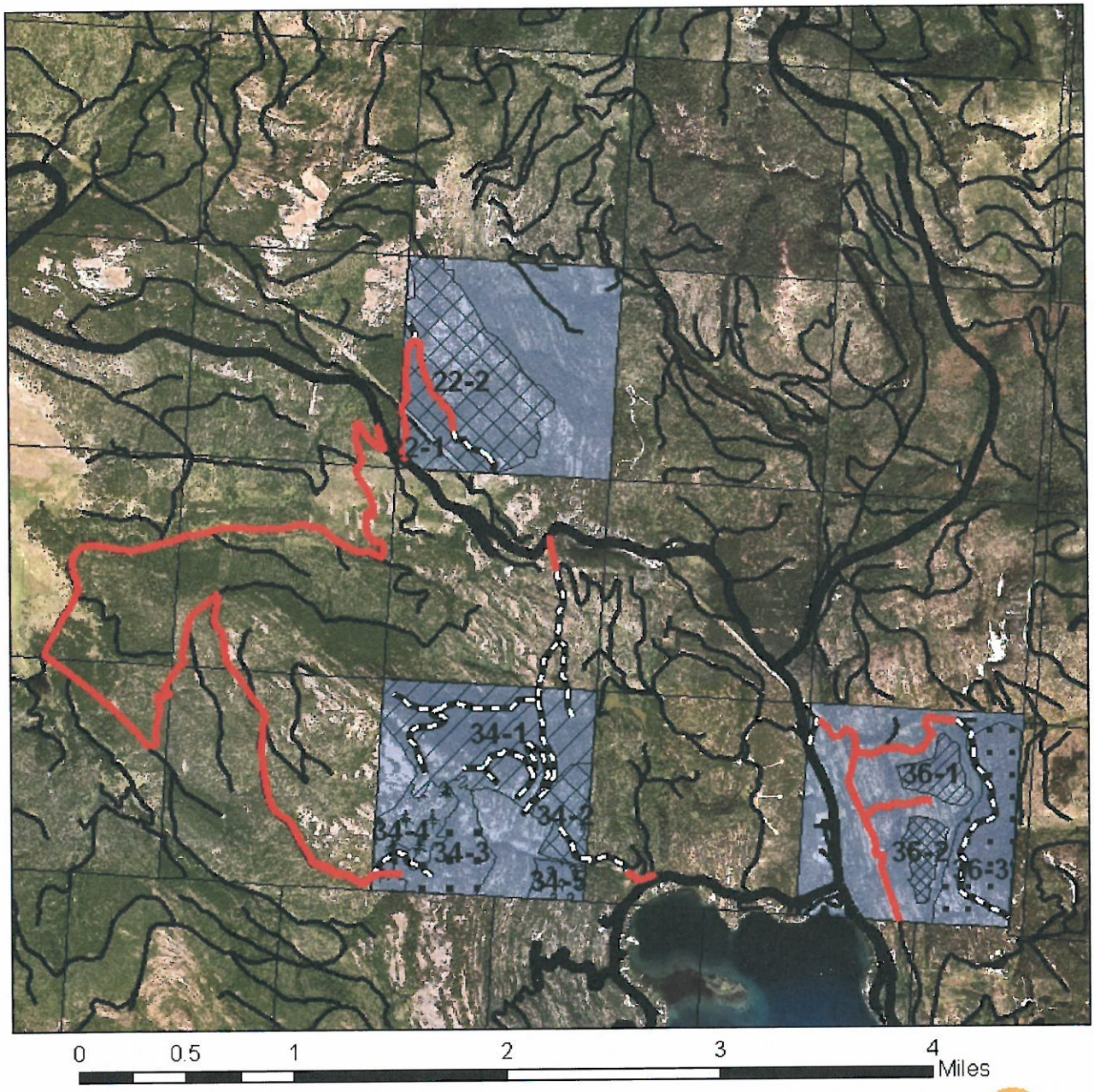
- **Vicinity Map** _____ **11**
- **Haul Route Map** _____ **12**
- **Harvest Map** _____ **13**


Bitter Herrig Timber Sale
115°0'0"W
49°0'0"N
48°0'0"N
LINCOLN
FLATHEAD
GLACIER
PONDERA
SANDERS
LAKE
MINERAL
MISSOULA
LEWIS & CLARK
POWELL
Whitefish
Columbia Falls
Evergreen
Kalispell
Polson
37
40
93
35
2
82
56
200
28
83
90
135
89
0 5 10 20 30 40 50 Miles
Interstate Highway
U.S. Route
State Highway
Rivers
City
County
Lakes
DNRC managed for timber
DNRC other
21 February 2007
Montana DNRC
Technical Services Section/dr
MONTANA DNRC
Area of Interest

Bitter Herrig Timber Sale - Haul Route Map

Sec. 22, 34, 36 T28N R25W



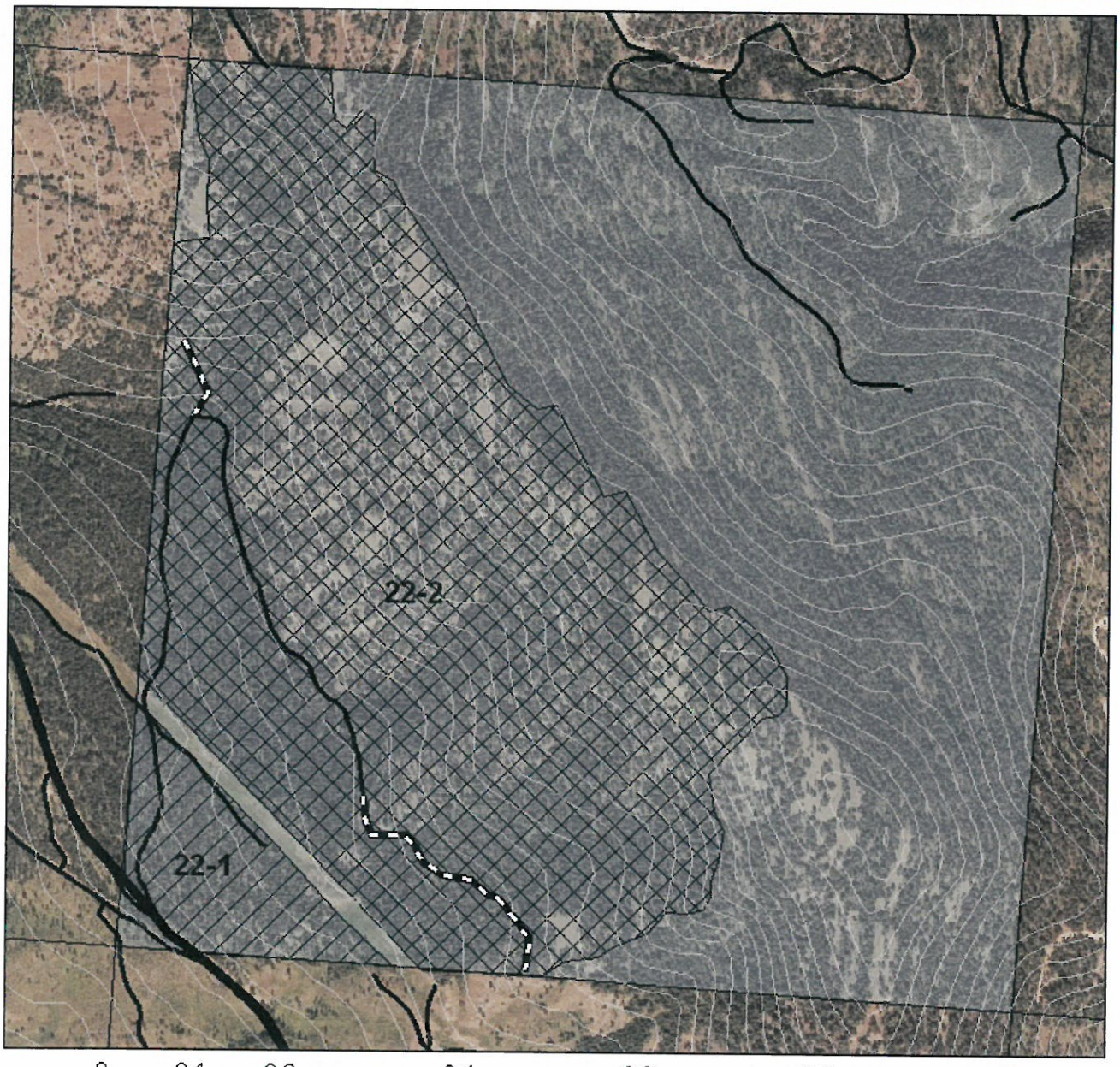
Legend

- Haul Route
- New Road Construction
- County Road
- Streams
- Existing Roads
- State Trust Lands

Montana DNRC
Northwest Land Office
Kalispell Unit

Bitter Herrig Timber Sale - Harvest Map

Sec. 22 T28N R25W



0 0.1 0.2 0.4 0.6 0.8 Miles

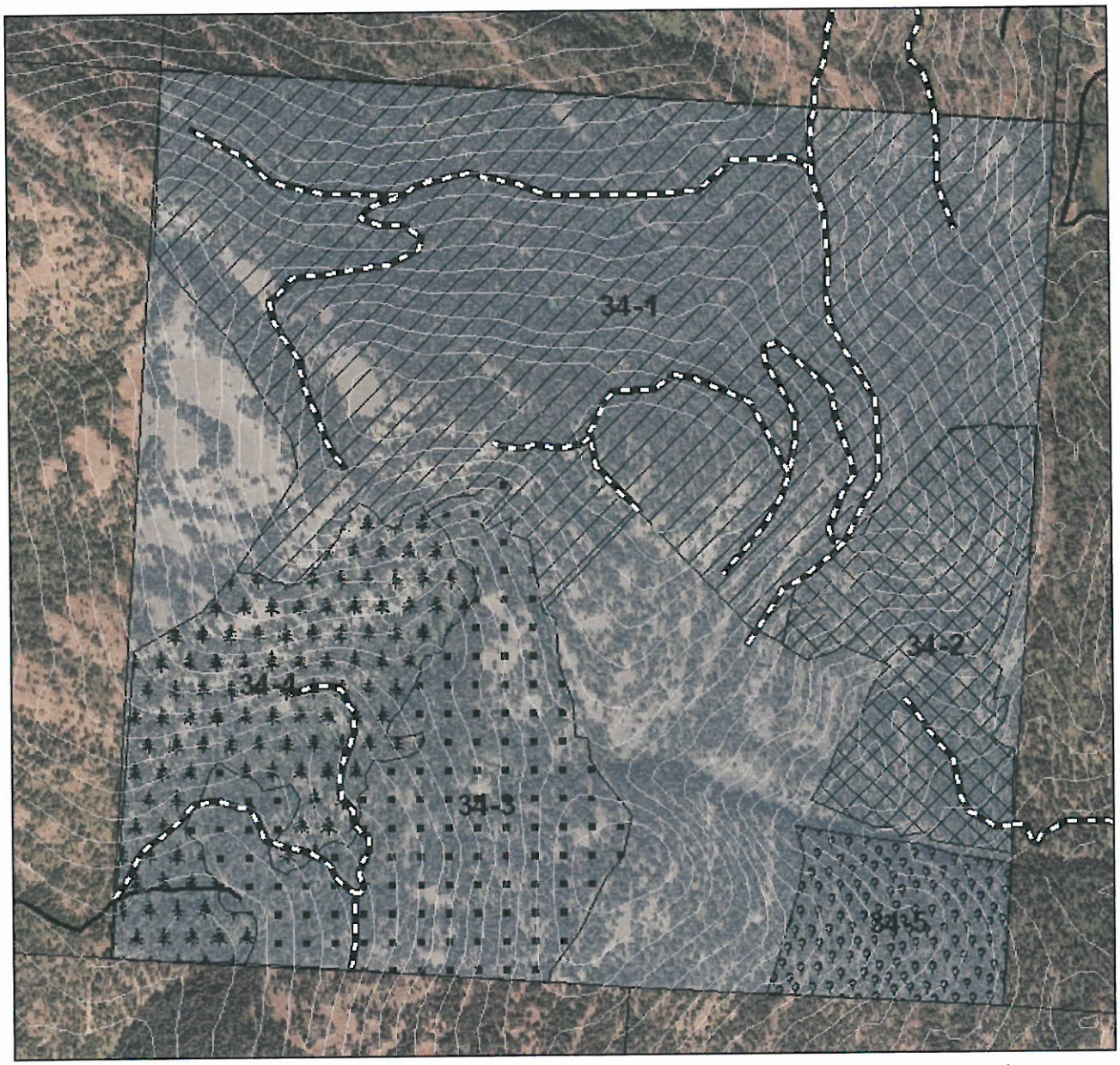
Legend

- State Trust Land
- New Road Construction
- Existing Roads
- County Road

Montana DNRC
Northwest Land Office
Kalispell Unit

Bitter Herrig Timber Sale - Harvest Map

Sec. 34 T28N R25W



0 0.125 0.25 0.5 0.75 1 Miles

Legend

State Trust Land

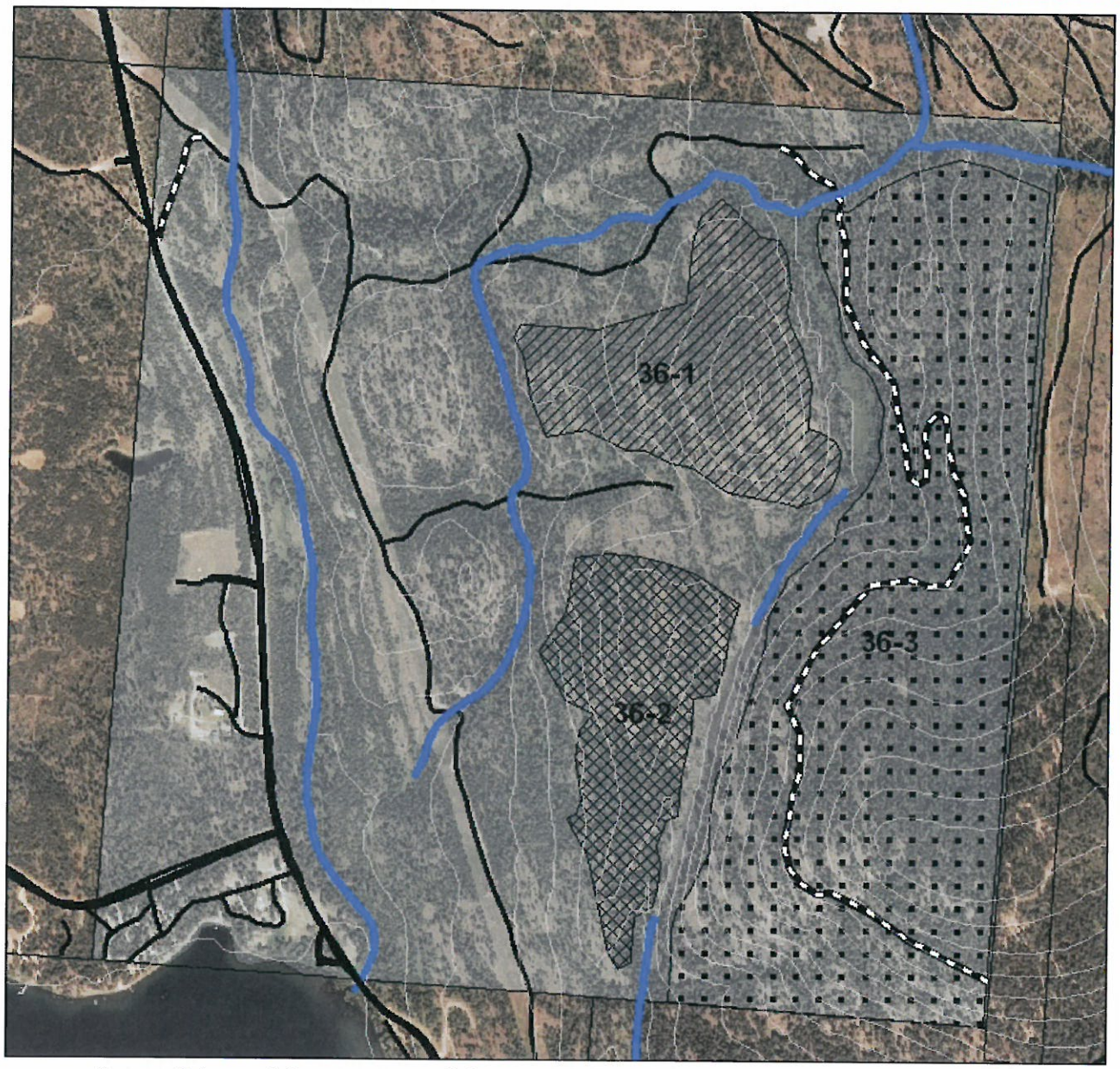
New Road Construction

Existing Roads

Montana DNRC
Northwest Land Office
Kalispell Unit

Bitter Herrig Timber Sale - Harvest Map

Sec. 36 T28N R25W



0 0.1 0.2 0.4 0.6 0.8 Miles

Legend

- State Trust Land
- New Road Construction
- Existing Roads
- County Road

Montana DNRC
Northwest Land Office
Kalispell Unit

Attachment II

Resource Analysis

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- **Vegetation Analysis** _____ **17**
- **Wildlife Analysis** _____ **23**
- **Hydrology Analysis** _____ **53**
- **Soils Analysis** _____ **61**

VEGETATION ANALYSIS

INTRODUCTION

This analysis is used to look at the existing conditions of the vegetation in the proposed area and determine the possible effects that could result from the alternatives of the project. During the initial scoping, issues were developed by the public and internally regarding vegetative concerns. The following concerns were expressed from these comments regarding proposed timber harvesting and related activities:

- Forest Health: There are concerns that endemic populations of diseases and insects are increasing on the site and have the potential to reach epidemic proportions or reduce productivity.

- Old Growth Stands: There are 74 acres of ponderosa pine old growth located within the project area.

- Fire Ecology: There is a concern that the exclusion of fire from the landscape has changed the historical stand compositions from the desired conditions.

- Forest Productivity: There are concerns with the canopy closure and the increased competition between trees which will decrease the productivity of the trees. The increase in competition will also stress the trees which will increase the trees susceptibility for disease and insect outbreaks.

GENERAL DESCRIPTION OF THE AREA

The Montana Department of Natural Resources and Conservation (DNRC) Kalispell Unit, is proposing a timber harvest on trust lands located near Little Bitterroot Lake in Section 22, Section 34 and Section 36 T28N, R25W (See Attachment 1, Area Maps, and Project Plan). The sections are located approximately 20 miles west of Kalispell. The three sections have 1,920 acres of State Trust Land. All three sections are bordered by Plum Creek land with some private land.

ANALYSIS METHOD AND AREAS

The Kalispell Unit typically prepares two to four timber sales per year. Each project is evaluated for its potential effects on lands managed by the DNRC and the surrounding landscape. Methods used in the analysis included review of stand level inventory (SLI) data, field visits, review of scientific literature, aerial photography, and consultation with other professionals. The area used to determine the direct and indirect impacts to vegetation are Section 22, Section 34 and Section 36 T28N, R25W. The area used to determine cumulative impacts is the Kalispell Unit.

EXISTING CONDITIONS

Stand History and Past Management Activities

Section 22 has been managed in the past. The southwest half of the section was logged with a selective cut in 1945 with 3.4 MMBF harvested. In 1976 the Haskill Pass timber sale produced 543 mbf from 319 acres. In 1985 there was a timber sale on the northeast half of the section that

produced 952 mbf. Section 34 has only one entry in the early 1990's. A salvage harvest occurred in the southwest corner of the section to cut all of the beetle hit ponderosa pine. There are no volume records. Section 36 has previously been managed. The Little Bitterroot Lake timber sale occurred in 1981. A seed tree harvest occurred on 260 acres that produced 2.2 MMBF.

Forest Habitat Types

The Bitter Herrig project area has Douglas-fir (*Pseudotsuga menziesii),* grand fir (abies grandis) and subalpine fir (Abies lasiocarpa) forest habitat types. The majority of the area is classified in the Douglas-fir type. This indicates that most of the project is classified as a moderately warm/dry site with some areas of cooler/moist sites located on north facing slopes and in draws. The timber production ranges from moderate to very high. Ponderosa pine, Douglas-fir, and western larch are the dominant species. There are scattered lodgepole pine and subalpine fir in the high elevations with grand fir, Engelmann spruce, and black cottonwood growing in the wet lower elevation sites.

Fire Regimes

A mosaic of even and multi-aged patches is present in the project area. The majority of the Bitter Herrig project area would be classified in a low to moderate/ mixed severity fire regime. Fire intervals are considered to be frequent, 50 years or less. Most of the project area has evidence of past fire activity on old growth trees and snags that are present. Forest stands shaped by frequent to mixed severity fires typically have an abundance of seral species in the overstory.

As a result of fire suppression, stands of the PP (ponderosa pine) and WL/DF (western larch/Douglas-fir) cover types that characteristically would have been open-grown now have thick understories of more shade tolerant species throughout both the project area and Kalispell Landscape. In general, fire return intervals have been lengthened and fire intensity has increased due to increased fuel loadings vertically and horizontally. Lower intensity, more frequent fires would have kept a larger composition of seral species and provided for less shade tolerant regeneration.

Insect and Disease Activity

Inventory and field reconnaissance were used to identify and quantify insect and disease activity in the project area.

1. Western Spruce Budworm (*Choristoneura occidentalis*)
   - Spruce budworm is defoliating the Douglas fir and true fir regeneration as well as some of the overstory trees.

2. Dwarf Mistletoe (*Arceuthobium laricis*)
   - Western larch dwarf mistletoe infecting the overstory trees on the north and east slopes of section 34. It is concentrated in clumps but where it is present it is killing off the overstory western larch.

3. Bark Beetles
   - There is evidence of Douglas-fir beetle (*Dendroctonus pseudotsugae*) in the area. The infestation is minimal but a few pockets of dead Douglas-fir have been observed. There have also been ponderosa pine and lodgepole pine with evidence of mountain pine beetle (*Dendroctonus ponderosae).*

Forest Age Class & Cover Type Distributions

Table 2–1. Current and appropriate cover types for the Kalispell Unit as of April 2013.

Cover Type	Current Cover Type (Acres	Appropriate Cover Type (Acres)	Current Type Minus (-) Appropriate Type (Acres)
SAF	1060	201	859
DF	4974	433	4541
HW	250	314	-64
LP	1684	930	754
MC	9360	1419	7941
PP	10702	17978	-7276
OTHER	3501	3118	383
WL/DF	21907	25874	-3967
WWP	1810	4981	-3171
TOTAL	55248	55248	--

SAF = subalpine fir. DF = Douglas-fir. LP = lodgepole pine. MC = mixed conifer. PP = ponderosa pine. WL/DF = western larch/ Douglas-fir. WWP = western white pine. Other = non stocked lands, nonforest, or water. The Current Type minus Appropriate Type column above lists the excess and deficit (-) acres for each Cover Type.

Table 2-1 shows the difference between the current cover types and the desired future conditions for all of the acres of state trust land under the Kalispell DNRC management. The abundance of shade tolerant cover types and the lack of seral cover types can be attributed to two things. The first is the removal of old growth western larch, Douglas-fir, ponderosa pine, and western white pine about 60-70 years ago. The second factor is the exclusion of fire which allows the more shade tolerant species to become established in the stands with low severity high frequency fire regimes.

Table 2–2. Current and appropriate cover types & stand compositions for the Pleasant Valley Timber Sale project area.

Cover Type	Current Cover Type (Acres)	Appropriate Cover Type (Acres)	Current Type Minus (-) Appropriate Type (Acres)
SAF	0	0	0
DF	94	0	94
HW	0	0	0
LP	4	0	4
MC	0	0	0
PP	510	955	-445
Other	0	0	0
WL/DF	452	95	357
WWP	0	10	-10
TOTAL	1060	1060	--

SAF = subalpine fir. DF = Douglas-fir. LP = lodgepole pine. MC = mixed conifer. PP = ponderosa pine. WL/DF = western larch/ Douglas-fir. WWP = western white pine. Other = non stocked lands or nonforest. The Current Type minus Appropriate Type column above lists the excess and deficit (-) acres for each Cover Type.

Table 2-2 shows the current and potential cover types for the Pleasant Valley project area. It reflects the same trend in forest cover type shifts as the Kalispell landscape, but not as drastically due to previous harvest activities. The previous management activities removed most of the shade tolerant species and left the seral species.

Old Growth Stands

As per the Land Board's decision in February, 2001, the DNRC adopted definitions for old growth by forest habitat groups, based on minimum number and size of large trees per acre and age of those trees as noted in *Old-Growth Forest Types of the Northern Region(Green et. Al. 1992).* The DNRC approach to old-growth management (and forest management in general) is further clarified in (ARM 36.11.401 to 36.11.450). SLI data identified 193 acres of old growth in four stands in section 34. After implementing an old growth cruise, 74 acres in three of the stands were verified to be old growth while 119 acres in one stand did not meet the criteria to be classified as old growth.

Sensitive Plants

A review of the records from the MNHP for the project indicated two plant species of special concern identified within the project area.

1. Spalding's Catchfly (*Silene spaldingii*)
   - Spalding's catchfly is a perennial plant that grows in open, mesic grasslands in the valleys and foothills usually with rough fescue, Nelson's needlegrass, Richardson's needlegrass and Idaho fescue. Occasionally with scattered ponderosa pine or broadleaf shrubs. Soils are usually deep and loamy. *S. spaldingii* typically occurs on northerly aspects and along draws and swales. There is a population of plants located on the Lost Trail National Wildlife Refuge. The two major threats to the species viability in Montana are invasive weeds that are negatively impacting the bunchgrass habitat and cattle grazing.

Noxious Weeds

Spotted knapweed (*Centautea stoebe*) is the most abundant noxious weed within the project area. It is mainly established along existing roads with some spreading to adjacent grassy openings. Houndstongue (*Cyroglossum oficinale*) is also present within the project area. Both are present along existing roads. There is potential for the continued spread of these species from the proposed project but there will be mitigations implemented to try and control their spread.

ENVIRONMENTAL EFFECTS

Direct and Indirect

No Action Alternative

No timber harvest or associated activities would occur under this alternative. Timber types would continue to advance towards climax conditions and away from desired future conditions. Growth and vigor of the trees present in the analysis area would continue to decline as competition for resources increases. Noxious weeds would continue to exist along the roads and move into the forested areas as natural disturbances prepare appropriate seedbeds.

Action Alternative

The proposed alternative would harvest timber on approximately 1060 acres and promote the desired future conditions of ponderosa pine and western larch/Douglas-fir. A commercial thin harvest prescription will be implemented on 25 acres to promote the desired future condition of ponderosa pine. A seed tree treatment will be used on 967 acres to promote desired future conditions of ponderosa pine and western larch/Douglas-fir. An old growth restoration treatment will be applied to 69 acres to restore the old growth ponderosa pine stands to the structure before fire suppression. The harvest would be focused on the removal of those trees affected by or susceptible to insect and disease mortality, as well as shade tolerant tree species. More detailed information for treatment can be obtained in Attachment III, "Prescriptions". Through harvest and site preparation activities, fuel loadings would be reduced by the removal of ladder fuels from the understory and intermediate components of these stands. Crown spacing in the intermediate and overstory components of treated stands would increase, resulting in decreased fuel continuity. Growth and vigor of residual trees would increase as a result of increased residual tree spacing that would allow full light to crowns and more access to water.

Noxious weeds may increase due to the disturbance and the opening in the canopy. However, this will be monitored and addressed through an integrated pest management plan including chemical and biological control methods. The spread of weeds would be controlled by washing of equipment before it is moved on site and with weed treatments along roads.

The area will be monitored for the sensitive plant species Spalding's Catchfly. The plant is associated with grasslands and open pine stands. No plants have been observed during field reconnaissance, but if one of the species is found, an equipment restriction zone will be made around the plant and a plant survey will be conducted in the area.

Cumulative Effects

No Action Alternative

Under this alternative, stand structure and species composition on State land across the Kalispell Unit are expected to continue the change towards more shade tolerant species. Fuel loading is also expected to increase due to tree mortality and ladder fuels.

Action Alternative

The timber harvesting treatments occurring under the Action Alternative would, in combination with other State timber harvesting activities, alter the current cover type distribution by promoting the development of desired future cover types on the Kalispell Unit. Specifically, these projects would reduce the acreage of mixed conifer, subalpine fir, lodgepole pine, and Douglas-fir types and increase the western larch/Douglas-fir, ponderosa pine, and western white pine cover types. Untreated stands would be expected over time to develop an increasing component of shade-tolerant species that would in most cases lead stands away from DNRC's desired future conditions.

The timber harvest treatments would also increase the stand productivity by decreasing the stocking levels of the stands. By decreasing the stocking levels, this would cause the trees to get adequate space to become healthier and more resistant to insects and diseases. The amount of tree mortality will decrease which would decrease the fuel loading. The site disturbance from the timber harvest would potentially cause the spread of noxious weeds. The spread of weeds would be controlled by washing of equipment before it is moved on site and with weed treatments along roads.

The proposed action would occur on about 1,060 acres of the Kalispell Unit total 55,937 acres or approximately 1.8% of the total Kalispell Unit acreage. These changes would result in minor and inconsequential impacts across the landscape of the Kalispell Unit.

WILDLIFE ANALYSIS

INTRODUCTION

The wildlife analysis is designed to disclose the existing condition of wildlife resources and the anticipated direct, indirect, and cumulative effects that may result from implementing the No-Action and Action alternatives. The following issue statements were developed from concerns raised by DNRC specialists and comments received during scoping and will be addressed in the following analysis:

Mature forest cover and connectivity. The proposed activities could decrease mature forested cover, which could reduce habitat connectivity and suitability for wildlife species associated with mature forest.

Snags and coarse woody debris. The proposed activities could reduce the availability of snags and coarse woody debris and increase human access for firewood harvesting, which could adversely affect the quality of wildlife habitat.

Old-growth forests. The proposed activities could affect wildlife species associated with old-growth forests by reducing habitat availability and increasing fragmentation.

Canada lynx. The proposed activities could reduce landscape connectivity and the availability of suitable Canada lynx habitat, reducing the capacity of the area to support Canada lynx.

Bald Eagles. The proposed activities could remove large trees and snags and could increase disturbance to bald eagles, which could reduce the quality of bald eagle habitat.

Fishers. The proposed activities could reduce the availability and connectivity of suitable fisher habitat and increase human access, which could reduce fisher habitat suitability and increase trapping mortality.

Flammulated owls. The proposed activities could alter the structure of flammulated owl preferred habitat, which could reduce habitat suitability for flammulated owls.

Gray wolves. The proposed activities could disturb gray wolves and reduce winter range habitat quality for big game, which could displace gray wolves from denning and rendezvous sites and reduce prey availability.

Pileated woodpeckers. The proposed activities could reduce tree density and alter the structure of mature forest stands, which could reduce habitat suitability for pileated woodpeckers.

Big game winter range. The proposed activities could reduce cover, which could reduce the quality of big game winter range habitat.

ANALYSIS AREAS

Direct and Indirect Effects

The direct and indirect effects of the proposed activities on all species/issues were analyzed within the project area (FIGURE W-1 –ANALYSIS AREAS), which consists of 1,908 acres of DNRC-managed lands.

Cumulative Effects

The cumulative effects of the proposed activities on all species/issues were analyzed at a broad surrounding landscape scale that varies according to the issue or wildlife species being discussed. Cumulative effects analysis areas are named according to the size of the area or species considered and are summarized in TABLE W-1 –ANALYSIS AREAS and FIGURE W-1 – ANALYSIS AREAS. Cumulative effects analysis areas (CEAAs) include the project area as well as lands managed by other agencies and private landowners. Detailed descriptions of each analysis area are located in the **Existing Condition** section for each issue or species evaluated.

TABLE W-1. ANALYSIS AREAS. Descriptions of the project area and cumulative effects analysis areas.

ANALYSIS AREA NAME	DESCRIPTION	TOTAL ACRES	ISSUE(S)/SPECIES ANALYZED
Project Area	DNRC managed lands in Sections 22, 34, and 36 T28N, R27W.	1,908	direct & indirect effects for all issues/species
Bald Eagle CEAA	The 2.5 mile radius area surrounding a bald eagle nest located on Little Bitterroot Lake	13,346	bald eagles
Medium CEAA	Portions of the Upper Pleasant Valley Fisher River and Little Bitterroot Lake Subwatersheds	13,871	mature forest cover & connectivity, snags & coarse-woody debris, old-growth forests, fishers, flammulated owls, pileated woodpeckers, big game
Large CEAA	Portions of the Upper Pleasant Valley Fisher River and Little Bitterroot Lake Subwatersheds	31,508	Canada lynx, gray wolves

ANALYSIS METHODS

Analysis methods are based on DNRC State Forest Land Management Rules, which are designed to promote biodiversity. The primary basis for this analysis included information obtained by: field visits, review of scientific literature, Montana Natural Heritage Program (MNHP) data queries, DNRC Stand Level Inventory (SLI) data analysis, aerial photograph analysis, and consultation with wildlife professionals. The coarse-filter wildlife analysis section includes analyses of the direct, indirect and cumulative effects of the proposed alternatives on old-growth, connectivity of mature forest habitat, and snags and coarse woody debris. In the fine-filter analysis, individual species of concern are evaluated. These species include wildlife species federally listed under the Endangered Species Act, species listed as sensitive by DNRC, and species managed as big game by DFWP.

Cumulative effects analyses account for known past and current activities, as well as planned future agency actions. Recent timber sale projects (≤20 years) that could contribute to cumulative effects are summarized in TABLE W-2 RECENT PROJECTS.

TABLE W-2. RECENT PROJECTS. Recent projects that could contribute to cumulative effects and the number of harvested acres that occur in each analysis area.

SALE NAME	AGENCY	SALE DATE/STATUS	PROJECT AREA	MEDIUM CEAA	LARGE CEAA
Fire Salvage	DNRC	2001/Complete	22	22	22

Changes to forest structure resulting from all DNRC projects have been accounted for in SLI data used for this analysis. Timber sales that occurred on other ownerships are accounted for in analyses of aerial photographs.

RELEVANT AGREEMENTS, LAWS, PLANS, RULES, AND REGULATIONS

Various policy and procedural documents provide the foundation for management criteria pertaining to wildlife and their habitat on state lands. The documents most pertinent to this project include: *DNRC Forest Management Rules*, *DNRC Forested Trust Lands Final Environmental Impact Statement and Habitat Conservation Plan (USFWS and DNRC 2010)*, the *Endangered Species Act*, the *Migratory Bird Treaty Act*, and the *Bald and Golden Eagle Protection Act*.

COARSE-FILTER WILDLIFE ANALYSIS

MATURE FOREST COVER AND CONNECTIVITY

Issue: *The proposed activities could decrease mature forested cover, which could reduce habitat connectivity and habitat suitability for wildlife species associated with mature forest.*

Introduction

Mature forests characterized by large diameter trees and dense canopy cover provides important wildlife habitat. Historically, the spatial configuration of mature forested habitat in the western United States was shaped by natural disturbance events, primarily wildfire, blowdown, and pest outbreaks. Natural disturbance events resulted in a mosaic-like spatial configuration of forest patches varying in age, species composition, and development. Spatial configuration, including patch size and connectivity of forested habitat, is important for many wildlife species. Patch size may affect the distribution of wildlife species that are attracted to, or avoid forest edges. Additionally, connectivity of mature forested habitat may facilitate movements of wildlife species that avoid openings in canopy cover. For example, discontinuous mature forested habitat would negatively affect movements of fisher, which avoid large openings in canopy cover. Timber harvest, like wildfire and blowdown, is a disturbance event that often creates open patches of young, early-successional habitat. Forest management considerations for wildlife species dependent on mature forested habitat include providing well-connected patches of habitat with ≥40% canopy cover.

Analysis Areas

The analysis area for direct and indirect effects is the 1,908-acre project area (FIGURE W-1 – ANALYSIS AREAS). The analysis area for cumulative effects is the 13,871-acre medium CEAA described in TABLE W-1 –ANALYSIS AREAS (FIGURE W-1 –ANALYSIS AREAS). The medium CEAA is defined by geographic features including ridgelines and streams and represents an area large enough to support a diversity of species that use mature forest habitat and/or require connected forest habitat.

Analysis Methods

Analysis methods for mature forest cover and landscape connectivity include field evaluations and Geographical Information System (GIS) analysis of aerial-photographs, DNRC SLI data, and USFS canopy cover data (VMap 9.1.1). Mature forested habitat is defined here and in the remainder of the document as forest stands with ≥40% canopy cover comprised primarily of trees that are on average >9 inches dbh. Forested stands containing trees of at least this size and density were considered adequate for providing minimal conditions necessary to facilitate movements of many wildlife species that benefit from well-connected mature forest conditions. Factors considered in the analysis include: 1) the degree of timber harvesting, 2) availability and patch size of mature forested habitat (≥40% canopy cover, trees >9 inches dbh average), 3) open and restricted road density, and 4) the availability of potential travel corridors.

Existing Conditions

Mature Forested Habitat and Connectivity

The project area currently contains approximately 1,299 acres (68.1% of project area) of mature stands with ≥40% canopy cover (>9 inches dbh average) composed primarily of Douglas-fir, larch, and ponderosa pine stands that occur in three parcels (FIGURE W-1 –ANALYSIS AREAS, TABLE W-3 –MATURE FOREST). The remaining 609 acres in the project area consists of 335 acres of mature stands with <40% canopy cover as well as some younger stands and non-forested open areas. Mature forested habitat is continuous across each of these parcels; however, these forested stands are not connected by corridors between parcels due to timber harvest on neighboring ownerships. The project area does not occur in any particular area of documented importance for habitat connectivity; however, riparian habitat in the project area associated with Herrig Creek (Section 36) and other small intermittent streams may provide connectivity. The network of open and restricted roads in the project area has reduced some landscape connectivity. Open road density in the project area is low (1.3 miles/square mile) and total road density is moderate (2.0 miles/square mile). Additionally, there is a power line corridor in Section 36 that has fragmented mature forested habitat.

The medium CEAA contains 3,187 acres (23.0% of analysis area) of mature stands (TABLE W-3 –MATURE FOREST). The remaining acres in the medium CEAA consist primarily of young regenerating stands due to the extensive history of timber harvest on private land. Connectivity of mature forested habitat is low with large patches of mature stands concentrated on the west side of Little Bitterroot Lake and on DNRC- and USFS-managed lands located in the northern portion of the project area (FIGURE W-1 –ANALYSIS AREAS). Little Bitterroot Lake occupies approximately 756 acres of the medium CEAA. Across the analysis area, riparian areas associated with Herrig Creek and additional smaller streams may provide wildlife travel corridors. The network of open roads has reduced landscape connectivity, particularly in the vicinity of Little Bitterroot Lake where there are many private residences. Open and seasonally restricted road density in the medium CEAA is moderate (1.7 miles/square mile) and total road density is high (3.9 miles/square mile). Additionally, residential development is concentrated around Little Bitterroot Lake and a power line corridor runs from north-to-south through the medium CEAA, further fragmenting mature forested habitat.

TABLE W-3 -MATURE FOREST. Average patch size and acreage of mature forested habitat (≥40% canopy cover, >9 inches dbh) pre- and post-harvest in the project area and medium CEAA for the Bitter Herrig Timber Sale. The percentage of mature forested habitat of the total corresponding analysis area is in parentheses.

	AVERAGE PATCH SIZE		TOTAL ACRES OF MATURE FOREST	
ANALYSIS AREA	Existing	Post-harvest	Existing	Post-harvest
Project Area -- 1,908Acres (% of area)	260	26	1,299 68.1%	346 18.1%
Medium CEAA –13,871 Acres (% of area)	55	30	3,187 23.0%	2,236 16.1%

Environmental Effects

Direct and Indirect Effects of the No-Action Alternative on Mature Forested Habitat and Connectivity

None of the proposed forest management activities would occur. Forests would continue to age and dense stands of shade-tolerant trees would continue to develop. Thus, since: 1) no appreciable change in the abundance, patch size, or suitability of mature forested habitat would occur, 2) no changes in open or restricted road density would occur, and 3) no changes in the availability of travel corridors would occur, no direct or indirect effects to mature forested habitat abundance, suitability, or connectivity would be anticipated as a result of the No-Action Alternative.

Direct and Indirect Effects of the Action Alternative on Mature Forested Habitat and Connectivity

The proposed activities would occur in 952 (73.3%) of the 1,299 acres of mature stands available in the project area. The treatments proposed for these stands would reduce canopy cover to approximately 5-25% in 927 acres proposed for seed tree and old-growth restoration treatments and to 30-40% in 25 acres proposed for commercial thinning treatments. These areas would not provide mature forested habitat post-harvest, although small suitable patches may occur in the 25 acres proposed for commercial thin treatments. Average patch size of mature forested habitat would be reduced from 260 to 26 acres, adversely affect wildlife species that prefer large patches of mature forested habitat. Riparian habitat associated with stream RMZs in the project area would not be harvested. Approximately 6 miles of restricted roads are proposed for construction, which may reduce connectivity. However, open road density would decrease following the closure of 2.1 miles of roads in Section 36. Connectivity of upland mature canopy forest within the proposed project area would be reduced, but travel corridors would remain along streams. Thus, since: 1) the abundance of mature forested habitat would decrease by 952 acres (73.3% of existing mature forest); 2) average patch size of mature forested habitat would decrease by 234 acres; 3) 6 miles of restricted roads would be constructed, but 2.1 miles of open roads would be closed; 4) riparian habitat would not be harvested; and 5) overall connectivity of mature forested habitat would decrease; moderate direct or indirect effects to mature forested habitat abundance, suitability, or connectivity would be anticipated as a result of the Action Alternative.

Cumulative Effects of the No-Action Alternative on Mature Forested Habitat and Connectivity

None of the proposed forest management activities would occur. Forests in the project area would continue to age, and dense stands of shade-tolerant trees would continue to develop. Other proposed or ongoing activities within the medium CEAA could affect the abundance, suitability, and connectivity of mature forested habitat. Thus, since: 1) no appreciable change in

the abundance, patch size, or suitability of mature forested habitat would occur; 2) no changes in open or restricted road density would occur; and 3) no changes in the availability of travel corridors would occur; no cumulative effects to mature forested habitat abundance, suitability or connectivity would be anticipated as a result of the No-Action Alternative.

Cumulative Effects of the Action Alternative on Mature Forested Habitat and Connectivity

The proposed activities would affect 952 acres of the 3,187acres (30.0%) of mature forested habitat available in the medium CEAA. The proposed activities would open the majority timber stands proposed for harvest to <40% canopy cover, although some patches of suitable habitat may occur in the 25 acres of mature forest proposed for commercial thin treatments. Connectivity would decrease, and the average patch size of mature forested habitat would be reduced from 55 to 30 acres. Reductions in the availability of suitable mature forested habitat would be additive to harvest activities that are proposed or ongoing in the medium CEAA, although DNRC is unaware of any projects at this time. Riparian habitat would not be affected by the proposed activities. Additionally, 7.1 miles of restricted roads are proposed for construction, potentially reducing connectivity. However, 2.1 miles of currently open roads are proposed for closure. Thus, since: 1) the abundance of mature forested habitat in the medium CEAA would decrease by 30.0%; 2) average patch size of mature forested habitat would decrease by 25 acres; 3) 7.1 miles of restricted roads would be constructed, but 2.1 miles of open roads would be closed; and 4) riparian habitat would not be harvested; moderate adverse cumulative effects to mature forested habitat abundance, suitability, or connectivity would be anticipated as a result of the Action Alternative.

SNAGS AND COARSE WOODY DEBRIS

***Issue**: The proposed activities could reduce the availability of snags and coarse woody debris and increase human access for firewood harvesting, which could adversely affect the quality of wildlife habitat.*

Introduction

Snags and coarse woody debris are important components of forest ecosystems that provide the following functions: 1) increase structural diversity, 2) alter the canopy microenvironment, 3) promote biological diversity, 4) provide important habitat substrates for wildlife, and 5) act as storehouses for nutrient and organic matter recycling agents (*Parks and Shaw 1996*). Coarse woody debris, snags, and defective trees are used by a wide variety of wildlife species for foraging, nesting, roosting, and cover. Woodpeckers excavate cavities in snags, which in turn are used by a variety of secondary cavity users, such as small mammals and birds, which are unable to excavate cavities. The value of snags and coarse woody debris for wildlife varies. Thick-barked tree species tend to provide high quality snag habitat and large diameter snags are also important because many species that nest in smaller diameter snags will also use large snags; however, the opposite is not true. Coarse woody debris habitat value varies according to size, length, decay, and distribution. Single, scattered downed trees may provide access under the snow for small mammals and weasels, while log piles may provide secure areas for snowshoe hares. Timber harvest may affect the abundance and spatial distribution of snags and coarse woody debris directly by removal for commercial value or for human safety purposes or indirectly by increasing human access for firewood harvesting.

Analysis Areas

The analysis area for direct and indirect effects is the 1,908-acre project area (FIGURE W-1 – ANALYSIS AREAS). The analysis area for cumulative effects is the 13,871-acre medium CEAA described in TABLE W-1 –ANALYSIS AREAS and depicted in FIGURE W-1 –ANALYSIS

AREAS. The medium CEAA is defined by geographic features and represents an area large enough to support a diversity of species that use coarse woody debris and snags.

Analysis Methods

The abundance of snags and coarse-woody debris was quantitatively estimated in the project area using 18 systematically-placed fixed plots (each 100 feet x 66 feet). Coarse-woody debris tons/acre was estimated for material ≥3 in diameter where it intersected a 100-ft transect line according to methods described by Brown (*1974*). Snags per acre were estimated by recording all snags ≥8 in dbh and ≥6 ft tall located within in each plot. Factors considered in the analysis include: 1) the level of harvesting, 2) availability of snags and coarse woody debris, and 3) risk of firewood harvesting.

Existing Conditions

Snags and Coarse Woody Debris

During field assessments, 16 snags/acre ≥ 8 inches dbh were observed (range: 0-53 snags/acre) and 6 snags ≥21 inches dbh occurred within study plots. Wildlife use of snags was observed throughout the project area. The majority of snags observed were Douglas-fir with a few ponderosa pine and western larch snags also observed. Coarse woody debris levels ranged from 0-50 tons/acre across the project area, but averaged 15 tons/acre. Firewood harvesting has likely reduced the availability of coarse woody debris and snags along open roads in Sections 22 and 36 (1.3 miles/square mile open road density; total road density 2.0 miles/square mile). Open roads are not present in Section 34 and the area has not been affected by firewood harvesting.

In the medium CEAA, snag and coarse woody debris levels on surrounding lands vary widely depending on motorized access, harvest history, and natural disturbance history. Snag and coarse woody debris levels are likely somewhat limited due to the level of timber harvest that has occurred on private lands. Snags and coarse woody debris are frequently collected for firewood in the medium CEAA, especially near open roads including the Pleasant Valley and Griffin Creek Roads. Open and seasonally restricted road density in the medium CEAA is moderate (1.7 miles/square mile) and total road density is high (3.9 miles/square mile), and provides accessibility for firewood cutting.

Environmental Effects

Direct and Indirect Effects of the No-Action Alternative on Snags and Coarse Woody Debris

None of the proposed forest management activities would occur. Thus, since: 1) no timber harvesting would alter present or future snag or coarse woody debris abundance, and 2) no changes to human access for firewood harvesting would occur, no direct or indirect effects to snags and coarse woody debris availability or associated wildlife habitat quality would be anticipated as a result of the No-Action Alternative.

Direct and Indirect Effects of the Action Alternative on Snags and Coarse Woody Debris

Some existing snags and snag recruits would be removed from 1,059 acres (55.5% of project area) due to timber felling operations. Additional recruitment trees and snags may also be lost following timber harvest due to wind throw. Given operability and human safety constraints, existing non-merchantable snags would be left standing. Across the project area, at least 2 large snags and 2 large recruitment trees (>21 inches dbh) per acre would be retained (*ARM 36.11.411*). If such large trees and snags are absent, the largest available snags and/or recruitment trees would be retained. Additionally, 15-20 tons/acre of coarse woody debris would

be retained (*ARM 26.11.414*). Firewood cutting risk in the project area would be reduced post-harvest due to the closure of 2.1 miles of currently open roads in Section 36, reducing the density of open roads from 1.3 miles/square mile to 0.6 miles/square mile. Thus, since: 1) the proposed actions would remove some snags and influence the amount of coarse woody debris on 1,059 acres (55.5% of project area), 2) accessibility for firewood harvesting would decrease post-harvest due to the closure of 2.1 miles of currently open roads, and 3) snags and coarse woody debris would be retained to meet DNRC Forest Management Rules (*ARM 36.11.411, ARM 26.11.414*), minor adverse direct and indirect effects to snags and coarse woody debris availability associated with wildlife habitat quality would be anticipated as a result of the Action Alternative.

Cumulative Effects of the No-Action Alternative on Snags and Coarse Woody Debris

None of the proposed forest management activities would occur. Ongoing and proposed forest management activities may affect the availability of snags and coarse woody debris in the medium CEAA. Thus, since: 1) no timber harvesting on DNRC lands would alter present or future snag or coarse woody debris abundance, and 2) no changes to human access for firewood harvesting would occur, no cumulative effects to snags and coarse woody debris availability associated with wildlife habitat quality would be anticipated as a result of the No-Action Alternative.

Cumulative Effects of the Action Alternative on Snags and Coarse Woody Debris

Some existing snags and snag recruits would be removed from the 1,059 acres (7.6% of medium CEAA) proposed for harvest within the medium CEAA, but retention measures would apply (*ARM 36.11.411, ARM 26.11.414*). Reductions in the availability of coarse woody debris and snags would be additive to any forest management activities occurring in the CEAA, although DNRC is unaware of any ongoing or proposed activities at this time. Firewood cutting risk in the medium CEAA would be reduced following the closure of 2.1 miles of currently open roads in Section 36, reducing open and seasonally restricted road density from 1.7 miles/square mile to 1.6 miles/square mile. Thus, since: 1) the proposed actions would remove some snags and influence the amount of coarse woody debris on 1,059 acres (7.6% of the medium CEAA); 2) accessibility for firewood cutting would be reduced due to the closure of 2.1 miles of open roads; and 3) snags and coarse woody debris would be retained in amounts required to meet DNRC Forest Management Rules (*ARM 36.11.411, ARM 26.11.414*); minor cumulative effects to snags and coarse woody debris availability associated with wildlife habitat quality would be anticipated as a result of the Action Alternative.

OLD-GROWTH FORESTS

Issue: *The proposed activities could affect wildlife species associated with old-growth forests by reducing habitat availability and increasing fragmentation.*

Introduction

Old-growth forests are an important component of biological diversity. Old-growth forest stands typically contain various combinations of large old trees, abundant snags and downed logs, and multiple canopy layers, which are typically not found in young forests. These attributes provide structures used by a diversity of wildlife species. The diversity of species and the complexity of interactions between them can be different than in earlier successional stages (*Warren 1990*). Of the 48 old-growth associated species occurring in the Northern Rockies, about 60% may require stands larger than 80 acres (*Harger 1978*). Smaller patches may be unsuitable for wildlife species with large home ranges. Additionally, small, less-mobile species may be at greater risk of local extinction in small patches. Timber harvest can affect the size, availability, and spatial juxtaposition of old-growth stands.

Analysis Areas

The analysis area for direct and indirect effects is the 1,908-acre project area (FIGURE W-1 – ANALYSIS AREAS). The analysis area for cumulative effects is the 13,871-acre medium CEAA described in TABLE W-1 –ANALYSIS AREAS and depicted in FIGURE W-1 –ANALYSIS AREAS. The medium CEAA represents an area large enough to support a diversity of species that use old-growth forest habitat, is centered on the project area, and provides a reasonable scale of analysis for wildlife species that inhabit old-growth forests and could be influenced by project-related activities.

Analysis Methods

Old-growth forest stands were identified as described in the *VEGETATION ANALYSIS.* Patch sizes and shapes were assessed using GIS. Changes in the total acres of old-growth, as well as the number of patches greater than 80 acres, were assessed. Factors considered in the analysis include: 1) the level of harvesting, 2) the abundance of old-growth, and 3) the abundance of patches >80 acres.

Existing Environment

The project area contains approximately 75 acres (3.9% of project area) of stands meeting the definition of old-growth (*Green et al. 1992*), thus no patches >80 acres occur in the project area. This old-growth occurs as one continuous patch in the southwest corner of Section 34. This old-growth patch is located adjacent to dense forest stands with ≥40% canopy cover and average tree diameters >9 inches dbh. Thus, the effective patch size may be larger than 75 acres.

The medium CEAA contains 3,187 acres of mature forested habitat, which includes 75 acres of old-growth stands on DNRC-managed lands and additional old-growth on surrounding ownerships. Considering that 61.2% of the analysis area is privately owned, and the history of timber harvest, old-growth availability is likely limited. Additional old-growth in the medium CEAA is most likely to be located in the northern portion of the analysis area on USFS lands. Connectivity of old-growth is very low in the medium CEAA considering the connectivity of mature forested habitat (see *MATURE FOREST COVER AND CONNECTIVITY* in the coarse filter analysis for additional information).

Environmental Effects

Direct and Indirect Effects of No-Action on Old-growth Forests

No changes to the amounts, quality, or spatial arrangement of old-growth would occur under this Alternative. Thus, no direct and indirect effects associated with the abundance or fragmentation of old-growth forests would be anticipated as a result of the No-Action Alternative.

Direct and Indirect Effects of the Action Alternative to Old-growth Forests

Approximately 69 acres (92.0%) of the 75 acres of old-growth forest in the project area would be affected by the proposed activities. All of these acres are proposed for an old-growth restoration treatment designed to promote characteristics of old-growth ponderosa pine stands. The treatment would focus on removing shade tolerant species and trees that are insect infested and diseased while retaining snags where they occur. Overall, old-growth structural attributes would be maintained in these stands, and they would continue to exceed the minimum threshold old-growth definitions described by *Green et al. (1992*) post-harvest (see VEGETATION ANLYSIS). However, logging could adversely affect some old-growth-associated species, particularly those preferring dense forest stands. Patch size would not be affected by the proposed activities and the presence of large old-growth patches >80 acres would not be affected. Thus, since 1) the

abundance of old-growth would not change; 2) stand density would decrease in 69 acres (92.0% of existing old-growth stands), which may affect wildlife species that prefer dense old-growth stands; and 3) the abundance of patches >80 acres would not change; minor direct and indirect effects associated with the abundance or fragmentation of old-growth forests would be anticipated as a result of the Action Alternative.

Cumulative Effects of the No-Action Alternative to Old-growth Forests

None of the proposed forest management activities would occur. Ongoing and proposed forest management activities may change the amount, quality, or spatial arrangement of old-growth in the medium CEAA. Thus, no cumulative effects associated with the abundance or fragmentation of old-growth forests would be anticipated as a result of the No-Action Alternative.

Cumulative Effects of the Action Alternative to Old-growth Forests

Approximately 69 acres of the existing old-growth habitat in the medium CEAA would be affected by the proposed activities. These acres would be treated with an old-growth restoration treatment which would maintain characteristics of old-growth ponderosa pine stands by removing shade tolerant trees as well as diseased and dying trees. This stand would continue to exceed the minimum threshold old-growth definitions described by *Green et al. (1992)* post-harvest (See VEGETATION ANALYSIS), but the stand would retain less large trees, potentially affecting wildlife species that prefer dense old-growth stands. Patch size and the availability of large old-growth stands >80 acres in size would not be affected. Changes in structural attributes of old-growth would be additive to ongoing forest management activities in the medium CEAA, although DNRC is unaware of such projects at this time. Thus, since: 1) the abundance of old-growth would be not be affected; 2) stand density would decrease on 69 acres, which may affect wildlife species that prefer dense old-growth stands; and 3) the abundance of patches >80 acres would not be affected; minor cumulative effects associated with the abundance or fragmentation of old-growth forests would be anticipated as a result of the Action Alternative.

FINE-FILTER WILDLIFE ANALYSIS

TABLE W-4 –FINE-FILTER. Anticipated effects of the Bitter Herrig Timber Sale on wildlife species. For several species, more detailed analysis is provided below where indicated.

SPECIES/HABITAT	EFFECTS ASSESSMENT
THREATENED & ENDANGERED SPECIES	
Canada lynx (*Felis lynx*) Habitat: Subalpine fir habitat types, dense sapling, old forest, deep snow zones	***Detailed Analysis Provided Below*** – The project area contains 548 acres of suitable lynx habitat.
Grizzly bear (*Ursus arctos*) Habitat: Recovery areas, security from human activity	The project area is located 1 mile outside of grizzly bear recovery zone and non-recovery occupied habitat associated with the Northern Continental Divide Ecosystem (NCDE) (*USFWS 1993*, *Wittinger* 2002). Bears are occasionally documented using the area (*Mace and Roberts 2012*); however, the area is unlikely to be an important linkage zone for bears traveling between the NCDE and Cabinet-Yaak Ecosystem due to the proximity of the area to Little Bitterroot Lake, which is a popular recreation site (*Servheen et al. 2003*). Thus, negligible direct, indirect, or cumulative effects to grizzly bears would be expected to occur as a result of either alternative.

SENSITIVE SPECIES	
Bald eagles (*Haliaeetus leucocephalus*) Habitat: Late-successional forest less than 1 mile from open water	***Detailed Analysis Provided Below*** – A bald eagle nest is located on Little Bitterroot Lake <1 mile from the project area.
Black-backed woodpeckers (*Picoides arcticus*) Habitat: Mature to old burned or beetle-infested forest	No recently (<5 years) burned areas occur within 0.25 miles of the project area. Thus, no direct, indirect, or cumulative effects to black-backed woodpeckers would be expected to occur as a result of either alternative.
Coeur d'Alene salamanders (*Plethodon idahoensis*) Habitat: Waterfall spray zones, talus near cascading streams	No moist talus or streamside talus habitat occurs in the project area. Thus, no direct, indirect, or cumulative effects to Coeur d'Alene salamanders would be expected to occur as a result of either alternative.
Columbian sharp-tailed grouse (*Tympanuchus Phasianellus columbianus*) Habitat: Grassland, shrubland, riparian, agriculture	No suitable grassland communities occur in the project area. Thus, no direct, indirect, or cumulative effects to Columbian sharp-tailed grouse would be expected to occur as a result of either alternative.
Common loons (*Gavia immer*) Habitat: Cold mountain lakes, nest in emergent vegetation	The project area is located adjacent to Little Bitterroot Lake and the probability of loons occupancy of this lake is high (82%) (*Hammond 2009*). However, the proposed units are located more than 0.2 miles from the lakeshore. Thus, considering that lakeshore habitat would not be affected and disturbance to loons from the proposed activities would be minimal; negligible direct, indirect, or cumulative effects to common loons would be expected to occur as a result of either alternative.
Fishers (*Martes pennanti*) Habitat: Dense mature to old forest less than 6,000 feet in elevation and riparian	***Detailed Analysis Provided Below*** – Approximately 1,107 acres of suitable fisher habitat occur within the project area.
Flammulated owls (*Otus flammeolus*) Habitat: Late-successional ponderosa pine and Douglas-fir forest	***Detailed Analysis Provided Below*** – Approximately 1,305 acres of flammulated owl habitat types occur in the project area.
Gray wolves (*Canis lupus*) Habitat: Ample big game populations, security from human activities	***Detailed Analysis Provided Below*** – The 2011 home range of the Elbow Pack coincides with the project area (*MFWP wolf pack data, 2012*).
Harlequin ducks (*Histrionicus histrionicus*) Habitat: White-water streams, boulder and cobble substrates	Suitable white-water streams do not occur within 1 mile of the project area and harlequin ducks have not been observed in the vicinity of the project area (*MNHP data, December 4, 2012*). Thus, no direct, indirect and cumulative effects to harlequin ducks would be anticipated.

Northern bog lemmings (*Synaptomys borealis*) Habitat: Sphagnum meadows, bogs, fens with thick moss mats	Potentially suitable wetlands occur within the project area; however harvesting would not occur in small (<0.25 acre) wetlands or within 50 feet of large (>0.25 acre) wetlands. Thus, negligible direct, indirect, or cumulative effects to northern bog lemmings would be expected to occur as a result of either alternative.
Peregrine falcons (*Falco peregrinus*) Habitat: Cliff features near open foraging areas and/or wetlands	Suitable cliffs/rock outcrops for nest sites were observed in the project area; however, peregrine eyries have not been documented within 5 miles of the project area (*MNHP data, December 4 2012*). If a nest is documented within 0.5 miles of the proposed units, timing restrictions and vegetation retention requirements would apply. Thus, negligible direct, indirect, or cumulative effects to peregrine falcons would be anticipated as a result of either alternative.
Pileated woodpeckers (*Dryocopus pileatus*) Habitat: Late-successional ponderosa pine and larch-fir forest	***Detailed Analysis Provided Below*** – Approximately 416 acres of pileated woodpecker habitat occur in the project area.
Townsend's big-eared bats (*Plecotus townsendii*) Habitat: Caves, caverns, old mines	No suitable caves or mine tunnels are known to occur in the project area. Thus, no direct, indirect or cumulative effects to Townsend's big-eared bats would be expected to occur as a result of either alternative.
BIG GAME	
Elk (*Cervus canadensis*)	***Detailed Analysis Provided Below*** – The project area contains potential elk, mule deer, and white-tailed deer winter range habitat as identified by DFWP (*T. Chilton-Radandt, DFWP, Wildlife Biologist, pers. comm., Jan. 22, 2013*).
Mule Deer (*Odocoileus hemionus*)	
White-tailed Deer (*Odocoileus virginianus*)	

THREATENED AND ENDANGERED SPECIES

CANADA LYNX

***Issue**: The proposed activities could reduce landscape connectivity and the availability of suitable Canada lynx habitat, reducing the capacity of the area to support Canada lynx.*

Introduction

Canada lynx are medium-size cats that prey primarily on snowshoe hares and occupy a mosaic of young and mature forests that provide habitat suitable for hunting and denning (*Ruediger et al. 2000*). Lynx foraging habitat in western Montana consist of young coniferous stands and mature forested stands with high levels of horizontal cover, which provide snowshoe hare habitat (*Squires et al. 2010*). Additionally, lynx typically avoid large openings in overhead canopy cover in the winter; hence, forested cover that is well connected is important for travel and security (*Squires et al. 2010*). Canada lynx are federally listed as a threatened species. Forest management considerations for lynx include providing a mosaic of young and mature lynx foraging habitat and well-connected large patches of mature forested cover occurring in vegetation types preferred by lynx.

Analysis Areas

The analysis area for direct and indirect effects is the 1,908-acre project area (FIGURE W-1 – ANALYSIS AREAS). The analysis area for cumulative effects is the, 31,568-acre large CEAA described in TABLE W-1 –ANALYSIS AREAS and depicted in FIGURE W-1 –ANALYSIS AREAS. The large CEAA is centered on the project area, approximates the size of a lynx home range, and is defined according to geographic features (i.e., ridgelines), which are likely to influence movements of Canada lynx in the vicinity of the project area. Thus, this defined area provides reasonable analysis area for Canada lynx that could be influenced by project-related activities.

Analysis Methods

Analysis methods include field evaluations, aerial photograph interpretation, and GIS analysis of SLI data and suitable lynx habitat. Lynx habitat was subdivided into the following habitat classes: 1) winter foraging, 2) summer foraging, 3) other suitable, and 4) temporary non-habitat. Lynx habitat was classified according to DNRC's lynx habitat mapping protocols (*USFWS and DNRC 2010*) based upon vegetation characteristics important to lynx and snowshoe hares (i.e., forest habitat type, canopy cover, stand age class, stems/acre, etc.). Other suitable lynx habitat is defined as habitat that has the potential to provide connectivity and lower quality foraging habitat, but does not contain the necessary attributes to be classified as winter or summer foraging habitat. The temporary non-habitat category consists of forested stands that are comprised of forest types preferred by lynx, but are not likely to be used by lynx until suitable horizontal cover develops. On non-DNRC lands, data identifying lynx suitable habitat are not readily available. Therefore, for the purpose of this analysis, the stands considered most likely to provide suitable habitat for lynx were mature forest stands (≥40% canopy cover, >9 inches dbh average) below 6,000 feet elevation. Factors considered in the analysis include: 1) the level of harvesting, 2) the availability of suitable lynx habitat classes, and 3) landscape connectivity.

Existing Conditions

Canada Lynx

The project area contains 548 acres of suitable lynx habitat (TABLE W-5 –LYNX HABITAT). The remaining 1,306 acres consist of stands that are dry Douglas-fir, larch and ponderosa pine forest types that are not considered to provide lynx habitat. Lynx habitat in the project area occurs in mostly continuous patches in Sections 22 and 34. Travel across Section 22 is possible from northwest to southeast, but travel across Section 34 is not possible due the patchy distribution of potential lynx habitat. Approximately 10 acres of suitable lynx habitat occur in Section 36, thus travel across this parcel is not possible due to the limited availability of suitable forest types. Riparian habitat associated with streams in the project area likely provides some habitat connectivity for lynx (see *MATURE FORESTED COVER AND CONNECTIVITY* in the coarse filter analysis section for further information). However, overall, connectivity is low due to the patchy distribution of forest types preferred by lynx and the lack of mature forested habitat in the vicinity of project area.

The large CEAA contains approximately 4,443 acres of suitable lynx habitat (14.2% of large CEAA), including 548 acres on DNRC-managed lands (TABLE W-5 –LYNX HABITAT) and 3,896 acres on other ownerships. The remaining 27,125 acres in the analysis area consists primarily of stands that do not contain structure necessary for lynx use as well as stand that are not appropriate cover types (i.e., dry Douglas-fir and ponderosa pine stands). In the vicinity of the project area, connectivity of lynx habitat is low due to the lack of suitable habitat (see *MATURE FORESTED COVER AND CONNECTIVITY* in the coarse filter analysis section for further information).

TABLE W-5 –LYNX HABITAT. Existing lynx habitat and lynx habitat that would remain post-harvest in the project area. Values in parentheses refer to the percentages of each lynx habitat category of total potential lynx habitat[a].

LYNX HABITAT CATEGORY	ACRES OF LYNX HABITAT (percent of total potential DNRC lynx habitat)	
	Existing	Post-Harvest
Summer Foraging	25 (4.6%)	25 (4.3%)
Winter Foraging	438 (79.9%)	262 (47.9%)
Other Suitable	85 (15.5%)	8 (1.4%)
Temporary non-habitat	0 (0%)	253 (46.1%)
Grand Total - Suitable Lynx Habitat[b]	548 (100%)	295 (53.9%)

[a]Total potential lynx habitat describes all areas that contain appropriate forest habitat types for lynx (i.e., sum of summer foraging, winter foraging, other suitable, and temporary non-suitable lynx habitat classes).
[b]Total suitable lynx habitat describes all lynx habitat categories that contain structural attributes necessary for lynx use (i.e., sum of summer foraging, winter foraging, other suitable lynx habitat classes).

Environmental Effects

Direct and Indirect Effects of the No-Action Alternative on Canada Lynx

None of the proposed forest management activities would occur. Lynx habitat availability and habitat connectivity would not change. Thus, since: 1) no changes to lynx habitat availability would occur, and 2) no changes to landscape connectivity would occur, no adverse direct or indirect effects to Canada lynx associated with landscape connectivity and availability of suitable habitat would be anticipated as a result of the No-Action Alternative.

Direct and Indirect Effects of the Action Alternative on Canada Lynx

The proposed activities would affect 284 acres (51.8%) of the 548 acres of suitable lynx habitat available in the project area (TABLE W-5 –LYNX HABITAT). Of these 284 acres, 32 acres of existing winter foraging habitat would retain adequate structural attributes to remain classified as winter foraging habitat post-harvest. The remaining 252 acres of suitable lynx habitat would be reclassified as temporary non-suitable habitat due to lack of canopy cover in the understory and overstory. To ensure that forest structural attributes preferred by snowshoe hares remain following harvest, dense patches of advanced regeneration would be retained where they occur, especially within existing lynx winter foraging habitat. Additionally, 15-20 tons/acre of coarse woody debris would be retained (*ARM 36.11.414)* and retention of downed logs ≥15 inch diameter would be emphasized. Lynx habitat connectivity would be reduced due to the transition of 284 acres of suitable lynx habitat to temporary non-suitable habitat. However, the majority of harvest within lynx habitat would occur in the discontinuous patches of habitat within Sections 34 and 36. Connectivity across Section 22 would remain at the existing level. If present in the vicinity of the project area, lynx could be temporarily displaced by forest management activities

for up to 3 years due to disturbance caused by motorized activities. Thus, since: 1) lynx suitable habitat availability would be reduced by 252 acres (45.9% of suitable lynx habitat); 2) stand density would be reduced within 32 acres of existing lynx winter foraging habitat (5.8% of suitable lynx habitat); 3) patches of advanced regeneration would be retained where feasible, especially in winter foraging habitat; and 4) discontinuous patches of suitable lynx habitat would be harvested, but landscape connectivity would be retained where it exists in Section 22; moderate adverse direct and indirect effects to Canada lynx associated with landscape connectivity and availability of suitable habitat would be anticipated as a result of the Action Alternative.

Cumulative Effects of the No-Action Alternative on Canada Lynx

None of the proposed forest management activities would occur. Ongoing and proposed forest management activities may change the availability of suitable lynx habitat and landscape connectivity in the large CEAA. Thus, since: 1) no changes to lynx habitat type availability would occur, and 2) no changes to landscape connectivity would occur on DNRC lands, no cumulative effects to Canada lynx associated with landscape connectivity and availability of suitable habitat would be anticipated as a result of the No-Action Alternative.

Cumulative Effects of the Action Alternative on Canada Lynx

The proposed activities would affect 284 acres (6.4%) of the 4,443 acres of suitable lynx habitat available in the large CEAA. After harvest, 32 acres of suitable lynx habitat would retain adequate stand characteristics to remain classified as lynx winter foraging habitat. The remaining 252 acres would be reclassified as temporary non-suitable habitat due to lack of canopy cover in the understory and overstory. However, dense patches of advanced regeneration would be retained where possible, especially within lynx winter foraging habitat. Additionally, 15-20 tons/acre of coarse woody debris would be retained (*ARM 36.11.414)* and retention of downed logs ≥15 inch diameter would be emphasized. Lynx habitat connectivity would be reduced due to the transition of 252 acres of suitable lynx habitat to temporary non-suitable habitat. However, the proposed activities would primarily affect discontinuous lynx habitat patches and connectivity would remain at a similar level where it exists. Changes to lynx suitable habitat availability and habitat connectivity would be additive to any proposed or ongoing projects, although DNRC is currently unaware of any such projects. Lynx could be temporarily displaced by forest management activities associated with the Bitter Herrig Timber Sale for up to 3 years. Thus, since: 1) lynx suitable habitat availability would be reduced by 252 acres (5.7% of potentially suitable lynx habitat in the large CEAA); 2) stand density would be reduced within 32 acres of existing lynx winter foraging habitat (0.7% of potentially suitable lynx habitat in the large CEAA); 3) patches of advanced regeneration and shade-tolerant understory trees would be retained where feasible, especially in winter foraging habitat; and 4) discontinuous patches of suitable lynx habitat would be harvested, but landscape connectivity would be retained where it exists; minor adverse cumulative effects to Canada lynx associated with landscape connectivity and suitable habitat type availability would be anticipated as a result of the Action Alternative.

SENSITIVE SPECIES

BALD EAGLES

Issue: The proposed activities could remove large trees and snags and could increase disturbance to bald eagles, which could reduce the quality of bald eagle habitat.
Introduction

Bald eagles are diurnal raptors associated with sizable bodies of water, such as rivers, lakes, and coastal zones. The diet of the bald eagle consists primarily of fish and waterfowl, but may also include carrion and items taken from other birds of prey. Bald eagles generally require large snags or mature trees for nest construction and hunting perches; however, eagles may also

construct nests on cliffs. Forest management considerations for bald eagles include restricting disturbance during the breeding season and retaining large trees and snags within bald eagle territories.

Analysis Area

The analysis area for direct and indirect effects is the 1,908-acre project area (FIGURE W-1 – BALD EAGLES). The analysis area for cumulative effects is the 13,346–acre bald eagle CEAA described in TABLE W-1 –ANALYSIS AREAS and depicted in FIGURE W-1 –ANALYSIS AREAS. This area is located within a 2.5-mile radius of the nest and includes T28N, R27W, Section 22, which is located outside of the 2.5-mile radius area, but is a part of the project area. This analysis area incorporates areas most likely to be used by the nesting pair and includes the project area.

Analysis Methods

Analysis methods include field evaluations, aerial photograph interpretation, and GIS analysis of bald eagle management zones including nest site areas, primary use areas, and home ranges (*ARM 36.11.429*). Bald eagle management zones are defined according to distance from active nests (i.e., nests that have been active within the preceding 5 years (*ARM 36.11.403(2)*). Nest site areas are located within a 0.25-mile radius of nests and bald eagle primary use areas are located within a 0.25- to 0.5-mile radius of nests. Bald eagle home range habitat is located within a 2.5- mile radius of nests and includes nest site habitat and primary use habitat. Factors considered in the analysis include: 1) the degree of harvesting, 2) the location of known bald eagle nests, 3) bald eagle habitat characteristics, and 4) disturbance levels, including the proximity of bald eagle habitat to open roads and harvest units.

Existing Conditions

Bald Eagles

The project area is located approximately 0.5 miles from an active bald eagle nest, which is located near the north shore of Little Bitterroot Lake. The pair has used the same nest since 1996, which was productive until 2012. In 2012 adults were not observed using the territory (*K. DuBois, DFWP, Non-Game Biologist, pers. comm., Dec. 4, 2012*), which may indicate that one of the pair has been killed or alternatively, that the pair attempted to nest and failed early on in the season. Approximately 1,281 acres (67.1% of project area) within the project area are considered bald eagle home range habitat (TABLE W-6 –BALD EAGLE). Within the project area, 2 snags/acre ≥21 inches dbh were observed, thus there are suitable snags available for perching and roosting. No known bald eagle-flight paths occur in the project area. The nest is located 0.3 miles from residential development along the shore of Little Bitterroot Lake and bald eagles may be disturbed by recreational activities on the lake; however, the nest has been successful up until 2012 and the eagles seem to be tolerant of current levels of disturbance.

The bald eagle CEAA is managed primarily Plum Creek and other private land owners (TABLE W-6 –BALD EAGLE). The majority of breeding activities are likely to occur in nest site habitat and primary use habitat, which are managed by private landowners. Within all bald eagle management zones, Little Bitterroot Lake provides important foraging habitat (FIGURE W-1 – BALD EAGLES). The nest is located 0.3 miles from residential development along the shore of Little Bitterroot Lake and bald eagles may be disturbed by recreational activities on the lake; however, the nest has been successful up until 2012 and the eagles seem to be tolerant of current levels of disturbance.

TABLE W-6 –BALD EAGLE. Land ownership (acres, percent of total area in parentheses) within bald eagle management zones. Acreages exclude Little Bitterroot Lake.

OWNERSHIP	BALD EAGLE BREEDING MANAGEMENT ZONES		
	NEST SITE AREA	PRIMARY USE AREA	HOME RANGE
Montana DNRC	0	0	1,281 (12.7%)
Plum Creek	0	0	4,868 (48.4%)
Private	7 (100%)	83 (100%)	3,407 (33.9%)
USFS	0	0	508 (5.1%)
Total	***7***	***83***	***10,064***

Environmental Effects

Direct and Indirect Effects of the No-Action Alternative on Bald Eagles

None of the proposed forest management activities would occur. Timber harvest would not occur within bald eagle management zones occurring in the project area. Thus, since: 1) no change in bald eagle habitat characteristics would occur, and 2) no increased disturbance levels would occur, no direct or indirect effects to bald eagle eagles associated with nesting habitat quality or disturbance risk would be anticipated as a result of the No-Action Alternative.

Direct and Indirect Effects of the Action Alternative on Bald Eagles

The proposed timber harvest would affect 758 acres of bald eagle habitat within the home range of the pair (59.2% of bald eagle habitat in the project area). Within bald eagle home range habitat, 69 acres would be treated with an old-growth restoration treatment, which would retain 15-25% canopy cover. The remaining 689 acres would be treated with a seed tree treatment, which would retain 5-10% canopy cover and favor retention of ponderosa pine, western larch, and Douglas-fir. Across the project area, at least 2 large snags and 2 large recruitment trees per acre (>21 inches dbh) would be retained (*ARM 36.11.411*). The proposed units are located approximately 0.8 miles from the nest with residential development located between the nest and the proposed units. Considering the distance between the proposed units and the nest as well as existing levels of development and disturbance, adverse effects to eagles would likely be minimal. Truck traffic associated with the timber harvest would elevate traffic levels on approximately 16.0 miles of roads located within the bald eagle home range area, but no open roads are proposed for construction and 2.1 miles of road currently open to the public would be gated post-harvest. The proposed activities would occur in the project area for up to 3 years. Considering that the territory was inactive last year, it is possible that the next occupants of the territory may switch to a new nest location. If the nest is located closer to the proposed project area in the future, timing restrictions may be instated to protect the nesting pair. Thus, since: 1) no harvest would occur within the most sensitive management zones (i.e., nest site or primary use areas); 2) the proposed activities would affect 758 acres (59.2%) of bald eagle habitat located on DNRC-managed lands within the project area; 3) the proposed activities would not affect known bald eagle flight paths; 4) some large trees or snags would be removed within bald eagle home range habitat, but retention measures would apply (*ARM 36.11.411*); and 5) disturbance levels would

increase for 3 years due to harvesting and increased logging traffic; minor direct and indirect effects to bald eagle eagles associated with nesting habitat quality or disturbance risk would be anticipated as a result of the Action Alternative.

Cumulative Effects of the No-Action Alternative on Bald Eagles

None of the proposed forest management activities would occur. Ongoing and proposed forest management projects within the CEAA could change bald eagle habitat characteristics and disturbance levels. Thus, since: 1) no change in bald eagle habitat characteristics would occur, and 2) no increased disturbance levels within the CEAA would occur, no cumulative effects to bald eagle eagles associated with nesting habitat quality or disturbance risk would be anticipated as a result of the No-Action Alternative.

Cumulative Effects of the Action Alternative on Bald Eagles

The proposed timber harvest would remove some important bald eagle habitat attributes (i.e., large snags, large emergent trees) on 758 acres within bald eagle home range habitat. These proposed activities would occur outside of the sensitive nest site and primary use area management zones located within 0.5 miles of the nest. Overall, 6.0% of the bald eagle home range management zone would be affected. However, considering that the proposed units are located 0.8 miles from Little Bitterroot Lake, adverse effects to eagles are expected to be minimal. Disturbance levels would increase during harvest due to increased traffic levels on approximately 16.0 miles of roads. The proposed harvest would be additive to proposed and ongoing harvests, although DNRC is unaware of specific future plans. The proposed activities would occur in the project area for up to 3 years. Thus, since: 1) no harvest would occur within the most sensitive management zones (i.e., nest site or primary use areas); 2) the proposed activities would affect 758 acres (6.0%) of bald eagle home range habitat; 3) the proposed activities would not affect known bald eagle flight paths; 4) some large trees or snags may be removed within bald eagle breeding habitat, but retention measures would apply (*ARM 36.11.411*); and 5) disturbance levels would increase for up to 3 years due to increased logging traffic; minor cumulative effects to bald eagle eagles associated with nesting habitat quality or disturbance risk would be anticipated as a result of the Action Alternative.

FISHERS

Issue: *The proposed activities could reduce the availability and connectivity of suitable fisher habitat and increase human access, which could reduce habitat suitability and increase trapping mortality.*

Introduction

In the Rocky Mountains, fishers prefer late-successional moist coniferous forests (*Jones 1991*) and prey upon snowshoe hares, ungulate carrion, and small mammals (*Roy 1991*). Preferred fisher habitat typically contains large live trees, snags, and logs, which are used for resting and denning sites, and dense canopy cover, which is important for snow intercept (*Jones 1991*). Fishers generally avoid large openings in canopy cover and shrub-seedling stands. Forest management considerations for fishers involve providing upland and riparian resting and denning habitat, maintaining a network of travel corridors, and reducing trapping risk associated with motorized access.

Analysis Areas

The analysis area for direct and indirect effects is the 1,908-acre project area (FIGURE W-1 – ANALYSIS AREAS). The analysis area for cumulative effects is the 13,871-acre medium CEAA

described in TABLE W-1 –ANALYSIS AREAS and depicted in FIGURE W-1 –ANALYSIS AREAS. The large CEAA is centered on the project area and is defined according to geographic features (i.e., ridgelines), which are likely to influence movements of fishers in the vicinity of the project area, providing a reasonable analysis area for fishers that could be influenced by project-related activities.

Analysis Methods

Analysis methods include field evaluations, aerial photograph interpretation, and GIS analysis of travel corridors, preferred fisher cover types (*ARM 36.11.403(60)*), and habitat structure. Fisher habitat classifications considered in the analysis include: 1) upland fisher habitat, and 2) riparian fisher habitat, which are defined according to proximity of the area to streams. Riparian fisher habitat is located within 100 feet of Class 1 streams or within 50 feet of Class 2 streams (*ARM 36.11.440(b)*). The remaining fisher habitat is considered upland fisher habitat. Habitat structure considered appropriate for fisher use includes stands of sawtimber size class trees (≥9 inches dbh) with 40-100% crown density. Potential fisher habitat (riparian, upland) on other ownerships was identified by examining mature forested habitat below 6,000 feet elevation and the proximity of mature forested habitat (≥40% cover, >9 inches dbh average) to perennial and intermittent streams. Factors considered in the analysis include: 1) the degree of harvesting, 2) availability and structure of preferred fisher habitat (upland, riparian), 3) landscape connectivity, and 4) human access.

Existing Conditions

Fishers

The project area contains 1,107 acres of fisher habitat (58.0% of project area) including 21 acres of riparian fisher habitat associated with Class 1 and 2 streams. The remaining 801 acres in the project area consist of Douglas-fir, lodgepole pine, and ponderosa pine stands that are not an appropriate cover type for fishers. Fisher habitat is continuous within Sections 22 and 34, but is fragmented within Section 36. Overall, connectivity of suitable fisher habitat is high. Riparian habitat associated with Herrig Creek and additional Class 1 and 2 streams likely provide suitable travel corridors. Open road density in the project area is low (1.3 miles/square mile) and total road density is moderate (2.0 miles/square mile), thus there is moderate level of access that could facilitate trapping.

The medium CEAA contains approximately 2,998 acres of fisher habitat (21.6% of analysis area), including 1,107 acres of fisher habitat on DNRC-managed lands and an additional 1,891 acres of mature forested habitat on other ownerships located below 6,000 feet elevation, which are likely to provide suitable fisher habitat. Of these acres of potential fisher habitat, approximately 147 acres are riparian fisher habitat. The remaining 10,873 acres in the medium CEAA consist primarily of young regenerating stands located on private lands. Fisher habitat exists in discontinuous patches throughout the medium CEAA with the majority of potential fisher habitat located on USFS and DNRC lands in the northern and southern portions of the analysis area. The density of open and seasonally restricted roads is 1.7 miles/square mile and total road density is 3.9 miles/square mile, thus there is a moderate level of access that could facilitate trapping.

Environmental Effects

Direct and Indirect Effects of the No-Action Alternative on Fishers

None of the proposed forest management activities would occur. Thus, since: 1) no change in the amounts or structure of preferred fisher habitat would occur, 2) no change in landscape

connectivity would occur, and 3) no changes to human access would occur that would facilitate trapping, no direct or indirect effects to fisher associated with habitat suitability and trapping risk would be anticipated as a result of the No-Action Alternative.

Direct and Indirect Effects of the Action Alternative on Fishers

The proposed activities would affect 681 acres (61.5%) of the 1,107 acres of suitable fisher habitat present in the project area. Mature canopy cover would be reduced to 30-40% in 25 acres treated with commercial thin treatments. The remaining 656 acres would be treated with a seed tree or old-growth maintenance treatments, which would retain 5-25% canopy cover; thus the structure of all of stands proposed for harvest would be expected to become unsuitable for fishers. Fisher riparian habitat would not be affected by the proposed activities. The availability of snags and coarse woody debris would be reduced by harvest activities; although retention of dead material and live snag recruitment trees would meet DNRC Forest Management Rules (*ARM 36.11.411, ARM 26.11.414*). Approximately 6.0 miles of restricted roads are proposed for construction; however, these roads would be closed to the public post-harvest and 2.1 miles of currently open roads in Section 36 would be closed post-harvest. Thus trapping risk associated with human access would increase in some areas, but decrease in others. Connectivity of mature forested habitat suitable for fisher use would be expected to decrease under the Action Alternative, although travel corridors associated with riparian habitat would remain, and connectivity would remain high in the northeast portion of Section 22. If present in the vicinity of the project area, fishers could disturbed and be temporarily displaced by forest management activities for up 3 years. Thus, since: 1) habitat availability would be reduced by 681 acres (61.5%), but some snags and coarse woody debris would be retained (*ARM 36.11.411, ARM 26.11.414);* 2) riparian fisher habitat would not be affected; 3) landscape connectivity would be reduced, but connectivity would remain in riparian habitat and in Section 22; and 4) approximately 6 miles of restricted roads would be constructed, but open road density would be reduced following the closure of 2.1 miles of open roads; moderate adverse direct and indirect effects to fisher associated with habitat suitability and trapping risk would be anticipated as a result of the Action Alternative.

Cumulative Effects of the No-Action Alternative on Fishers

None of the proposed forest management activities would occur. Ongoing and proposed forest management projects within the medium CEAA that could influence fisher habitat availability, habitat structure, and landscape connectivity. Thus, since: 1) no change in the amount or structure of preferred fisher habitat would occur, 2) no change in landscape connectivity would occur, and 3) no changes to human access would occur that would facilitate trapping, no cumulative effects to fisher associated with habitat suitability and trapping risk would be anticipated as a result of the No-Action Alternative.

Cumulative Effects of the Action Alternative on Fishers

The proposed activities would affect 681 acres (22.7%) of the 2,997 acres of potential fisher habitat available in the medium CEAA. The proposed activities would change the structure of these stands, reducing canopy cover to 5-25% in 656 acres and to 30-40% in 25 acres; thus the structure of these stands proposed for harvest would be expected to become unsuitable for fishers. Riparian fisher habitat would not be affected by the proposed activities. The availability of snags and coarse woody debris would be reduced by harvest activities; although retention of dead material and live snag recruitment trees would be required to meet DNRC Forest Management Rules (*ARM 36.11.411, ARM 26.11.414*). Connectivity of fisher habitat would be reduced, but travel corridors associated with riparian habitat would be maintained. Approximately 7.1 miles of restricted roads would be constructed, increasing trapping risk, but 2.1 miles of open roads would be closed post-harvest. Any adverse affects to fisher would be additive to any proposed or ongoing sales in the medium CEAA, although DNRC is unaware of any such projects

at this time. Fishers could be temporarily displaced by forest management activities associated with the proposed Bitter Herrig Timber Sale for up to 3 years. Thus, since: 1) habitat availability would decrease by 681 acres (22.7%), but snags and coarse woody debris would be retained (*ARM 36.11.411, ARM 26.11.414);* 2) riparian fish habitat would not be affected; 3) landscape connectivity would be reduced; and 4) approximately 7.1 miles of restricted roads would be constructed, but open road density would decrease due to the closure of 2.1 miles of open roads; minor adverse cumulative effects to fisher associated with habitat suitability and trapping risk would be anticipated as a result of the Action Alternative.

FLAMMULATED OWLS

***Issue**: The proposed activities could alter the structure of flammulated owl preferred habitat, which could reduce habitat suitability for flammulated owls.*

Introduction

Flammulated owls are small, migratory, insectivorous forest owls that inhabit old, open stands of warm-dry ponderosa pine and cool-dry Douglas-fir forests in the western United States (*McCallum 1994*). Flammulated owls are secondary cavity nesters, and typically nest in 12-25 inch dbh aspen, ponderosa pine, or Douglas-fir cavities excavated by pileated woodpeckers or northern flickers. Forest management considerations for flammulated owls include providing open, dry stands of ponderosa pine and Douglas-fir and retaining snags for nesting. Timber harvest may affect the physiognomy of timber stands and reduce the availability of snags, potentially reducing habitat suitability for flammulated owls.

Analysis Area

The analysis area for direct and indirect effects is the 1,908-acre project area (FIGURE W-1 – ANALYSIS AREAS). The analysis area for cumulative effects is the 13,871-acre medium CEAA described in TABLE W-1 –ANALYSIS AREAS and depicted in FIGURE W-1 –ANALYSIS AREAS. The medium CEAA is defined according to geographic features (i.e., ridgelines) which may influence movements of local flammulated owls in the vicinity of the project area and provides a reasonable analysis area for local flammulated owls that could be affected by project-related activities.

Analysis Methods

Analysis methods include field evaluations, aerial photograph interpretation, and GIS analysis of available habitat. In the project area, SLI data were used to identify preferred flammulated owl habitat types (*ARM 36.11.403(28)*). Stands were considered suitable for flammulated owl use if the stocking density of trees >9 inches dbh was in the poorly-stocked class (10-39% canopy cover). On non-DNRC lands, data identifying suitable flammulated owl habitat are not readily available. Therefore, GIS analysis of aerial-photographs was used to identify stands containing 10-39% canopy cover that were composed primarily of trees >9 inches dbh below 6,000 feet. These stands are likely to contain habitat types preferred by flammulated owls as well as matrix habitat. Factors considered in the analysis include: 1) the degree of harvesting, and 2) the structure of flammulated owl preferred habitat.

Existing Conditions

Flammulated Owls

The project area contains 1,306 acres (68.4% of project area) of cover types preferred by flammulated owls. This habitat is composed primarily of western larch and Douglas-fir stands, with some ponderosa pine. Approximately 241 (12.6% of project area) of these 1,306 acres are

poorly-stocked (10-39% canopy cover) and are likely to provide habitat attributes suitable for flammulated owl use. The remaining 1,065 acres of preferred flammulated owl cover types in the project area are not likely to provide suitable structural attributes for use by flammulated owls due to high stocking density. The remaining acres in the project area consist primarily of larch stands that are not considered a suitable habitat type for flammulated owls as well as 17 acres of open non-forested areas consisting of grasses and shrubs. Snag density in the project area is currently high, suggesting that nesting trees are available in the project area (see *SNAGS AND COARSE WOODY DEBRIS* in the coarse-filter analysis section for additional information).

The medium CEAA contains approximately 2,945 acres (21.2% of medium CEAA) of mature open forested conditions (10-39% canopy cover, 9 inches dbh average), which includes 242 acres of DNRC-managed flammulated owl habitat containing suitable structure and 2,703 acres of open mature forested habitat on other ownerships. The remaining acres consist of approximately 6,859 acres of young stands composed of trees <9 inches dbh average (49.4% of analysis area), 3,187 acres (23.0% of analysis area) of mature forest that are too dense for appreciable flammulated owl use, and 788 (5.7% of analysis area) acres of open permanent non-forest areas. Open and seasonally restricted road density in the medium CEAA is moderate (1.7 miles/square mile) and total road density is high (3.9 miles/square mile). Due to motorized access and the harvesting history in the medium CEAA, average stand age is young and snag availability for flammulated owl nesting is likely limited.

Environmental Effects

Direct and Indirect Effects of the No-Action Alternative on Flammulated Owls

None of the proposed forest management activities would occur. Timber harvest would not occur in preferred flammulated owl habitat. Thus, since there would be no change in the structure of preferred flammulated owl habitat, no direct or indirect effects to flammulated owl habitat suitability would be anticipated as a result of the No-Action Alternative.

Direct and Indirect Effects of the Action Alternative on Flammulated Owls

Timber harvest would occur in 742 of the 1,306 acres (56.8%) of preferred flammulated owl cover types available in the project area. The proposed activities would open stands to 5- 25% canopy cover in 717 acres proposed for old-growth maintenance and seed tree treatments, and to 30-40% in 25 acres proposed for commercial thin treatments, improving stand structure suitability for flammulated owls, particularly in 640 acres of stands that are currently moderately- or well-stocked. Additionally, the proposed harvest would favor leaving ponderosa pine and Douglas-fir while removing shade-tolerant trees and retaining regenerating conifers, which is preferable for flammulated owls (*ARM 36.11.437(b)*). Some snags could be removed by the proposed harvest, but at least 2 large snag and 2 large snag recruitment tree per acre (>21 inches dbh) would be retained (*ARM 36.11.411*). Flammulated owls are tolerant of human disturbance (*McCallum 1994*), however disturbance associated with harvesting could adversely affect flammulated owls for up to 3 years, should they be present in the project area. Thus, since: 1) changes in structure and cover type would generally increase flammulated owl habitat suitability, and 2) snags would be retained to meet DNRC administrative rules (*ARM 36.11.411*), minor beneficial direct and indirect effects to flammulated owl habitat suitability would be anticipated as a result of the Action Alternative

Cumulative Effects of the No-Action Alternative on Flammulated Owls

None of the proposed forest management activities would occur. Flammulated owl habitat availability and structure would remain the same in the project area, but may change on other ownerships. Thus, since no change in the structure of preferred flammulated owl habitat would

occur, no cumulative effects to flammulated owl habitat suitability would be anticipated as a result of the No-Action Alternative.

Cumulative Effects of the Action Alternative on Flammulated Owls

The proposed activities would occur in 742 acres of preferred flammulated owl cover types available in the project area. The proposed activities would open stands to 5-40% canopy cover, favor retention of ponderosa pine and Douglas-fir, and retain patches of regenerating conifers where feasible, improving stand structure suitability for flammulated owls, particularly within 640 acres of preferred flammulated owl cover types that are currently moderately- to well-stocked (*ARM 36.11.437(b)*). The availability of suitable flammulated owl habitat is expected to increase by 578 acres, from 2,945 acres to 3,585 total acres of suitable flammulated owl habitat in the medium CEAA (25.8% of medium CEAA). Changes in flammulated owl habitat suitability would be additive to proposed and ongoing activities occurring in the medium CEAA, although DNRC is currently unaware of such projects. The proposed activities could disturb flammulated owls for up to 3 years should they be present in the vicinity of the project area. Thus, since 1) changes in structure and cover type would generally increase flammulated owl habitat suitability, and 2) snags would be retained to meet DNRC administrative rules (*ARM 36.11.411*), minor beneficial cumulative effects to flammulated owl habitat suitability would be anticipated as a result of the Action Alternative.

GRAY WOLVES

Issue: *The proposed activities could disturb gray wolves and reduce winter range habitat quality for big game, which could displace gray wolves from denning and rendezvous sites and reduce prey availability.*

Introduction

Wolves are wide-ranging opportunistic carnivores that prey on ungulates. In general, wolf densities are positively correlated to prey densities (*Fuller et al. 1992*). Wolves prey primarily on white-tailed deer, and, to a lesser extent, elk and moose, in northwest Montana (*Kunkel et al. 1999*). However, some studies have shown that wolves may prey upon elk more frequently during certain portions of the year (particularly winter) or in areas where elk numbers are higher (*Arjo et al. 2002, Kunkel et al. 2004, Garrott et al. 2006*). Thus, reductions in big game numbers and winter range productivity could be indirectly detrimental to wolf populations. Forest management considerations for wolves include restricting disturbance near den and rendezvous sites and promoting habitat characteristics necessary for healthy big game populations.

Analysis Areas

The analysis area for direct and indirect effects is the 1,908-acre project area (FIGURE W-1 – ANALYSIS AREAS). The analysis area for cumulative effects is the 31,568-acre large CEAA described in TABLE W-1 –ANALYSIS AREAS and depicted in FIGURE W-1 –ANALYSIS AREAS. The large CEAA is centered on the project area, defined according to geographic features (i.e., ridgelines), incorporates big game winter range and provides a reasonable analysis area for wolves that could be influenced by project-related activities.

Analysis Methods

Analysis methods include field evaluation, aerial photograph interpretation, and GIS analysis of available habitat. Factors considered in the analysis include: 1) the degree of harvesting, 2) the location of any known den or rendezvous sites, and 3) big game winter range habitat characteristics.

Existing Conditions

Gray Wolves

The project area contains 616 acres of the estimated 2011 home range of the Elbow Pack (32.3% of project area; 2.1% of wolf pack home range) (*DFWP 2012*). No wolf rendezvous sites or den sites have been documented within 1 mile of the project area (*K. Laudon, DFWP, wolf management specialist, pers. comm., Oct. 1, 2012*); however, wolf use of the area could occur at any time. All three sections may provide big game winter range for elk, mule deer, moose, and white-tailed deer. All of these species except for elk were observed by DNRC personnel in the project area. This area contains favorable characteristics for big game winter range including southwest-facing slopes, low elevation, and ample overstory canopy cover. Game trails, tracks, and pellets were observed throughout the project area; although heavy browsing of young conifers was not observed during visits to the area. White-tailed deer, mule deer, and moose were observed by DNRC personnel using the project area. The project area likely provides habitat for prey species, should wolves use the area.

The large CEAA contains 7,105 acres of the estimated 2011 home range of the Elbow Pack (22.5% of analysis area; 23.7% of wolf pack home range). Portions of the CEAA are identified as elk, mule deer, moose, and white-tailed deer winter range by DFWP. The analysis area likely provides habitat for prey species year round, should wolves use the area.

Environmental Effects

Direct and Indirect Effects of the No-Action Alternative on Gray Wolves

None of the proposed forest management activities would occur. Thus, since: 1) no disturbance to wolf den or rendezvous sites would occur, and 2) no change in big game winter range habitat characteristics would occur, no direct or indirect effects to wolves associated with displacement or changes in prey availability would be anticipated as a result of the No-Action Alternative.

Direct and Indirect Effects of the Action Alternative on Gray Wolves

The proposed activities would occur in 303 acres (49.2%) of the Elbow Pack home range present in the project area. The proposed activities would affect elk, mule deer, moose, and white-tailed deer winter range as identified by DFWP. Moose are fairly tolerant of winter conditions due to their large body size and the proposed activities are not expected to adversely affect moose. Canopy cover would be reduced in mature forested habitat to approximately 5-25% in 927 acres proposed for seed tree and old-growth restoration treatments and to 30-40% in 25 acres proposed for commercial thinning treatments. Due to the proposed activities, prey location and availability may change. However, continued use of the project area is expected post-harvest due to rocky topography and habitat conditions in the surrounding area, although the area would become less suitable for white-tailed deer. There are no known wolf rendezvous or den sites in the project area. However, if documented in the vicinity of the project area, mechanized activities would be restricted within 1 mile of wolf dens (*ARM 33.11.430(1)(a)*) and 0.5 miles of wolf rendezvous sites (*ARM 33.11.430(1)(b)*). Wolf use of the area is possible, and if present in the vicinity of the project area, wolves could be displaced by forest management activities for up to 3 years. Thus, since: 1) wolf den or rendezvous sites do not occur within the vicinity of the project area, but restrictions would apply if either are encountered during operations (*ARM 33.11.430(1)(a)(b)*); 2) canopy cover would be removed, potentially changing the location and availability of prey; and 3) big game would likely continue to use the project area; minor adverse direct and indirect effects to wolves associated with displacement or changes in prey availability would be anticipated as a result of the Action Alternative.

Cumulative Effects of the No-Action Alternative on Gray Wolves

None of the proposed forest management activities would occur. Wolves would not be disturbed by forest management activities on DNRC lands. Big game winter range availability in the project area would not change, but may change on other ownerships outside the project area due to other potential proposed and ongoing projects. Thus, since: 1) no disturbance to wolf den or rendezvous sites would occur and 2) no change in big game winter range habitat characteristics would occur, no direct or indirect effects to wolves associated with displacement or changes in prey availability would be anticipated as a result of the No-Action Alternative.

Cumulative Effects of the Action Alternative on Gray Wolves

The proposed activities would occur in 303 acres (4.3%) of the Elbow Pack home range present within the large CEAA. The proposed activities would affect elk, mule deer, moose, and white-tailed deer winter range as identified by DFWP. Moose are fairly tolerant of winter conditions due to their large body size and the proposed activities are not expected to adversely affect moose. The proposed harvest would reduce canopy cover to <40% within 952 acres (18.2%) of the 5,194 acres of mature habitat available in the large CEAA. The proposed activities are anticipated to have moderate adverse affects on big game wintering in the large CEAA. However, big game could still use the affected habitat post-harvest. There are no known rendezvous or den sites on DNRC lands in the large CEAA. However, if documented in the vicinity of the project areas, mechanized activities would be restricted within 1 mile of wolf dens (*ARM 33.11.430(1)(a)*) and 0.5 miles of wolf rendezvous sites (*ARM 33.11.430(1)(b)*). Big game winter range availability and disturbance to wolves would be additive to any proposed and ongoing activities occurring in the large CEAA, although the DNRC is unaware of such projects at this time. If present in the vicinity of the project area, wolves could be displaced by forest management activities associated with the Bitter Herrig Timber Sale for up to 3 years. Thus, since: 1) wolf den or rendezvous sites do not occur within the vicinity of the project area, but restrictions would apply if either are encountered during operations (*ARM 33.11.430(1)(a)(b)*); 2) canopy cover would be removed, potentially changing the location and availability of prey; and 3) big game are likely to continue to use the area post-harvest; minor adverse cumulative effects to wolves associated with displacement or changes in prey availability would be anticipated as a result of the Action Alternative.

PILEATED WOODPECKER

Issue: *The proposed activities could reduce tree density and alter the structure of mature forest stands, which could reduce habitat suitability for pileated woodpeckers.*

Introduction

Pileated woodpeckers require mature forest stands with large dead or defective trees for nesting and foraging. Cavities created by pileated woodpeckers are ecologically important and are often used in subsequent years by a variety of wildlife species for nesting and roosting. Pileated woodpeckers prefer to nest in ≥20 inch dbh western larch, ponderosa pine, cottonwood, or quaking aspen. The diet of the pileated woodpecker consists primarily of carpenter ants, which inhabit large downed logs, stumps, and snags. Additionally, the density of pileated woodpeckers is positively correlated with the amount of dead and dying wood in a stand (*McClelland 1979*). Forest management considerations for pileated woodpeckers include retaining dense patches of old and mature coniferous forest with abundant large snags and coarse-woody debris.

Analysis Areas

The analysis area for direct and indirect effects is the 1,908-acre project area (FIGURE W-1 – ANALYSIS AREAS). The analysis area for cumulative effects is the 13,871-acre medium CEAA

described in TABLE W-1 –ANALYSIS AREAS and depicted in FIGURE W-1 –ANALYSIS AREAS. The medium CEAA is centered on the project area and defined according to geographic features (i.e., ridgelines) and provides a reasonable analysis area for pileated woodpeckers that could be influenced by project-related activities. This scale provides a sufficient area to support multiple pairs of pileated woodpeckers (*Bull and Jackson 1995*).

Analysis Methods

Analysis methods include field evaluation, aerial photograph interpretation, and GIS analysis of available habitat. SLI data were used to identify preferred pileated woodpecker habitat (*ARM 36.11.403(58)*). To assess potential pileated woodpecker habitat on DNRC-managed lands, sawtimber stands ≥100 years old within preferred pileated cover types (*ARM 36.11.403(58)*) with ≥40% or greater canopy closure were considered potential pileated woodpecker habitat. On non-DNRC lands, the stands considered potential suitable habitat for pileated woodpeckers were mature forest stands (≥40% canopy cover, >9 inches dbh average) below 6,000 feet elevation. Factors considered in the analysis include: 1) the degree of harvesting and 2) the structure of pileated woodpecker preferred habitat types.

Existing Conditions

Pileated Woodpeckers

The project area contains 416 acres (21.8% of project area) of suitable pileated woodpecker habitat. This habitat is composed primarily of Douglas-fir, larch, and ponderosa pine stands occurring primarily in scattered patches in Section 22 and 34. The remaining acres in the project area consist of 1,235 acres of stands that do not contain adequate stocking density or are not appropriate forest types for pileated woodpeckers (64.7% project area), 293 acres of young stands <100 years in age (15.3% project area), as well non-forested open grass and shrub areas. During field visits, pileated woodpeckers were heard calling and recent foraging on snags was observed in Section 36. Snag availability in the project is moderate at 16 snags snags/acre ≥8 inches dbh and coarse woody debris moderate at 15 tons/acre (see *SNAGS AND COARSE WOODY DEBRIS* in the coarse-filter analysis section for additional information).

The medium CEAA contains 2,304 acres (17.6% of medium CEAA) of potential pileated woodpecker habitat, which includes 416 acres of DNRC-managed pileated woodpecker habitat and an additional 1,888 acres of mature forested habitat (<6,000 feet elevation) on other ownerships. Open and seasonally restricted road density in the medium CEAA is moderate (1.7 miles/square mile) and total road density is high (3.9 miles/square mile) and provides accessibility for firewood cutting. Considering the extensive history of timber harvest on private lands in the medium CEAA (74.7% medium CEAA privately owned), snag and coarse-woody debris availability is likely limited. Considering the open road density, land ownership patterns, and harvesting history, there are likely limited amounts of snags and coarse-woody debris available in the medium CEAA.

Environmental Effects

Direct and Indirect Effects of the No-Action Alternative on Pileated Woodpeckers

None of the proposed forest management activities would occur. Thus, since no change in the structure of pileated woodpecker habitat would occur, no direct or indirect effects to pileated woodpecker habitat suitability would be anticipated as a result of the No-Action Alternative.

Direct and Indirect Effects of the Action Alternative on Pileated Woodpeckers

The proposed activities would occur in 353 acres (84.9%) of the 416 acres of pileated woodpecker habitat available in the project area. The proposed activities would open stands to 5-10% canopy cover in 284 acres and to 15-25% canopy cover in 69 acres of current pileated woodpecker habitat. Thus, the structure of these stands would be expected to become unsuitable for appreciable use by pileated woodpeckers, although some limited use could occur in old-growth stands retaining 15-25% canopy cover. Snags would be removed by the proposed harvest, but at least 2 large snags and 2 large snag recruitment trees per acre (>21 inches dbh) would be retained (*ARM 36.11.411*). Disturbance associated with harvesting could adversely affect pileated woodpeckers on portions of the project area for up to 3 years, should they be present in the project area. Thus, since: 1) forest structural changes would occur, but mitigation would include retention of snags and coarse woody debris (*ARM 36.11.411, ARM 36.11.414*); and 2) harvesting would reduce pileated woodpecker suitable habitat availability by 353 acres (84.9%) within the project area; moderate adverse direct and indirect effects to pileated woodpecker habitat suitability in the project area would be anticipated as a result of the No-Action Alternative.

Cumulative Effects of the No-Action Alternative on Pileated Woodpeckers

None of the proposed forest management activities would occur. Ongoing and proposed forest management projects within the medium CEAA could change pileated woodpecker habitat availability. Thus, since no change in the structure of pileated woodpecker habitat would occur, no cumulative effects to pileated woodpecker habitat suitability would be anticipated as a result of the No-Action Alternative.

Cumulative Effects of the Action Alternative on Pileated Woodpeckers

The proposed activities would occur in 353 acres (15.3%) of the 2,304 acres of potential pileated woodpecker habitat in the medium CEAA. The proposed activities would open stands to 5-10% canopy cover in 284 acres and to 15-25% canopy cover in 69 acres of current pileated woodpecker habitat, causing habitat structure to become unsuitable for pileated woodpecker use, although these acres would retain some habitat attributes important to pileated woodpeckers including snags and coarse woody debris. Snags would be removed by the proposed harvest, but at least 2 large snags and 2 large snag recruitment trees per acre (>21 inches dbh) would be retained (*ARM 36.11.411*). Changes in pileated woodpecker habitat suitability would be additive to proposed and ongoing activities occurring in the medium CEAA, although DNRC is currently unaware of such projects. Disturbance associated with the proposed activities could adversely affect pileated woodpeckers for up to 3 years in portions of the project area. Thus, since: 1) structural changes would occur, but mitigations would include retention of snags and coarse woody debris; and 2) harvesting would reduce pileated woodpecker suitable habitat availability by 353 acres (15.3%) within the medium CEAA; minor adverse cumulative effects to pileated woodpecker habitat suitability would be anticipated as a result of the Action Alternative.

BIG GAME WINTER RANGE

Issue: *The proposed activities could reduce cover, which could reduce the quality of big game winter range habitat.*

Introduction

Big game, including elk, mule deer, and white-tailed deer require areas with adequate amounts of cover and forage at lower elevations during winter. Effective big game winter range contains ample mid-story and overstory, which can ameliorate severe winter conditions by reducing wind velocity and providing snow intercept, enabling big game to move across the landscape, and by improving access to forage with less energy expenditure. Forest management considerations for

big game include providing adequate hiding cover and ample overstory, which ameliorate the effects of harsh weather conditions in winter.

Analysis Areas

The analysis area for direct and indirect effects is the 1,908-acre project area (FIGURE W-1 – ANALYSIS AREAS). The analysis area for cumulative effects is the 13,871-acre medium CEAA described in TABLE W-1 –ANALYSIS AREAS and depicted in FIGURE W-1 –ANALYSIS AREAS. The medium CEAA includes the project area as well as low-elevation west- and southwest-facing slopes in the vicinity of the project area that are most likely to provide suitable conditions for big game winter range. The area is defined according to geographic features including watershed boundaries, which, provides a reasonable biological analysis unit for local big game animals that could be influenced by project-related activities.

Analysis Methods

Analysis methods include field evaluations, aerial photograph interpretation, and GIS analysis of available big game winter range. The availability of mature forested habitat (≥40% canopy cover, >9 inch dbh average) was used to assess the quality of big game winter range in the medium CEAA. Factors considered in the analysis include: 1) the degree of timber harvesting, and 2) the availability and structure of big game winter range.

Existing Conditions

Big Game Winter Range

The project area provides potential elk, mule deer, and white-tailed deer winter range. The project area is a part of a larger winter range extending west into the Lost Trail National Wildlife Refuge (NWR) and east along the west-facing slopes of the Salish Mountains. Desirable winter range habitat attributes found in the project area include low elevation (3,920-5,000 feet), steep slopes, southwest-facing aspects, and appreciable amounts of canopy cover. Approximately 1,299 acres (68.1% of project area) contain mature canopy cover (≥40% canopy cover, 9 inch dbh average) composed primarily of Douglas-fir, western larch, and ponderosa pine stands. This habitat contains approximately 718 acres of dense canopy cover (≥70% canopy cover). Big game trails and pellets were observed in the project area, but extensive foraging on young conifers often seen in critical winter range was not observed. However, the area likely still provides important winter range habitat.

The medium CEAA contains elk, mule deer, and white-tailed deer winter range. Elk are observed wintering in the vicinity of Lost Trail NWR and white-tailed deer and mule deer also likely use the area. Frequently used portions of the winter range are likely located in areas with high canopy cover on USFS and DNRC lands as well as the parcels located at low elevations near Dahl Lake and Little Bitterroot Lake. Desirable winter range habitat attributes that occur in this area include low elevation, steep slopes, and south- and southwest-facing aspects. Approximately 3,187acres (24.4% analysis area) of mature forested habitat (≥40% canopy cover, >9 inch dbh average) occur in the medium CEAA and provides some thermal protection for big game. The remaining habitat in the medium CEAA consists of open mature stands and young regenerating stands due to the history of logging. The town of Marion is located south of the medium CEAA and substantial residential development exists along the shore of Little Bitterroot Lake, potentially displacing big game animals or reducing the quality of these areas (*Vore 2012*). Areas with less residential development occur at higher elevations above of the valley bottoms as well as near Lost Trail NWR .

Environmental Effects

Direct and Indirect Effects of the No-Action Alternative on Big Game Winter Range

None of the proposed forest management activities would occur. Mature forested habitat in the project area providing thermal cover in the project area would not be affected. Thus, since the structure of existing big game winter range would not change, no direct and indirect effects to big game winter range quality and wintering animals would be anticipated as a result of the No-Action Alternative.

Direct and Indirect Effects of the Action Alternative on Big Game Winter Range

Big game winter range would be affected by the proposed activities. Canopy cover would be reduced in mature forested habitat to approximately 5-25% in 927 acres proposed for seed tree and old-growth restoration treatments and to 30-40% in 25 acres proposed for commercial thinning treatments. The proposed activities would retain large ponderosa pine and western larch, but would be relatively open post-harvest, reducing the capacity of these areas to provide snow intercept and reduce wind velocity. Within Sections 22 and 36, retention of mature canopy cover would facilitate travel across these areas. Additionally, the project area is very rocky and pockets of dense cover will remain in areas that are not feasible to harvest. Considering that canopy cover would be reduced below 70% in these harvest units, white-tailed deer would likely not use the harvest units within project area post-harvest when snow accumulation is high. However, elk and mule deer may continue using these areas, but, the availability of thermal cover would be reduced. Regenerating conifers would be retained throughout the harvest units, providing some residual cover and needle-foraging opportunities. Winter logging may occur, but would not be required and wintering animals could be displaced for up to 3 winters by the proposed activities. Thus, since: 1) canopy cover would be removed on 952 acres (73.3% of available mature canopy cover), 2) some canopy cover and regenerating conifers would be retained, 3) displacement of big game would be temporary (up to 3 years), 4) connectivity would be retained in Sections 22 and 36 at a reduced level, moderate adverse direct and indirect effects to big game winter range quality and wintering animals would be anticipated as a result of the Action Alternative.

Cumulative Effects of the No-Action Alternative on Big Game Winter Range

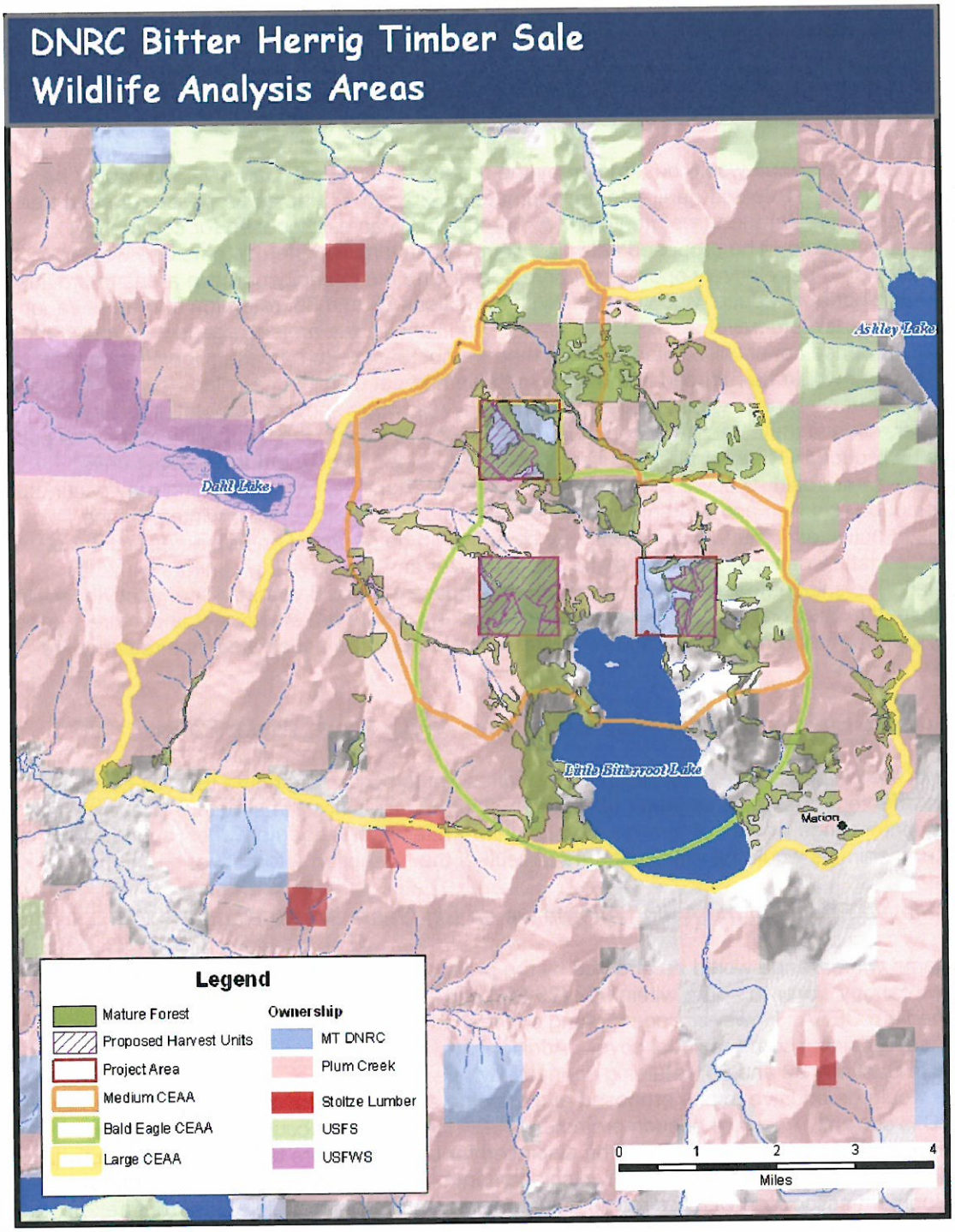
None of the proposed forest management activities would occur. Big game thermal cover would not be affected, but may change on other ownerships. Thus, since the structure of existing big game winter range would not change, no cumulative effects to big game winter range quality and wintering animals would be anticipated as a result of the No-Action Alternative.

Cumulative Effects of the Action Alternative on Big Game Winter Range

Big game winter range would be affected by the proposed activities. The proposed harvest would reduce canopy cover to <40% within 952 (29.9%) of the 3,187acres of mature habitat available in the medium CEAA. However, regenerating conifers and some canopy cover (5-40%) would be retained, providing some residual cover. Additionally, higher retention of canopy cover would occur in Sections 22 and 36, retaining connectivity at a reduced level. Reductions in thermal cover would be additive to any proposed and ongoing activities in the medium CEAA, although DNRC is currently unaware of such projects. Winter logging may occur, but would not be required and wintering animals could be displaced for up to 3 winters by the proposed activities. Displacement would be additive to any displacement occurring due to the high level of residential development associated with the residential areas along the shore of Little Bitterroot Lake. Thus, since: 1) canopy cover would be removed, reducing the quality of big game winter range on 952 acres (29.4% of available canopy cover) currently providing thermal cover; 2) some canopy cover and regenerating conifers would be retained; 3) displacement of big game would additive to other

sources of disturbance, but would occur for a short period of time (3 years); and 4) the proposed activities would retain a riparian travel corridor across winter range identified by DFWP in Section 36; moderate adverse cumulative effects to big game winter range quality and wintering animals would be anticipated as a result of the Action Alternative.

FIGURE W-1 –ANALYSIS AREAS. The project area and wildlife cumulative effects analysis areas (CEAAs) for the proposed Bitter Herrig Timber Sale.



WATERSHED AND HYDROLOGY ANALYSIS

INTRODUCTION

Project Area and Project Activities

The gross project area includes approximately 1920 acres of trust lands near Marion, Montana. Affected watersheds include Herrig Creek and unnamed tributaries to Little Bitterroot Lake. These parcels are within the Thompson River watershed. In addition, one class 1 stream contributes surface flow to Little Bitterroot Lake. The remainder of the draws have no evidence of surface flow or surface contribution to other streams, lakes or other bodies of water. The project area is adjacent to land managed by Plum Creek Timber Company. Proposed project activities would include ground based and cable yarding methods to harvest timber on approximately 1060 acres within the project area.

Resource Description

Resources potentially at risk in the project area include increased water yield and increased sediment delivery. Water yield increases (WYI) can affect channel stability if dramatically altered, and sediment delivery from both in-channel and introduced sources is a primary component of overall water quality in a watershed.

Issues and Measurement Criteria

The following issues encompass the specific issues and concerns raised through public comment and scoping of the proposed project. For a specific list of individual comments and concerns, please refer to the project file.

Sediment Delivery

Sediment delivery and subsequent water-quality impacts can occur as a result of timber harvesting and related activities, such as road construction and log yarding to landings. Construction of roads, skid trails and landings can generate and transfer substantial amounts of sediment through the removal of vegetation and exposure of bare soil. In addition, removal of vegetation near stream channels reduces the sediment-filtering capacity and may reduce channel stability and the amounts of large woody material. Large woody debris is a very important component of stream dynamics, creating natural sediment traps and energy dissipaters to reduce the velocity and erosive power of stream flows.

Measurement Criteria: Sediment from roads, harvesting activities and vegetative removal will be analyzed qualitatively through data collected during past statewide and DNRC internal BMP field reviews.

Water Yield

Water yield can be affected by timber harvesting and associated activities by affecting the timing, distribution and amount of water yield in a harvested watershed. Water yields increase proportionately to the percentage of canopy removal (*Haupt 1976*), because removal of live trees reduces the amount of water transpired, leaving more water available for soil saturation and runoff. Water yield is further affected because canopy removal also decreases interception of rain and snow and alters snowpack distribution and snowmelt. Water yield impacts are

ameliorated as new trees begin to grow and use water. New growth also begins to return snowpack distribution to pre-harvest levels as stands grow. Higher water yields may lead to increases in peak flows and peak-flow duration, which can result in accelerated streambank erosion and sediment deposition. Vegetation removal can also reduce peak flows by changing the timing of snowmelt. Openings will melt earlier in the spring with solar radiation and have less snow available in late spring when temperatures are warm. This effect can reduce the synchronization of snowmelt runoff and lower peak flows.

Measurement criteria: The water yield increase for the project area streams was determined using field review and aerial photo interpretation. Visual inspection of the runoff patterns and stream channel stability within the Thompson Face project area were used to assess the impacts of past management to water yield. Aerial photo interpretation was used to determine the extent of past management in these watersheds.

Fish Habitat

Fish habitat can be affected in three primary ways by timber harvesting through the following: 1) introduction of fine sediment to spawning habitat as a result of road construction and use, and ground-based equipment operation, 2) stream temperature can be increased if trees that provide shade to a stream are removed, and 3) large woody debris in streams can be reduced if trees are removed that have the potential to fall into or across a stream.

Measurement criteria: Qualitative discussion of potential risks to sediment delivery, stream shading and large woody debris.

Analysis Area

Sediment Delivery

Analysis area for direct, indirect and cumulative effects to sediment delivery will be analyzed on all existing roads in and leading to the proposed project area. Sediment delivery will be analyzed qualitatively where stream crossings exist within the proposed project area using visual inspection and lineal measurement to determine the road surface area delivering to a stream. Additional sites on proposed haul routes located outside the project area will be assessed qualitatively for their potential to affect downstream water.

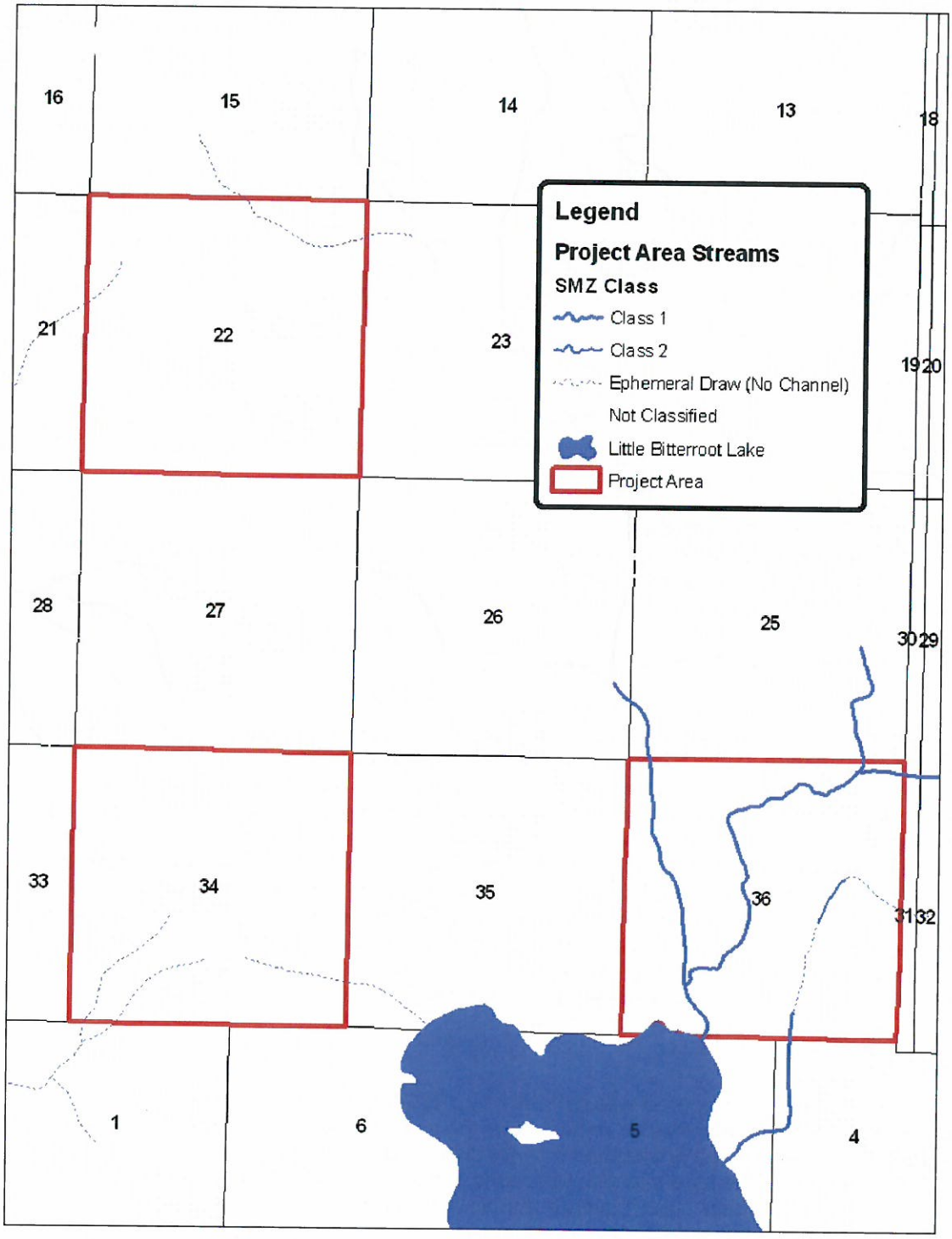
Water Yield

Direct, indirect and cumulative effects to water yield will be analyzed in the stream systems within the project area. A map of the project area and the streams found within the project area is found in ***Figure H-1***. All existing activities on all ownership and proposed activities related to the Bitter Herrig project will be analyzed using methods described above. These drainages were chosen as an appropriate scale of analysis, and will effectively display the estimated impacts of proposed activities.

Fish Habitat

Direct, indirect and cumulative effects to fish habitat will be analyzed in the Herrig Creek watershed, specifically where proposed harvest areas may be adjacent to the main stem of Herrig Creek and its unnamed tributaries. Direct, indirect and cumulative effects to fish habitat will also be analyzed in the unnamed tributary to Little Bitterroot Lake located in Section 36 of the proposed project area (see Figure H-1).

Figure H-1 – Bitter Herrig Project Area Streams



EXSISTING CONDITIONS

Regulatory Framework

Montana Surface Water Quality Standards: According to ARM 17.30.607 (1)(a), this portion of the Flathead River drainage including the Little Bitterroot River and Herrig Creek, is classified as B-1. Among other criteria for B-1 waters, no increases are allowed above naturally occurring levels of sediment, and minimal increases in turbidity. "Naturally occurring," as defined by ARM 17.30.602 (19), includes conditions or materials present during runoff from developed land where all reasonable land, soil and water conservation practices (commonly called BMPs) have been applied. Reasonable practices include methods, measures or practices that protect present and reasonably anticipated beneficial uses. These practices include but are not limited to structural and non-structural controls and operation and maintenance procedures. Appropriate practices may be applied before, during, or after completion of activities that may impact the resource.

There is one surface water right within the proposed project area. This water right is for livestock watering.

Designated beneficial uses in the proposed project area may include cold water fisheries and recreation on Little Bitterroot Lake. No other beneficial water uses were identified due to a lack of stream channels or lack of delivery to downstream waters.

Water Quality Limited Waterbodies:
Herrig Creek is not listed in the *2012 Montana's Water Quality Integrated Report (305b)* publication produced by the Montana Department of Environmental Quality (DEQ, 2012). This list is compiled by the Montana Department of Environmental Quality (DEQ) as required by Section 303(d) of the Federal Clean Water Act and the Environmental Protection Agency (EPA) Water Quality Planning and Management Regulations (40 CFR, Part 130).

Montana Streamside Management Zone (SMZ) Law:
For a map of the streams and their SMZ classification, please refer to ***Figure H-1***. By the definition in ARM 36.11.312(3), Herrig Creek and a perennial tributary to Herrig Creek in section 36 of the proposed project area are class 1 streams since they flow more than 6 months per year and contribute flow to Little Bitterroot Lake. A small portion of another stream that flows through the south portion of section 36 is also a class 1 stream since it flows more than 6 months and contributes flow to Little Bitterroot Lake. Herrig Creek contains fish. No other fish were identified in any other streams within the proposed project area. To the east of these streams in section 36, there is a class 2 stream (ARM 36.11.312(4)) that has a defined channel, flows more than 6 months per year, but does not contribute surface flow to another stream. All other drainage features found within the proposed project area did not meet the definition of a stream in ARM 36.11.312(20), and are classified as ephemeral draws and swales with no defined channel.

Sediment Delivery

Sediment delivery on this parcel was reviewed by a DNRC hydrologist in 2011 and 2012. Three stream channels were identified in section 36 of the project area. Herrig Creek has an 8-foot bankfull width channel that is classified as a B4 channel using a classification system developed by *Rosgen* (*1996*). The perennial tributary found in the northeast portion of section 36 of the project area is a perennial class 1 stream with an approximately 4-foot bankfull width. This stream was classified as a B4/5 channel using a classification system developed by *Rosgen* (*1996*). Finally, the stream that passes through the eastern half of section 36 of the project area has a 4-foot bankfull width, and is classified as a B4 channel using a classification system developed by *Rosgen* (*1996*). Channel types rated as "B" are typically in the 2- to 4-percent gradient range, and have a moderate degree of meander (sinuosity). Channel-bed materials in B4/5 types are mainly gravel and coarse sand. No areas of unstable or actively down-cut

channels were identified during field reconnaissance. Large woody debris was found in adequate supply to support channel form and function. Woody material in a stream provides traps for sediment storage and gradient breaks to reduce erosive energy and work as flow deflectors to reduce bank erosion. No evidence of past SMZ harvesting was found. No areas of channel instability or active down-cut channels were found during field review.

One source of sediment delivery as well as an in-channel sediment source was found in section 36 of the project area. A portion of power line access road crosses Herrig Creek with a native surfaced, unimproved ford. This site has affected approximately 30-40 feet of stream bed and banks due to vehicle traffic breaking down the banks, and is a chronic source of sediment delivery and in-channel erosion. The road has unrestricted access and sees frequent use by both the Power Company and recreationists.

No other sediment delivery from the existing road system was identified on any of the proposed haul routes within or leading to the project area. The existing road system in the proposed project area is low to moderate standard native-surfaced road, and most reaches meet applicable best management practices for surface drainage and erosion control. Most road grades are generally under 8%, and no areas beyond those described above were causing active erosion or sediment delivery to streams.

Water Yield

No water yield impacts were identified from past activities in and around project area parcels. Past management activities include timber management and cattle grazing. These activities have led to reductions in forest canopy cover, and construction of roads.

Following field reconnaissance of these parcels, it was determined that a detailed water yield analysis would not be necessary for this project. No stream channels were identified in section 22 or 34 of the project area, and stream channels in section 36 were stable and showing no signs of impacts from water yield increases. None of the broad ephemeral draws within the proposed project area have any evidence of overland flow (channel scour, re-alignment of litter, definable banks). As a result, annual water yield and peak flow increases resulting from past activities have not been sufficient to create scoured channels on existing ephemeral draws or lead to surface water delivery to downstream waters in ephemeral draws. After evaluating the watershed cumulative effects risks along with the current conditions in the Bitterroot Herrig parcels, by ARM 36.11.423, a detailed watershed analysis is not needed in this project area.

Fish Habitat

Herrig Creek is currently fish habitat to a population of westslope cutthroat trout within the project area. Westslope cutthroat trout are classified as S2 Montana Animal Species of Concern. Species classified as S2 are considered to be at risk due to very limited and/or potentially declining population numbers, range and/or habitat, making the species vulnerable to global extinction or extirpation in the state. The Department of Natural Resources and Conservation has also identified westslope cutthroat trout as a sensitive species (ARM 36.11.436).

Fish habitat in Herrig Creek is affected by sediment levels in spawning gravel. Levels of sediment delivery reported above are moderate, and likely present a moderate risk of impacts to fish habitat in the proposed project area. No impacts to stream shading or large woody debris levels were apparent during field reconnaissance. The primary threat to westslope cutthroat trout populations in the project area is from competitive displacement and hybridization by nonnative species, especially rainbow trout. The issue of displacement and hybridization of native westslope cutthroat trout by non-native species is an issue outside the scope of the project proposal, and will not be analyzed further in this analysis.

DIRECT AND INDIRECT EFFECTS

No Action Alternative

Direct and indirect effects to sediment delivery, water yield and fish habitat from the No Action alternative would be similar to those described under the existing conditions. The sediment delivery, water yield, and fish habitat would be unaffected by the no action alternative. Streams, ephemeral draws, and fish habitat in the proposed project area would continue to be affected by natural and pre-existing conditions.

Action Alternative

The proposed action alternative would harvest timber from approximately 1060 acres and construct approximately 6.2 miles of new road. The following are the anticipated direct and indirect impacts:

Sediment Delivery

Sediment delivery is expected to be reduced with the action alternative. This alternative would maintain and improve erosion control and surface drainage on all roads proposed for haul. In addition, replacement of the ford on Herrig Creek with a culvert designed to carry a 50-year magnitude flow would eliminate an existing chronic source of sediment to Herrig Creek and Little Bitterroot Lake. The action alternative proposes to construct approximately 6.2 miles of new road. One new stream crossing would be constructed with the proposed road construction. Short-term risk of low levels of erosion and deposition would be increased for approximately 2 to 3 years after completion due to exposure of bare soil during construction, surface drainage improvement and hauling activities. This risk would return to near current levels as road surfaces and cut and fill slopes re-vegetate. Overall, there is a low risk of short-term low-level increase in erosion and sediment delivery for about 2-3 years at the new and existing stream crossings. However, water quality standards are expected to be met and there is a low risk of impacts to downstream beneficial uses.

Proposed timber harvesting activities would pose a low risk of sediment delivery to streams since they are located away from streams and do not propose harvesting within the SMZ, riparian management zone (RMZ) or within the channel migration zone (CMZ). The SMZ law, Administrative Rules for Forest Management, DNRC Habitat Conservation Plan and applicable BMPs would be applied to all harvesting activities, which would minimize the risk of sediment delivery to draws and streams. The Montana BMP audit process has been used to evaluate the application and effectiveness of forest-management BMPs since 1990; this process has also been used to evaluate the application and effectiveness of the SMZ Law since 1996. During that time, evaluation of ground-based-skidding practices near riparian areas has been rated 92-percent effective, and these same practices have been found effective over 99 percent of the time from 1998 to present (*DNRC 1990 through 2012*). Since 1996, effectiveness of the SMZ width has been rated over 99 percent (*DNRC 1990 through 2012*). As a result, with the application of BMPs and the SMZ Law, proposed activities are expected to have a low risk of low impacts to sediment delivery.

Water Yield

No measurable impacts to water yield are anticipated in this project area from the proposed harvesting for the following reasons: 1) The well-drained to excessively well-drained nature of the soils would absorb additional available moisture and not produce increased surface runoff, and would in turn produce little or no detectable change in water yield from upland sites, 2) Flows in the class 1 and class 2 streams are stable, the channels have not shown increased lateral or vertical erosion that could be attributed to increased flows, 3) The other streams and ephemeral

draws within this parcel are stable and vegetated with a dense mat of grass and forbs vegetation, making them capable of handling potential water yield increases without destabilizing.

Fish Habitat

There is a low risk of low direct and indirect effects to fish habitat from this alternative. The proposal would harvest timber from approximately 1060 acres within the project area. None of these acres are proposed within the any class 1 RMZ, including Herrig Creek. As reported in the Sediment Delivery portion of this analysis, replacement of the existing ford with a properly sized culvert designed to pass all fish would reduce the risk of sediment delivery from the existing condition. The replacement site could see a slightly elevated risk of sediment delivery for 2 to 3 years following installation due to bare soil on fill slopes. However, long-term the replacement would present a low risk of additional minor sediment delivery to Herrig Creek. There is also expected to be a low risk of impacts to stream shading/stream temperature or recruitment of large woody debris from this alternative since no activity would occur in an RMZ or SMZ. Risk of adverse direct or indirect effects to fish habitat from this alternative are expected to be minimized by implementation of all applicable BMPs, SMZ rules, and would satisfy ARM: 36.11.425(5) through 36.11.425(9).

CUMMULATIVE EFFECTS

No Action Alternative

Cumulative effects of the No Action alternative on sediment delivery and water yield would be similar to the situations described in the existing conditions. The sediment delivery and water yield would be unaffected by the No Action alternative, and the streams and ephemeral draws in the proposed project area would continue to be affected by natural and pre-existing conditions.

Action Alternative

Past activity in and around the proposed project area has mainly consisted of timber management, grazing and agricultural use. On sites where timber was harvested, there has been substantial vegetative and hydrologic recovery with no apparent impact on water yield increases. The anticipated cumulative effects of the proposed action alternative are summarized below.

Sediment Delivery

Risk of sediment delivery and sediment loading to Herrig Creek and downstream to Little Bitterroot Lake would be slightly increased from current levels in the short term and below current levels in the long term. Maintenance and improvement of existing erosion control and surface drainage on the existing road system would yield similar erosion rates to current levels. Replacement of the unimproved ford on Herrig Creek would generate a short-term increase to sedimentation levels, but there would be a cumulative long-term decrease to risk of sediment loading to Herrig Creek and Little Bitterroot Lake by replacing an existing in-channel sediment source with a properly functioning crossing. Overall, there is a low to moderate risk of short-term low-level increases in sediment loading for about 2-3 years. However, water quality standards are expected to be met and there is a low risk of impacts to beneficial uses.

Water Yield

The proposal is to harvest the stands within these parcels with a combination of commercial thinning and seed tree prescriptions. Cumulative effects to water yield in these parcels are not anticipated for the following reasons: 1) The well-drained to excessively well-drained nature of

the soils would absorb additional available and not produce increased surface runoff, and would in turn produce little or no detectable change in water yield from upland sites, 2) Flows in project area streams and draws are stable, channels have not shown increased lateral or vertical erosion that could be attributed to increased flows, so any increases in water yield present a low risk of increased in-channel erosion or other channel adjustments, and 3) The other streams and ephemeral draws within this parcel are stable and vegetated with a dense mat of grass and forbs vegetation, making them capable of handling potential water yield increases without destabilizing.

Fish Habitat

There is a low risk of low cumulative effects to fish habitat from the proposed Action Alternative. As reported in the above section, there is a low risk of low direct and indirect impacts from the Action Alternative due to harvesting activities within the Herrig Creek watershed, including sediment delivery, stream temperature and large woody debris recruitment. Replacement of the existing ford on Herrig Creek with a properly sized fish-passage culvert is expected to reduce the cumulative sediment loading to Herrig Creek and Little Bitterroot Lake by eliminating a chronic fine sediment source. This is also expected to improve the spawning habitat in Herrig Creek. When these potential impacts are combined with the existing conditions, there is a low risk of adverse cumulative impacts to fish habitat.

SOILS ANALYSIS

INTRODUCTION

Landform Description

The landform and parent materials in the project area are generally glacial till and colluviums derived from quartzite and argillite, with small areas of lacustrine deposits and soils formed from weathered bedrock. The majority of the bedrock consists of slightly metamorphosed sedimentary rocks formed from sand, silt, clay, and carbonate materials deposited in an ancient shallow sea during the Precambrian period.

Issues and Measurement Criteria

The following issues encompass the specific issues and concerns raised through public comment and scoping of the proposed project. For a specific list of individual comments and concerns, please refer to the project file.

Soil Physical Properties

Analysis of soil physical properties addresses the issue that timber harvesting and associated activities may affect soil conditions in the proposed project area through ground-based activities, and through repeated entries to previously harvested areas. Operation of ground-based machinery can displace fertile layers of topsoil, which can lead to a decrease in vegetation growth. Ground-based machinery can also lead to compaction of the upper layers of soil. Compaction decreases pore space in soil, reduces its ability to absorb and retain water, and can increase runoff and overland flow. These conditions can also lead to a decrease in vegetation growth.

Nutrient Cycling

Nutrient cycling, microbial habitat, moisture retention and protection from mineral erosion are provided by coarse and fine woody debris in forested environments (Harmon et al, 1986). Forest management can affect the volumes of fine and coarse woody debris through timber harvesting and result in changes to potentially available nutrients for long-term forest production.

Slope Stability

Slope stability can be affected by timber management activities by removing stabilizing vegetation, concentrating runoff, or by increasing the soil moisture. The primary risk areas for slope stability problems include, but are not limited to, landtypes that are prone to soil mass movement, and soils on steep slopes (generally over 60 percent).

Analysis Methods

Soil Physical Properties

Impacts to soil physical properties will be analyzed by evaluating the current levels of soil disturbance in the proposed project area based on field review and aerial photo review of existing and proposed harvest units. Percent of area affected is determined through pace transects, measurement, aerial photo interpretation, or GIS to determine skid trail spacing and skid trail width. From this, skid trail density and percent of area impacted are determined. Estimated effects of proposed activities will be assessed based on findings of DNRC soil Monitoring.

Nutrient Cycling

Nutrient cycling will be analyzed by disclosing existing levels of coarse woody debris from transects conducted during field reconnaissance. The method for quantifying the coarse woody debris is described in the *Handbook for Inventorying Downed Woody Material* (Brown, 1974). Potential impacts to nutrient cycling will be assessed by evaluating risks to nutrient pools and long-term site productivity from timber sale contract requirements and mitigation measures.

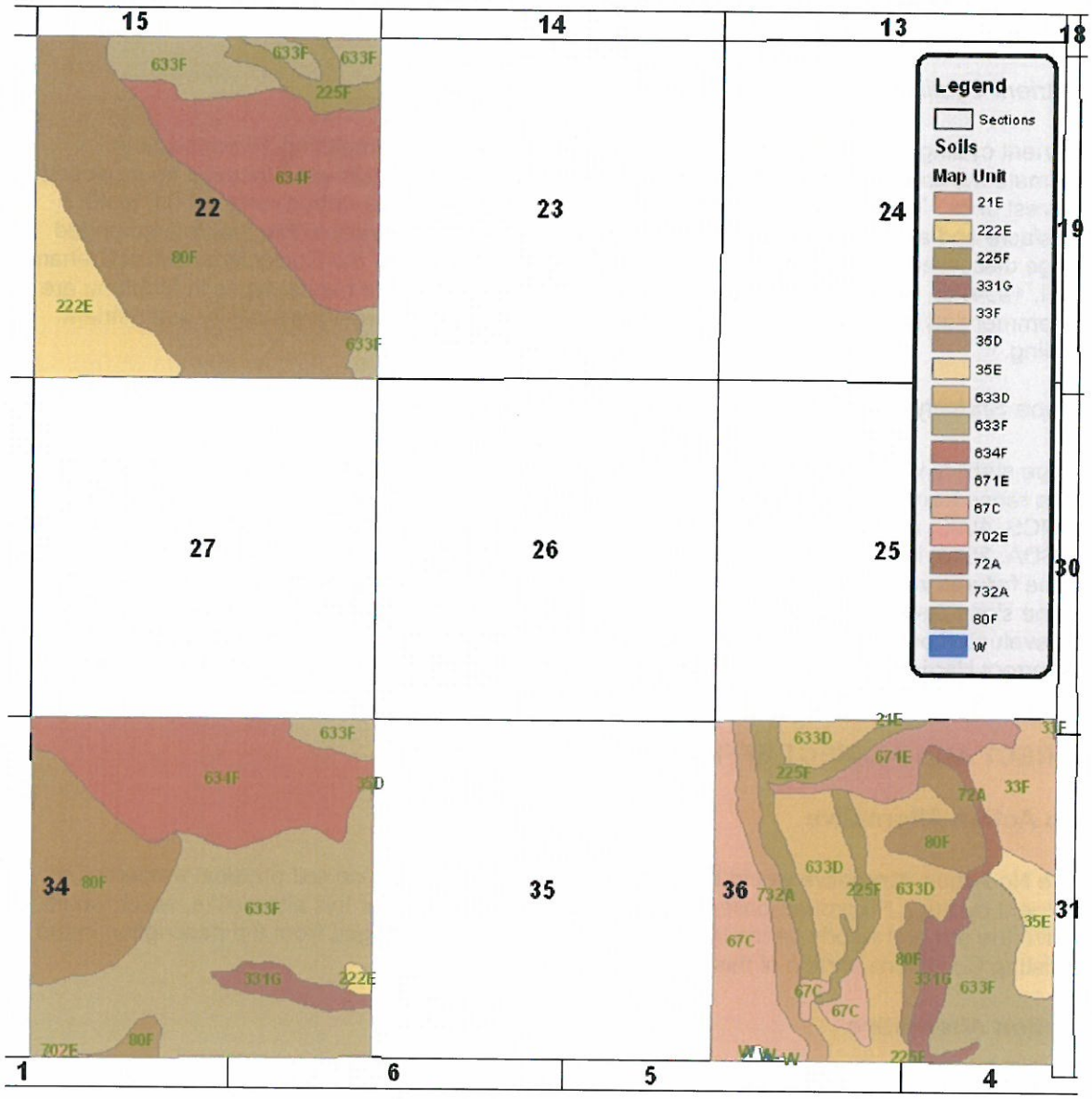
Slope Stability

Slope stability risk factors will be analyzed by reviewing the Web Soil Survey (NRCS, 1996) and the Soil Survey of Flathead County Area and Part of Lincoln County, Montana (USDA, 2010) to identify map units listed as high risk for mass movement. Field reconnaissance will also be used to identify any slopes greater than 60 percent as an elevated risk for mass movement.

Analysis Area

The analysis area for evaluating soil physical properties and slope stability will include DNRC owned land within the Bitterroot Herrig project area parcels. A map of the soil map units in the Bitterroot Herrig project area is found below in **Figure S-1**.

Figure S-1 – Map of Bitterroot Herrig Soil Map Units, Sections 22, 34 & 36



EXISTING CONDITIONS

Soil Physical Properties

Existing conditions of soil physical properties were assessed in the proposed project area by a DNRC watershed specialist in 2011 and 2012. The DNRC has conducted timber harvesting in the proposed project area since the 1940s, with the most recent activity in the 1980s. Timber sale records dating back to the 1940s indicate portions of sections 22 and 36 of the proposed project area have been harvested using primarily ground-based yarding methods. Ground-based yarding can create soil impacts through displacement and compaction of productive surface layers of soil, mainly on heavily used trails. Existing skid trails on project area parcels are spaced at between 75 and 120 feet apart. None of these existing skid trails were identified as erosion or sediment sources. Trails are still apparent, but most are well vegetated and past impacts are beginning to ameliorate from freeze-thaw cycles and root penetration. Based on pace transects

of trail spacing, knife penetration tests for compaction, and ocular estimates of re-vegetation, less than 10% of previously ground-skidded harvest units are in an impacted condition in the proposed project area.

Nutrient Cycling

Nutrient cycling was assessed in the proposed project area by completing 19 transects to estimate the current levels of coarse woody debris. These transects were focused on proposed harvest units. The average coarse woody debris is 14.8 tons/acre, with a range of 0.0 to 49.7 tons/acre and a median of 5.2 tons/acre. These results are generally within the recommended range discussed in *Managing Coarse Woody Debris in Forests of the Rocky Mountains* (Graham et al, 1994) on similar habitat types. Douglas-fir and Sub-alpine fir habitat types in Montana are recommended to have a range of 5 to 24 tons/acre to maintain forest productivity and nutrient cycling.

Slope Stability

Slope stability was assessed through field review of the project area. Soil types in the project area range from gentle to steep (0-70%) slopes found on hilly terrain. The Web Soil Survey (NRCS, 1996) and the Soil Survey of Flathead County Area and Part of Lincoln County, Montana (USDA, 2010) identified no areas of soils at high risk for mass movements in the project area. No slope failures were identified during reconnaissance in the proposed project area. Because none of the slope stability risk factors are present in the proposed project area, slope stability will not be evaluated on this project in the remainder of this analysis. A list of soil types found in the Bitterroot Herrig project area and their associated management implications is found in **Table S-2**.

DIRECT AND INDIRECT EFFECTS

No Action Alternative

The No Action Alternative would have no direct or indirect effects on soil physical properties or nutrient cycling. No ground-based activity would take place under this alternative, which would leave the soil and woody debris levels in the project area unchanged from the description in the Existing Conditions portion of this analysis.

Action Alternative

Soil Physical Properties

Direct and indirect effects of the proposed action alternative to soil physical properties were based on DNRC soil monitoring on soils and sites similar to those found in the project area. Based on past monitoring, direct impacts to soil physical properties would be expected on up to 150 of the total 1060 acres proposed for harvesting in the Bitterroot Herrig project area. Soil monitoring conducted on DNRC lands shows that sites harvested on DNRC lands statewide on similar soils with ground-based machinery had a range of impacts from 0 to 42.2 percent of the acres treated, with an average disturbance rate of 14.0% (DNRC, 2011). The low range of impacts includes operations on frozen or snow-covered soils, and the high range includes operations on steep slopes during non-winter conditions. Soil monitoring conducted on DNRC lands shows that sites harvested on DNRC lands statewide on similar soils with cable yarding equipment had a range of impacts from 2.3 to 11.4 percent of the acres treated, with an average disturbance rate of 6.2% (DNRC, 2009). As a result, the extent of impacts expected on ground-based harvesting would likely be similar to those reported by Schmalenberg (DNRC, 2011), or approximately 0 to 42.2 percent of ground-based harvested acres and approximately 2.3 to 11.4

percent of cable harvest acres. The proposal includes approximately 836 acres of ground-based mechanical harvesting.

Direct impacts to the soil physical properties would also be generated by ground-based site preparation. Site-preparation disturbance would be intentionally done, and these impacts are considered light and promote reforestation of the site. The expected impacts to the soil resource as a result of the Action Alternative are summarized in ***Table S-1***. These activities, including road construction and ground based yarding, would leave approximately 14.2 percent of the proposed harvest units in an impacted condition. This level is below the range analyzed for in the *EXPECTED FUTURE CONDITIONS* section of the *SFLMP*, and well within the 20-percent impacted area established as a level of concern in the *SFLMP (DNRC 1996)*. In addition, BMPs and a combination of mitigation measures would be implemented to limit the area and degree of soil impacts as noted in ARM 36.11.422 and the SFLMP (DNRC, 1996).

Table S-1 – Summary of Direct Effects of Alternatives on Soils

Description of Parameter	No Action	Action Alternative
Acres of Harvest	0	1060
Acres of ground based yarding	0	836
Acres of ground based impacts[1]	0	**117**
Acres of skyline yarding	0	224
Acres of skyline impacts[2]	0	**14**
Miles of new roads	0	6.2
Acres of new roads[3]	0	**19**
Total estimated acres of impacts	0	**150**
Percent of harvest area with impacts	0%	14.2%

[1] 14.0% of tractor units based on average impacts found on similar soils and sites by DNRC soil monitoring
[2] 6.2% of skyline units affected by corridors based on DNRC soil monitoring
[3] Assuming an average width of 25 feet, roads are approximately 3 acres per mile

Nutrient Cycling

Direct and indirect effects to nutrient cycling may include a slight decrease in coarse woody debris from the action alternative by removing standing timber. Some stands where woody debris levels are low may see in increase in large woody debris as a result of the proposed harvesting. In addition, this alternative would lead to an increase in fine woody material in the form of limbs and tree tops being left after harvest. Through the timber sale contract, approximately 10-15 tons of coarse woody material would be left on the ground following harvesting activities, as well as fine material for nutrient retention.

CUMMULATIVE EFFECTS

No Action

Soil Physical Properties

This alternative would have no cumulative impacts to soil physical properties or nutrient cycling in the project area. The impacts of this alternative would be similar to those described in the Existing Conditions portion of this analysis. No soil would be disturbed, woody debris levels would be unchanged and no re-entry of past harvest units would occur. All impacts from past management activities would continue to improve or degrade as dictated by natural and pre-existing conditions.

Action Alternative

Soil Physical Properties

Cumulative effects to soil physical properties may occur from repeated entries into a forest stand where additional ground is impacted by equipment operations. With this alternative, approximately 448 of the acres proposed for harvesting have had previous timber sale operations. Existing skid trails where compaction has begun to ameliorate through freeze-thaw cycles and re-vegetation would return to a higher level of impact due to the Action Alternative. Additional trails may also be required if existing trails are in undesirable locations. Cumulative impacts to soil physical properties under the Action Alternative are still expected to remain below the range analyzed for in the EXPECTED FUTURE CONDITIONS section of the SFLMP and remain well within the 20-percent impacted area established as a level of concern in the SFLMP (DNRC, 1996). Cumulative effects to soils physical properties in areas not previously entered for timber management would be the same as those reported in the direct and indirect effects section of this analysis.

DNRC would minimize long-term soil impacts and adverse cumulative effects by implementing any or all of the following: 1) existing skid trails from past harvest activities would be used if they are properly located and spaced 2) additional skid trails would be used only where existing trails are unacceptable 3) mitigating the potential direct and indirect effects with soil moisture restrictions, season of operation, and method of harvest 4) retention of a portion of coarse woody debris and fine litter for nutrient cycling.

Nutrient Cycling

Risk of cumulative effects to nutrient cycling from nutrient pool loss would be low. This alternative would follow research recommendations found in Graham (1994) for retention of coarse and fine woody debris through contract clauses and site-specific mitigation measures.

Table S-2 – Soil Map Unit Descriptions for the Bitterroot Herrig Project Area

Map Unit	Name	Soil & Vegetation Descriptions	Management Considerations			
			K_w**/erosion potential*	Timber	Roads	Comments
21E	Combest gravelly ashy silt loam 15 – 35% slopes	Soils of this map unit have been formed from volcanic ash over colluvium derived from quartzite. Vegetation is Douglas-fir over an understory of grasses and forbs.	K_w – 0.05-0.20 Erosion risk is low	Potential Prod: Mod/high Equipment: Tractor Regen: May be affected by moisture stress	Roads perform well with standard location, construction and maintenance practices.	
222E	Pleasantvalley-Winfall, dry complex 8-30% slopes	Soils of this map unit have been formed from volcanic ash over till derived from quartzite. Vegetation is Douglas-fir over an understory of shrubs and forbs.	K_w – 0.15-0.28 Erosion risk is low to moderate	Potential Prod: Mod/high Equipment: Tractor Regen: May be affected by moisture stress	Roads perform well with standard location, construction and maintenance practices.	
225F	Pleasantvalley-Courville-Glaciercreek complex 30-50% slopes	Soils of this map unit have been formed from volcanic ash over till derived from quartzite. Vegetation is Douglas-fir over an understory of shrubs and forbs.	K_w – 0.02-0.28 Erosion risk is low to moderate	Potential Prod: Mod/high Equipment: Tractor/cable Regen: May be affected by moisture stress	Roads perform well with standard location, construction and maintenance practices. Slope steepness may increase cost.	
331G	Metten,dry-Rock outcrop-Rockhill complex 40-70% slopes	Soils of this map unit have been formed from volcanic ash over colluvium derived from quartzite. Vegetation is Douglas-fir over an understory of grasses and forbs.	K_w – 0.05-0.28 Erosion risk is low to moderate	Potential Prod: Mod/high Equipment: Cable Regen: Good	Roads perform well with standard location, construction and maintenance practices. Slope steepness may increase cost.	
33F	Mitten gravelly ashy silt loam, dry 35-60% slopes	Soils of this map unit have been formed from volcanic ash over colluvium derived from quartzite. Vegetation is Douglas-fir over an understory of grasses and forbs.	K_w – 0.05-0.28 Erosion risk is low to moderate	Potential Prod: Mod/high Equipment: Cable Regen: May be affected by moisture stress	Roads perform well with standard location, construction and maintenance practices. Slope steepness may increase cost.	
35D 35E	Courville-Pleasantvalley complex D: 4 - 15 % slopes E: 8 - 30% slopes	Soils of this map unit have been formed from volcanic ash over till derived from quartzite. Vegetation is Douglas-fir over an understory of shrubs.	K_w – 0.10-0.28 Erosion risk is low to moderate	Potential Prod: High Equipment: Tractor Regen: Good	Roads perform well with standard location, construction and maintenance practices.	
633D 633F	Rockhill-Rock outcrop-Pleasantvalley complex D: 4 - 15% slopes F: 15 – 50% slopes	Soils of this map unit have been formed from volcanic ash over colluvium derived from quartzite. Vegetation is Douglas-fir over an understory of grasses and forbs.	K_w – 0.15-0.28 Erosion risk is low to moderate	Potential Prod: Low/Mod. Equipment: Tractor Regen: May be affected by moisture stress	Roads perform well with standard location, construction and maintenance practices.	Rock outcropping may affect road location/design.
634F	Rockhill-Rock outcrop-Courville complex 15-50% slopes	Soils of this map unit have been formed from volcanic ash over colluvium derived from quartzite. Vegetation is Douglas-fir over an understory of grasses and forbs.	K_w – 0.10-0.28 Erosion risk is low to moderate	Potential Prod: Moderate Equipment: Tractor/cable Regen: Good	Roads perform well with standard location, construction and maintenance practices. Slope steepness may increase cost.	
671E	Glaciercreek-Pleasantvalley complex 8-30% slopes	Soils of this map unit have been formed from volcanic ash over outwash. Vegetation is Douglas-fir over an understory of shrubs and forbs.	K_w – 0.02-0.28 Erosion risk is low to moderate	Potential Prod: Mod/high Equipment: Tractor Regen: May be affected by moisture stress	Roads perform well with standard location, construction and maintenance practices.	
67C	Glaciercreek gravelly ashy silt loam 0-8% slopes	Soils of this map unit have been formed from volcanic ash over alluvium or outwash. Vegetation is grand fir over an understory of forbs.	K_w – 0.02-0.20 Erosion risk is low	Potential Prod: High Equipment: Tractor Regen: Good	Roads perform well with standard location, construction and maintenance practices.	Watch season of use for rutting and compaction
702E	Halfmoon, cool-Halfmoon complex 8-30% slopes	Soils of this map unit have been formed from glaciolacustrine deposits. Vegetation is grand fir over an understory of forbs.	K_w – 0.43-0.55 Erosion risk is moderate to high	Potential Prod: High Equipment: Tractor Regen: May be affected by moisture stress	Roads perform well with standard location, construction and maintenance practices.	
72A	Blacklake mucky peat 0-1% slopes	Soils of this map unit have been formed from organic material over alluvium. These map units are pothole habitats inundated by water.	K_w – 0.32-0.55 Erosion risk is moderate to high	Potential Prod: NA Equipment: Tractor – frozen only Regen: Poor – high water table	Not suitable for road construction due to bearing strength and water table.	Operate only in frozen or snow-covered conditions
732A	Meadowpeak-Blacklake-McGregor complex 0-2% slopes	Soils of this map unit have been formed from alluvium Vegetation is riparian meadow	K_w – 0.43-0.55 Erosion risk is moderate to high	Potential Prod: NA Equipment: Tractor – frozen only Regen: Poor – high water table	Not suitable for road construction due to bearing strength and water table.	Operate only in frozen or snow-covered conditions

Map Unit	Name	Soil & Vegetation Descriptions	Management Considerations			
			K_w**/erosion potential*	Timber	Roads	Comments
80F	Sharrott-Rock outcrop-Winkler complex 15-60% slopes	Soils of this map unit have been formed from colluviums over residium weathered from quartzite and/or argillite. Vegetation is grand fir over an understory of grasses.	K_w – 0.05-0.20 Erosion risk is low	Potential Prod: Mod/high Equipment: Tractor/cable Regen: May be affected by moisture stress	Roads perform well with standard location, construction and maintenance practices. Slope steepness may increase cost.	

* Erosion Potential is based on slope and soil erosion factor K**. The soil loss is caused by sheet or rill erosion in off-road or off-trail areas where 50 to 70 percent of the surface has been exposed by logging, grazing, mining, or other kinds of disturbance. The hazard is described as slight (low), moderate, severe, or very severe. A rating of slight indicates that erosion is unlikely under ordinary climatic conditions; moderate indicates that some erosion is likely and that erosion-control measures may be needed; severe indicates that erosion is very likely and that erosion-control measures, including revegetation of bare areas, are advised; and very severe indicates that significant erosion is expected, loss of soil productivity and off-site damage are likely, and erosion–control measures are costly and generally impractical. (NRCS, 1996)

**Erosion Factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water. (NRCS, 1996

Attachment III

Prescriptions

Bitter Herrig Timber Sale Harvest Unit Prescriptions

Harvest Unit: 22-1 **Harvest Unit Acres:** 25 Acres

Elevation: 4080ft-4280ft **Slope:** 0%-25% **Aspect:** SW

Habitat Type: PSME/SYAL-CARU, PSME/CARU-AGSP, PSME/CARU-ARUV, PSME/CARU-CARU

Current Cover Type: Ponderosa Pine, Western Larch/Douglas-fir

Desired Future Condition: Ponderosa Pine

Soil Type: Gravelly Loam

Location: SW ¼ Section 22, Township 28N, Range 25W

Harvest Unit: 22-2 **Harvest Unit Acres:** 278 Acres

Elevation: 4280ft-4760ft **Slope:** 15%-45% **Aspect:** SW

Habitat Type: PSME/PHMA-CARU, PSME/LIBO-VAGL, PSME/CARU-CARU

Current Cover Type: Douglas-fir, Western Larch/Douglas-fir, Ponderosa Pine

Desired Future Condition: Ponderosa Pine

Soil Type: Gravely Loam

Location: NW ¼ & SE ¼ Section 22, Township 28N, Range 25W

Harvest Unit: 34-1 **Harvest Unit Acres:** 290 Acres

Elevation: 4320ft-4860ft **Slope:** 15%-55% **Aspect:** NW to N

Habitat Type: PSME/LIBO-VAGL, PSME/CARU-ARUV, PSME/CARU-AGSP

Current Cover Type: Western Larch/Douglas-fir, Ponderosa Pine

Desired Future Condition: Ponderosa Pine

Soil Type: Gravely Ashy Silt Loam

Location: N ½ Section 34, Township 28N, Range 25W

Harvest Unit: 34-2 **Harvest Unit Acres:** 54 Acres

Elevation: 4040ft-4840ft **Slope:** 15%-60% **Aspect:** SW

Habitat Type: PSME/PHMA-CARU, PSME/CARU-ARUV

Current Cover Type: Western larch/Douglas-fir, Ponderosa Pine

Desired Future Condition: Ponderosa Pine, Western White Pine

Soil Type: Gravely Ashy Silt Loam

Location: E ½ Section 34, Township 28N, Range 25W

Harvest Unit: 34-3 **Harvest Unit Acres:** 82 Acres

Elevation: 4040ft-4660ft **Slope:** 10%-45% **Aspect:** W to SW

Habitat Type: PSME/CARU-ARUV, ABGR/LIBO-LIBO

Current Cover Type: Ponderosa Pine

Desired Future Condition: Ponderosa Pine

Soil Type: Gravely Ashy Silt Loam, Gravelly Loam

Location: SW ¼ Section 34, Township 28N, Range 25W

Harvest Unit: 34-4 **Harvest Unit Acres:** 69 Acres

Elevation: 4000ft-4760ft **Slope:** 10%-45% **Aspect:** S to SW

Habitat Type: PSME/SYAL-CARU, PSME/LIBO-CARU, ABGR/LIBO-LIBO

Current Cover Type: Ponderosa Pine

Desired Future Condition: Ponderosa Pine

Soil Type: Gravely Ashy Silt Loam, Gravelly Loam

Location: SW ¼ Section 34, Township 28N, Range 25W

Harvest Unit: 34-5 (Optional Unit) **Harvest Unit Acres:** 27 Acres

Elevation: 4040ft-4360ft **Slope:** 10%-35% **Aspect:** E

Habitat Type: PSME/CARU-ARUV

Current Cover Type: Western Larch/Douglas-fir

Desired Future Condition: Ponderosa Pine

Soil Type: Gravely Ashy Silt Loam

Location: SE ¼ Section 34, Township 28N, Range 25W

Harvest Unit: 36-1 **Harvest Unit Acres:** 41 Acres

Elevation: 4120ft-4380ft **Slope:** 0%-35% **Aspect:** Variable

Habitat Type: PSME/CARU-CARU

Current Cover Type: Western Larch/Douglas-fir

Desired Future Condition: Ponderosa Pine

Soil Type: Gravely Loam, Gravely Ashy Silt Loam

Location: NE ¼ Section 36, Township 28N, Range 25W

Harvest Unit: 36-2 **Harvest Unit Acres:** 35 Acres

Elevation: 4040ft-4260ft **Slope:** 0%-35% **Aspect:** W

Habitat Type: PSME/CARU-AGSP

Current Cover Type: Western Larch/Douglas-fir, Douglas-fir

Desired Future Condition: Western Larch/Douglas-fir, Ponderosa Pine

Soil Type: Gravely Loam, Gravely Ashy Silt Loam

Location: SE ¼ Section 36, Township 28N, Range 25W

Harvest Unit: 36-3 **Harvest Unit Acres:** 159 Acres

Elevation: 4120ft-4680ft **Slope:** 10%-55% **Aspect:** W to S

Habitat Type: PSME/VACA, PSME/CARU, ALBA/CLUN-CLUN, ALBA/LIBO-VASC

Current Cover Type: Western Larch/Douglas-fir, Douglas-fir, Ponderosa Pine

Desired Future Condition: Western Larch/Douglas-fir, Ponderosa Pine

Soil Type: Gravely Ashy Silt Loam

Location: E ½ Section 36, Township 28N, Range 25W

Stand History:

In section 22, there have been two major harvest entries into the stand. The first was in 1944-1945 where 3.4 MMBF was removed from the southwest half of the section. There was also an entry in the early eighties. The majority of the timber that was removed on the northeast half of the section. In section 34, there was a salvage harvest in the early eighties. The harvest activities occurred on about 70 acres in the southwest corner of the section. The harvest was implemented to remove the bug infested and diseased trees. In section 36, the major entry occurred in 1981-1982. There was approximately 2.1 MMBF removed off of 260 acres. The prescription was for a regeneration harvest.

Description of Existing Stand:

In section 22 there are two harvest units that comprise the southwest half of the section.

- In unit 22-1, the Pleasant Valley Road runs through the southwest corner. There is also a Bonneville Power line the runs through the unit. The unit is bordered by Plum Creek land on the south and west sides. The unit is comprised of four different stands identified in the Stand Level Inventory. The stand is comprised of an uneven aged mix of Douglas-fir, ponderosa pine, and western larch due to previous harvests. The stand ages range from 60 to 140 years old. A commercial thin treatment will be implemented in this unit to create space between crowns. The stand has about 145 ft^2 basal area per acre. The average height is 70 feet tall and average diameter breast height is 14 inches.

- Unit 22-2 is bordered by Plum Creek land on the south and west sides. The unit is comprised of nine different stands identified in the Stand Level Inventory. The stand is comprised of an uneven aged mix of Douglas-fir, ponderosa pine, and western larch due to previous harvests. The stand ages range from 80 to 130 years old. A seed tree treatment will be implemented in this unit to remove the suppressed overstory. The stand has about 90 ft^2 basal area per acre. The average height is 72 feet tall and average diameter breast height is 14 inches.

In section 34 there are five harvest units that cover the majority of the section.

- Unit 34-1 is bordered by Plum Creek land on the north, east and west sides. There are no roads in this unit. The unit is comprised of four different stands identified in the Stand Level Inventory. The stand is comprised of an uneven aged mix of Douglas-fir, lodgepole pine and western larch with scattered ponderosa pine. The stand is deteriorating due to bugs and disease infecting the lodgepole, Douglas-fir and western larch. The stand age is approximately 140 years old. A seed tree treatment will be implemented in this unit by removing the suppressed overstory, insect infested and diseased trees. The stand has about 120 ft^2 basal area per acre. The average height is 74 feet tall and average diameter breast height is 15 inches.

- Unit 34-2 is bordered by Plum Creek land on the north and east sides. There are no roads in this unit. The unit is comprised of four different stands identified in the Stand Level Inventory. The stand is comprised of an uneven aged mix of Douglas-fir, ponderosa pine and western larch. The stand is deteriorating due to bugs and disease infecting the ponderosa pine and western larch. The stand age is approximately 130 years old. A seed tree treatment will be implemented in this unit by removing the suppressed overstory, insect infested and diseased trees. The stand has about 125 ft^2 basal area per acre. The average height is 68 feet tall and average diameter breast height is 13 inches.

- Unit 34-3 is bordered by Plum Creek land on the south side. The unit is comprised of three different stands identified in the Stand Level Inventory. The stand is comprised of an uneven aged mix of ponderosa pine, Douglas-fir and western larch with scattered lodgepole pine and grand fir pine. The stand is deteriorating due to bugs and disease infecting the ponderosa pine, lodgepole, Douglas-fir and western larch. The stand age is approximately 130 years old. A seed tree treatment will be implemented in this unit by removing the suppressed overstory, insect infested and diseased. The stand has about 90 ft^2 basal area per acre. The average height is 70 feet tall and average diameter breast height is 13 inches.

- Unit 34-4 is bordered by Plum Creek land on the west side. The unit is comprised of five different stands identified in the Stand Level Inventory. The stand is comprised of an uneven aged mix of ponderosa pine, Douglas-fir and western larch with scattered lodgepole pine and grand fir pine. The stand is deteriorating due to bugs and disease infecting the ponderosa pine, lodgepole, Douglas-fir and western larch. The stand age is approximately 180 years old. An old growth restoration treatment will be implemented in this unit by removing shade tolerant species, and trees that are insect infested and diseased. There will be eight trees per acre and 60ft^2 basal area retained to keep the characteristics of a ponderosa pine old growth stand. The stand has about 140 ft^2 basal area per acre. The average height is 80 feet tall and average diameter breast height is 15 inches

- Unit 34-5 is bordered by Plum Creek land on the south side and a private land owner on the east side. There are no roads in this unit. The unit is comprised of one stand identified in the Stand Level Inventory. The stand is comprised of an uneven aged mix of mostly Douglas-fir with a small component of western larch. The stand is deteriorating due to disease infecting the Douglas-fir and western larch. The stand age is approximately 120 years old. A seed tree treatment will be implemented in this unit by removing the suppressed overstory, insect infested and diseased trees. The stand has about 100 ft^2 basal area per acre. The average height is 65 feet tall and average diameter breast height is 13 inches.

In section 36 there are three harvest units that comprise the east half of the section.

- Unit 36-1 is comprised of one stand identified in the Stand Level Inventory. The stand is comprised of an uneven aged mix of mostly Douglas-fir with scattered lodgepole pine, ponderosa pine and western larch. The stand is deteriorating due to bugs, disease and being overstocked. The stand age is approximately 140 years old. A seed tree treatment will be implemented in this unit by removing the suppressed overstory, insect infested and diseased trees. The stand has about 90 ft^2 basal area per acre. The average height is 75 feet tall and average diameter breast height is 13 inches.

- Unit 36-2 is comprised of three different stands identified in the Stand Level Inventory. The stand is comprised of an uneven aged mix of mostly Douglas-fir with scattered lodgepole pine, ponderosa pine and western larch. The stand is deteriorating due to bugs and disease infecting the Douglas-fir. The stand age is approximately 130 years old. A seed tree treatment will be implemented in this unit by removing the suppressed overstory, insect infested and diseased trees. The stand has about 70 ft^2 basal area per acre. The average height is 70 feet tall and average diameter breast height is 13 inches.

- Unit 34-3 is bordered by private landowners on the south and east sides. The unit is comprised of eight different stands identified in the Stand Level Inventory. The stand is comprised of an uneven aged mix of Douglas-fir, ponderosa pine and western larch with scattered Engelmann spruce, lodgepole pine and grand fir. The stand is deteriorating due to bugs, disease and being overstocked. The stand age is approximately 140 years old. A seed tree treatment will be implemented in this unit by removing the suppressed overstory, insect infested and diseased trees. The stand has about 110 ft^2 basal area per acre. The average height is 75 feet tall and average diameter breast height is 14 inches.

Treatment Objectives:

- Retain old growth stand characteristics in unit 34-4 while promoting the desired future condition of ponderosa pine.
- Remove unhealthy, diseased and insect infested trees, as well as those with poor vigor, from the overstory to promote long-term forest health.
- Thin intermediate and understory components of stand to enhance growth characteristics and reduce fuel loading.
- Create a disturbance to promote natural ponderosa pine and western larch regeneration.
- Retain large diameter, decadent ponderosa pine and western larch for shading, cover and snag replacement.
- Protect soil productivity by minimizing soil displacement, compaction, and erosion during logging and road building operations.
- Retain logging slash for woody debris recruitment and nutrient cycling of foliage and fine fuels to maintain site productivity.

Prescribed Treatment:

- Commercial thin, old growth restoration, and seed tree harvest prescriptions will be used leaving healthy, vigorous trees with good crown and bark characteristics.
- Favor leaving dominant and co-dominant ponderosa pine, western larch and Douglas-fir while removing most merchantable grand fir, Engelmann spruce, sub-alpine fir, and lodgepole pine.
- In Units 22-2, 34-1, 34-2, 34-3, 34-5, 36-1, and 36-2 spacing for leave trees will be about 50ft. to 65ft. leaving 10 to 17 trees per acre.
- In Unit 34-4 average spacing will be about 35 ft leaving approximately 36 trees per acre and 60 ft^2 basal area per acre.
- In Unit 22-1 average spacing will be about 25ft leaving approximately 70 trees per acre.
- Retain at least two snags >16" DBH and two snag recruits per acre.

Harvest Method:

- Units 22-1, 22-2, 34-2, 34-3, 34-4, 34-5, 36-1 and 36-2 will be tractor logged with conventional, mechanical, or cut-to-length operations.
- Units 34-1and 36-3 will be logged using a combination of tractor and skyline yarding.
- Ponderosa pine, western larch and Douglas-fir will be marked to leave.

Hazard Reduction:

- Pile and burn slash at landings following harvest.
- Slash would be lopped and /or trampled to a depth of 24" or less.
- Machine pile and burn all slash in excess of retention requirements of 5 to 10 tons per acre.

- All slash piles will be burned by the State.
- The purchaser will be required to meet hazard reduction standards as applied under the State Fire Hazard Reduction Law (76-13-403 MCA).

Regeneration/Site Preparation:

- Monitor success of natural regeneration and plant seedlings if necessary.
- Precommercially thin healthy regeneration to promote future growth and vigor if funding allows.
- Slashing of advanced shade tolerant regeneration and site preparation to encourage seral regeneration will be used in areas without adequate stocking.

Anticipated Future Treatments:

- Stand conditions would be monitored for future salvage opportunities related to insect and disease outbreaks, severe weather events, fire or other unanticipated circumstances on a case-by-case basis.
- This stand would be evaluated for regeneration, planting needs and possible precommercial thinning opportunities as the stand progresses in age.

Attachment IV

Mitigations

Air Quality:

- To minimize cumulative effects during burning operations, burning would be done in compliance with the Montana Airshed Group, reporting regulations and any burning restrictions imposed in Airshed 2. This would provide for burning during conditions of acceptable ventilation and dispersion.

- Dozer, excavator, landing, and roadwork debris would be piled clean to allow ignition during fall and spring when ventilation is good and surrounding fuels are wet.

Archaeology:

- A contract clause provides for suspending operations if cultural resources were discovered; operations in that area may only resume as directed by the Forest Officer following consultation with a DNRC Archeologist.

- If cultural resources were discovered, the Confederated Salish-Kootenai Tribe would be notified.

Fisheries:

- Apply all applicable Forestry Best Management Practices (BMPs), including the Streamside Management Zone (SMZ) Law and Rules, HCP commitments, and Forest Management Rules for fisheries, soils, and watershed management (*ARMs 36.11.425* and *36.11.426*).

- Apply the SMZ Law and Rules to all streams and lakes.

- Monitor all road-stream crossings for sedimentation and deterioration of road prism.

- Only allow equipment traffic at road-stream crossings when road prisms have adequate load bearing capacity, thus reducing the potential for rutting.

Roads:

- A transportation system minimizing road miles and meeting Best Management Practices (BMPs) has been designed by the DNRC. The existing roads will be utilized in the project area and new roads will be constructed to minimized road density and still access the majority of the acres in the section.

- Brush would be removed from existing road prisms to allow for effective road maintenance.

- Road maintenance can help reduce sediment delivery.

Soils:

- Limit ground based equipment operations to periods when soils are relatively dry, (less than 20%), frozen or snow covered to minimize soil compaction and rutting, and maintain drainage features. Check soil moisture conditions prior to equipment start-up and during wet periods when active harvest is occurring.

- On ground skidding units, the logger and sale administrator will agree to a general skidding plan prior to equipment operations. Skid trail planning would identify which main trails to use, and what additional trails are needed. Trails that do not comply with BMPs (i.e. draw bottom trails) would not be used and may be closed with additional drainage installed where needed or grass seeded to stabilize the site and control erosion.

- Tractor skidding should be limited to slopes less than 35% unless the operation can be completed without causing excessive erosion. Short steep slopes above incised draws may require a combination

of mitigation measures based on site review, such as adverse skidding to ridge or winch line skidding from more moderate slopes less than 35%.

- Keep skid trails to 20% or less of the harvest unit acreage. Provide for drainage in skid trails and roads concurrent with operations.

- Slash Disposal- Limit disturbance and scarification combined to 30-40% of harvest units. Consider lop and scatter or jackpot burning on steeper slopes. Retain 10 to 15 tons per acre of material 3 inches and larger. Minimize removal of fine (<1/4" diameter) material for nutrient cycling.

Vegetation:

- To minimize the potential for the spread of noxious weed, off-road equipment would be cleaned and inspected as required in the timber sale contract to avoid seed migration.

- If any sensitive plant species are observed within the project area, a equipment restriction zone will be made around the specimen and a plant survey will be completed.

- All harvest areas shall have a minimum of 2 snags and 2 snag-recruits over 21 inches dbh, or the next largest size class available. Additional large-diameter recruitment trees may be left if sufficient large snags are not present. These snags and recruitment trees may be clumped or evenly distributed throughout the harvest units.

- Certain portions of the harvest areas would be left uncut; these areas may include large healthy trees, snag patches, small healthy trees, rocky outcrops, SMZs, small wetlands, etc.

Watershed:

- Planned erosion-control measures include: grade breaks on roads, surface water-diverting mechanisms on roads, slash-filter windrows, and grass seeding.

- Streamside Management Zones (SMZs) will be defined along those streams and/or wetlands where they occur within or adjacent to harvest areas. This project would meet or exceed SMZ rules.

- The contractor would be responsible for the immediate cleanup of any spills (fuel, oil, dirt, etc.,) that may affect water quality.

- The BMP audit process will continue. This project would likely be reviewed in an internal audit, and may be selected at random as a statewide audit site.

Wildlife:

- If a threatened or endangered species is encountered, consult a DNRC biologist and develop additional mitigations that are consistent with the Forest Management Rules for managing threatened and endangered species (*ARM 36.11.428* through *36.11.435*).

- Prohibit contractors and purchasers conducting contract operations from carrying firearms while on duty as per ARM 36.11.444(2) and *GB-PR2* (*USFWS and DNRC 2010)*.

- Contractors will adhere to food storage and sanitation requirements as per GB-PR3 (*USFWS and DNRC 2010*).

- Within Canada lynx winter foraging habitat, retain up to 10% of the stand area in patches of advanced regeneration of shade-tolerant trees (grand fir, subalpine fir, and spruce) as per LY-HB4 (*USFWS and DNRC 2010).* Applies to units: 34-1, 34-3, and 34-4.

- Manage for snags and snag recruits, particularly favoring western larch, Douglas-fir, and ponderosa pine.

- Retain 15-20 tons/acre of coarse-woody debris and emphasize the retention of downed logs ≥15 inches dbh where they occur as per LY-HB2 (*USFWS and DNRC 2010).*

- Use a combination of topography, group retention, and roadside vegetation to reduce sight distances within harvest units where feasible.

Attachment V

Consultants and References

Preparers

Tyrell Colombo, MT DNRC, Kalispell Unit, Kalispell, MT – Management Forester – Project Leader

Tony Nelson, MT DNRC, Northwest Land Office, Kalispell, MT - Area Hydrologist and Soils Specialist

Leah Smith, MT DNRC, Northwest Land Office, Kalispell, MT - Area Wildlife Biologist

Individual Consultants

Pete Seigmund, MT DNRC, Forest Management Supervisor, Kalispell Unit, Kalispell, MT

Greg Poncin, MT DNRC, Unit Manager, Kalispell Unit, Kalispell, MT

Christopher Forristal, MT DNRC, Wildlife and Fisheries Biologist, Northwest Land Office, Kalispell, MT

Patrick Rennie, MT DNRC, Archeologist, Trust Land Management Division, Helena, MT

Norm Kuennen, MT DNRC, Senior Right-of-Way Specialist, Northwest Land Office, Kalispell, MT

Michael Collins, MT DNRC, Trust Lands Program Manager, Northwest Land Office, Kalispell, MT

Mark Slaten, MT DNRC, Lead Inventory Forester, Forest Management Bureau, Missoula, MT

Mark Vessar, MT DNRC, Hydrologist and Soil Specialist, Northwest Land Office, Kalispell, MT

Terry Thorpe, MT DNRC, Forest Improvement Specialist, Northwest Land Office, Kalispell, MT

Jim Bower, MT DNRC, Fisheries Program Specialist, Forest Management Bureau, Missoula, MT

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